FINAL ◦ APRIL 2020

Environmental Impact Report for the Lower Klamath Project License Surrender Volume III







State Clearinghouse No. 2016122047

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Final Environmental Impact Report for the Lower Klamath Project License Surrender

Volume III

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April 2020

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Visit Lower Klamath Project License Surrender Project Web Site (**https://www.waterboards.ca.gov/waterrights/water_issues/programs/water_quality_cert/lower_klamath_ferc14803.shtml**) where you can view and download an electronic copy of the Final EIR.

To receive future email notifications regarding the Lower Klamath Project, please subscribe to the "Lower Klamath Project License Surrender" email subscription list under "Water Rights".

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- Provide your name and email in the required fields.
- In the categories below the email and name fields, select "Water Rights," then "Lower Klamath Project License Surrender."
- Click on the "Subscribe" button.
- An email will be sent to you. You must respond to the email message(s) to confirm your membership on the selected list(s).

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ACRONYMS AND ABBREVIATIONS

2010 BiOp Flows	Flows described in the NMFS 2010 Biological Opinion
2012 KHSA EIS/EIR	Klamath Facilities Removal EIS/EIR
2013 BiOp Flows	Flows described in the NMFS and USFWS 2013 Joint Biological Opinion
2019 BiOp Flows	Flows described in the NMFS 2019 and USFWS 2019 Biological Opinions
2R	Two Dam Removal Alternative
3R	Three Dam Removal Alternative
7DADM	7-Day Average Daily Maximum
ADT	Average Daily Traffic
AADT	Annual Average Daily Traffic
AB	Assembly Bill
AF	Acre-feet
amsl	Above mean sea level
AN	Above Normal
ASTM	American Society for Testing and Materials
BAAQMD	Bay Area Air Quality Management District
BiOp	Biological Opinion
BOD	Biochemical Oxygen Demand
BLM	Bureau of Land Management
BMI	Benthic Macroinvertebrates
BMPs	Best Management Practices
BN	Below Normal
^{o}C	Degrees Celsius
CAAQS	California Ambient Air Quality Standards
CaCO3	Calcium carbonate
CalEPA	California Environmental Protection Agency
CALFIRE	California Department of Forestry and Fire Protection
Caltrans	California Department of Transportation
CAPCOA	California Air Pollution Control Officers Association

CARB	California Air Resources Board
CCHAB	California Cyanobacteria Harmful Algal Bloom
CDFW	California Department of Fish and Wildlife
CDOC	California Department of Conservation
CEF	Coho Enhancement Fund
cells/mL	Cells per milliliter
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CESA	California Endangered Species Act
cfs	Cubic feet per second
CH_4	Methane
CHHSL	California Human Health Screening Level
CNDDB	California Natural Diversity Database
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CRHR	California Register of Historical Resources
CWA	Clean Water Act
CWHR	California Wildlife Habitat Relationships
CY	Cubic yards
D	Dry
DDW	Division of Drinking Water
DEIR	Draft Environmental Impact Report
DMMP	Dredged Material Management Program
DOC	California Department of Conservation
DOI	Department of the Interior
DPS	Distinct Population Segment
DRE	Dam Removal Entity
DWR	California Department of Water Resources
EC	Existing conditions
EDR	Environmental Data Sources, Inc.

EDRRA	Evaluation of Dam Removal and Restoration of Anadromy
EDT	Ecosystem and Diagnosis Treatment
EFH	Essential Fish Habitat
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
ENSO	El Niño Southern Oscillation
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
°F	Degrees Fahrenheit
FCH	Fall Creek Hatchery
FEIR	Final Environmental Impact Report
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
g DW/m^2	grams, dry weight per square meter
GCM	Global Circulation Model
GHG	Greenhouse Gas
GWP	Global Warming Potential
HCP	Habitat Conservation Plan
HFCs	Hydrofluorocarbons
HGMP	Hatchery Genetic Management Plan
HPMP	Historic Properties Management Plan
IBI	Index of Biological Integrity
IDP	Inadvertent Discovery Plan
IFR	Institute for Fisheries Resources
IG	Iron Gate
IMIC	Interim Measures Implementation Committee
IM	Interim Measure
IPCC	Intergovernmental Panel on Climate Change
KBRA	Klamath Basin Restoration Agreement

KBRA Flows	Flows described in the Klamath Basin Restoration Agreement
KDR	Klamath Dam Removal
KDRM	Klamath Dam Removal Model
Ke	Light extinction
KHP	Klamath Hydroelectric Project
KHSA	Klamath Hydropower Settlement Agreement
Km	Kilometer
KOP	Key Observation Point
KPFA	Klamath Power Facility Agreement
KRRC	Klamath River Renewal Corporation
KRWQM	Klamath River Water Quality Model
L	Long-term
LiDAR	Light Detection And Ranging
LOS	Levels of Service
LVPP	Looting and Vandalism Prevention Program
MCV	A Manual of California Vegetation
MDL	Method Detection Limit
MDT	mean daily temperature
mgd	Million gallons per day
mg/L	Milligram per liter
mi	Mile
mm	Millimeters
mm^3/L	Millimeters cubed per Liter
MRL	Method Reporting Limit
msl	Mean Sea Level
MW	Megawatts
MWh	Megawatt-hours
MWMT	Maximum Weekly Maximum Temperatures
NAAQS	National Ambient Air Quality Standards
NAVD88	North American Vertical Datum of 1988
NEPA	National Environmental Policy Act

NESHAP	National Emission Standards for Hazardous Air Pollutants
NH	No Hatchery Alternative
NH_3	Ammonia
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NNE	Nutrient Numeric Endpoints
NOAA	National Oceanic and Atmospheric Administration
NOP	Notice of Preparation
North Coast Regional Board	North Coast Regional Water Quality Control Board
NOx	Nitrogen oxides
NP	No Project Alternative
NPAB	Northeast Plateau Air Basin
NPS	National Park Service
NRC	National Research Council
NRHP	National Register of Historic Places
NWS	National Weather Service
O_3	Ozone
ODEQ	Oregon Department of Environmental Quality
ODFW	Oregon Department of Fish and Wildlife
ODOT	Oregon Department of Transportation
OEHHA	Office of Environmental Health Hazard Assessment
ORV	Outstandingly Remarkable Values
OWRD	Oregon Water Resources Department
PAH	Polycyclic Aromatic Hydrocarbon
PBDE	Polybrominated Diphenyl Ether
PCB	Polychlorinated Biphenyl
PCE	Primary Constituent Elements
PCFFA	Pacific Coast Federation of Fisherman's Association
PDO	Pacific Decadal Oscillation
PEL	Probable Effect Level
pg/g	picogram per gram

PLM	Polarized Light Microscopy
PM	Particulate Matter
PM_{10}	Particulate Matter that is 10 micrometers or less in diameter
$PM_{2.5}$	Particulate Matter that is 2.5 micrometers or less in diameter
PNA	Plant Nutrient Availability
PO_4	Orthophosphate
PP	Proposed Project
PR	Partial Removal Alternative
RBM-10	River Basin Model-10
RES	Resources Environmental Solutions, LLC.
RM	River Mile
RMA-11	Resource Modelling Associates Model 11
ROD	Record of Decision
ROG	Reactive Organic Gases
RSET	Regional Sediment Evaluation Team
RV	Recreational Vehicle
SAR	Smolt-To-Adult Ratio
SCAPCD	Siskiyou County Air Pollution Control District
SCAQMD	South Coast Air Quality Management District
SEF	Sediment Evaluation Framework
SEV	Severity Index
SF	Steady Flow Response
SF_6	Sulfur Hexafluoride
SGMA	Sustainable Groundwater Management Act
SL1	Screening Level 1
SMAQMD	Sacramento Metropolitan Air Quality Management District
SONCC	Southern Oregon/Northern California Coast
SRH-1D	Sedimentation and River Hydraulics sediment transport model
SSC	Suspended Sediment Concentration
State Water Board	State Water Resources Control Board

SO_2	Sulfur Dioxide
s.u.	Standard units
SVAPCD	San Joaquin Valley Air Pollution Control District
SWPPP	Stormwater Pollution Prevention Plan
TAC	Toxic Air Contaminant
TCR	Tribal Cultural Resource
TCRMP	Tribal Cultural Resources Management Plan
THPO	Tribal Historic Preservation Officer
TMDL	Total Maximum Daily Load
TMP	Traffic Management Plan
TN	Total Nitrogen
TP	Total Phosphorus
TSS	Total Suspended Solids
UKBCA	Upper Klamath Basin Comprehensive Agreement
ug/L	Micrograms per liter
ug/kg	Micrograms per kilogram
USACE	United States Army Corps of Engineers
USBR	United States Bureau of Reclamation
USEPA	United States Environmental Protection Agency
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VOC	Volatile Organic Compound
VRM	Visual Resource Management
VSS	Volatile Suspended Solids
WHO	World Health Organization
WOP	Without Project
WSR	Wild and Scenic River
WY	Water Year

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1 INTRODUCTION

The Klamath River Renewal Corporation (KRRC) has applied to the Federal Energy Regulatory Commission (FERC) to decommission and remove the four Lower Klamath Project dams and associated facilities to create a free-flowing Klamath River and provide for volitional fish passage in the Klamath River.

The State Water Resources Control Board (State Water Board) is the Lead Agency responsible for complying with the California Environmental Quality Act (CEQA)[1] for the Lower Klamath Project License Surrender (Proposed Project). This final Lower Klamath Project Environmental Impact Report (Final EIR) has been prepared in conformance with CEQA. This Final EIR encompasses three numbered volumes and recirculated portions of the Draft EIR. Volume I and Volume II of the EIR were issued on December 27, 2018 as the Draft EIR and include the following sections:

Volume I

- Section 1 − Introduction
- Section 2 − Project Description
- Section 3 − Environmental Setting, Potential Impacts, and Mitigation Measures
- Section 4 − Alternatives
- Section 5 − Other CEQA Considerations

Volume II

- Technical Appendices Appendix A through Appendix X

Recirculated portions of the Draft EIR were issued on December 21, 2019, and replace the air quality, greenhouse gas emissions, and energy portions of Draft EIR Volume I and Volume II.

Volume III of the EIR includes public comments on Draft EIR Volume I and Volume II and the recirculated portions of the Draft EIR; responses to public comments; and revisions to the Draft EIR and recirculated portions to address public comments. Revisions to Draft EIR Volume I and Volume II are presented in Volume III Attachment 1, consistent with CEQA Guidelines section 15088 (d). Revisions to recirculated portions of the Draft EIR are presented in Volume III Attachment 2, consistent with CEQA Guidelines section 15088 (d).

[1] Public Resources Code, sections 21000 et seq.

All three numbered volumes of the EIR and the recirculated portions of the Draft EIR can be found on the Lower Klamath Project License Surrender Project Web Site (https://www.waterboards.ca.gov/waterrights/water_issues/programs/water_quality_cert/low er_klamath_ferc14803.shtml).

2 PUBLIC COMMENTS AND RESPONSES

2.1 Summary of Written and Oral Comments

The Lower Klamath Project Draft EIR, Volumes I and II, was released on December 27, 2018, for public review and comment. All forms of written comments were accepted, including emails and letters. In addition, the State Water Board conducted four public meetings in Northern California in February 2019, which allowed the public the opportunity to provide oral comments on the Draft EIR, Volumes I and II. All comments on Draft EIR, Volumes I and II that were received by February 26, 2019 are summarized and responded to in Section 2.3 and Section 2.4. All comments on the Draft EIR were given full consideration.

The air quality, greenhouse gas emissions, and energy portions of the Draft EIR, Volumes I and II were recirculated on December 21, 2019. All comments on the recirculated portions of the Draft EIR were received by February 6, 2020 and all comments were given full consideration. All forms of written comments were accepted during the comment period on the recirculated portions of the Draft EIR, including emails and letters. Comments that address the recirculated portions of the Draft EIR are responded to in Section 2.5.

A total of 441 comment letters and oral comments from approximately 108 commenters were received on the Draft EIR, Volumes I and II and recirculated portions of the Draft EIR from state and local agencies as well as Native American Tribes, organizations, and individuals.

Table 2-1. Summary of Written Comments on the Lower Klamath Project Draft EIR, Volumes I and II Organized by Commenter Affiliation.

Commenter Affiliation, Name	Commenter Identification	Page
State Agencies		
CAL FIRE, Mike Hebrard	SA4	2-138
California Department of Fish and Wildlife, Tina Bartlett, Jeffrey Stoddard, Tiffany Manko	SA3	2-139
Local Agencies		
Board of Harbor Commissioners of the Crescent City Harbor District, James Ramsey	LA5	2-145
City of Crescent City, Blake Inscore	LA7	2-146
City of Yreka, Steven Baker, Don Henion	LA8	2-147
County of Siskiyou, Ashley J. Remilllard	LA9	2-193
Del Norte County Board of Supervisors, Taylor Carsley, Lori L. Cowan	LA6	2-276
Humboldt County Board of Supervisors, Rex Bohn, Hank Seemann	LA4	2-282

Commenter Affiliation, Name	Commenter Identification	Page
Humboldt County Department of Health, John H. Moseman IV	LA10	2-283
Native American Tribes		
Hoopa Valley Tribe, Tom Schlosser	TR17	2-284
Karuk Tribe, Alex Watts-Tobin	TR22	2-288
Karuk Tribe, Chairman Attebery	TR18	2-289
Quartz Valley Indian Reservation, Crystal Robinson	TR20	2-322
Shasta Indian Nation, Chair Janice Crowe, Sami Jo Difuntorum	TR23	2-341
Shasta Nation, Chairman Roy Hall	TR24	2-345
Yurok Tribe, Vice Chairman Franklin Joseph Myers, Michael Belchik	TR19	2-351
Organizations		
American Rivers, Mark Busto	ORG48	2-366
American Rivers, California Trout Incorporated, Trout Unlimited, Sustainable Northwest, Steve Rothert, Curtis Knight, Brian Johnson, Greg Block	ORG27	2-366
Endangered Habitat League, Dan Silver	ORG35	2-369
Friends of Del Norte, Eileen Cooper	ORG36	2-369
Institute for Trade, Standards and Sustainable Development, Inc., Lawrence Kogan	ORG44	2-370
Klamath River Renewal Corporation, Laura Zagar, Mark Bransom	ORG47	2-394
League of Women Voters, Andrew Muse-Fisher, Helen Hutchinson, Rollin Richmond	ORG25	2-442
Mount Shasta Bioregional Ecology Center, Arielle Halpern	ORG26 ORG40	2-444
Native Fish Society, Wild Fish Conservancy, Patagonia Inc., Fly Water Travel, University of Montana, Stoecker Ecological, Conrad Gowell, Jake Crawford, Mark Sherwood, Kurt Beardslee, Jamie Glasglow, Hans Cole, Charles Gehr, Jack Stanford, and Matt Stoecker	ORG33	2-445

Commenter Affiliation, Name	Commenter Identification	Page
Native Fish Society, Wild Fish Conservancy, Patagonia Inc., Fly Water Travel, University of Montana, Stoecker Ecological, World Salmon Forum, Jake Crawford, Conrad Gowell, Mark Sherwood, Kurt Beardslee, Jamie Glasgow, Yvon Chouinard, Hans Cole, Charles Gehr, Jack Stanford, Matt Stoecker, and Bruce McNae	ORG34	2-447
Oregon Wild, Doug Heiken	ORG32	2-471
Pacific Coast Federation of Fishermans Association, Glen Spain	ORG29	2-479
PacifiCorp Energy, Tim Hemstreet, Mark Sturtevant	ORG46	2-499
Patagonia Works, Thomas R. Wilmoth, Kennon Meyer	ORG42 ORG45	2-1073
Save California Salmon, Save the Klamath Trinity Salmon, Regina Chichizola	ORG41	2-1095
Sierra Club, John Livingston	ORG43	2-1100
Siskiyou County Water Users Association, Richard Marshall, Rex Cozzalio	ORG30	2-1101
Trout Unlimited, Cindy Noble, Jason Lindberg, Michael Caranci, Patrick Kallerman, Charlie Schneider, Christy Fischer, Erik Young, Bob Blankenship, Trevor Fagerskog, James Polfer, Sam Davidson	ORG38	2-1173
Whale and Dolphin Conservation, Colleen Weiler	ORG28	2-1174
Individuals (Last Name, First Name)		
[No last name given], Aaron	IND63	2-1190
[No last name given], Barry	IND82	2-1191
[No last name given], Dennis	IND163	2-1191
[No last name given], Trinity, Ari, and Adam	IND198	2-1192
Abidi, Shayda	IND255	2-1194
About, JR	IND434	2-1195
Adams, Robert	IND293	2-1196
Adler, Marjorie	IND358	2-1196
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Anderson, Nicholas	IND328	2-1199
Anderson, Ni-Galth	IND324	2-1200
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Armstrong, Chris	IND115	2-1202
Arnold, JoEllen	IND409	2-1203
Arnold, Stephen	IND251	2-1203
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Ashmun, Craig	IND127	2-1205
Babb, Brian	IND89	2-1206
Bacigalupi, Jerry	IND269	2-1206
Bailey, Michael	IND345	2-1222
Baker, Carli	IND105	2-1223
Ballinger, Doug	IND191	2-1223
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Burnett, Brenda	IND87	2-1262
Burton, Don	IND448	2-1263
Callow, David	IND143	2-1263

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Campbell, Bruce	IND97	2-1264
Campbell, Derek	IND169	2-1264
Campbell, Don	IND179	2-1265
Campbell, Jack	IND433	2-1266
Cantwell, Austin	IND79 IND80	2-1266
Carpenter, John	IND274	2-1267
Carter, Ken	IND381	2-1269
Casas, Dan	IND135	2-1270
Caudana, Nicole	IND325	2-1270
Cavellini, Steve	IND246	2-1271
Cederwall, Mark	IND357	2-1272
Chacon, Robert	IND295	2-1273
Charles, Cindy	IND449	2-1273
Cheek, Bruce	IND93	2-1274
Clapp, Heather	IND437	2-1275
Clark, Matthew	IND348	2-1275
Cohen, Corrina	IND126	2-1276
Collins, James	IND431	2-1277
Connolly, Leo	IND371	2-1277
Cook, Nathan	IND330	2-1278
Cotsirilos, George	IND447	2-1279
Counts, Thomas	IND229	2-1279
Covault, Jonnel	IND400	2-1280
Crosby, Peter	IND311	2-1281
Cuningham, Bruce	IND94	2-1282
Cunningham, Storm	IND235	2-1282
Dana, Mark	IND356	2-1283
Dau, Bruce	IND95	2-1287
Devine, Timothy	IND216	2-1288
DeWter-Durham, Robin	IND282	2-1289
Distad, David	IND144	2-1289
Douglas, Peter	IND310	2-1290
Dow, Gordon	IND444	2-1291
Draeger, R.B.	IND300	2-1291
Dryg, Edward	IND200	2-1292
Durack, Justin	IND390	2-1293
Ebert, Carl and Linda	IND178	2-1294
Eckersley, April	IND153	2-1297
Ellis, Lynn	IND365	2-1297
Enders, Todd	IND214	2-1298

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Englert, Lissa	IND170	2-1298
Farrell, Devin	IND171	2-1300
Fee, Kevin	IND375	2-1301
Feller, Fred	IND215	2-1301
Ferguson, John	IND408	2-1302
Ferroggiaro, Robert	IND292	2-1303
Filice, Ed	IND196	2-1303
Fischer, Mark and Lisa	IND294	2-1304
Flanagan, Robert	IND290	2-1312
Flannes, Steve	IND245	2-1312
Flo, Mark	IND355	2-1313
Flynn, Pierce	IND306	2-1314
Fochetti, John	IND407	2-1315
Ford, Julie	IND393	2-1315
Forster, Mitchell	IND333	2-1316
Forsythe, Bruce	IND98	2-1317
Friedman, Linda	IND370	2-1317
Fujimura, Robert	IND283	2-1318
Gallegos, Jeff	IND422	2-1319
Gee, Brad	IND86	2-1320
Gehring, Delbert	IND162	2-1320
Gierak, Richard and Chris Stein	IND268	2-1321
Goff, Gabreil	IND223	2-1330
Goldsmith, Dan	IND132	2-1331
Goodwin, Charles	IND113	2-1332
Graff, Steven	IND242	2-1332
Graham, Glenn	IND445	2-1333
Grant, Nora and Clancy	IND321 IND322 IND323	2-1334
Greyraven, Cynthia	IND129	2-1343
Gross, John	IND406	2-1344
Growney, Karen	IND388	2-1345
Gustafson, Sharon	IND256	2-1345
Hagen, William	IND193	2-1346
Hager, Steven	IND241	2-1347
Halvorson, Keith	IND384	2-1348
Hamann, R.B.	IND304	2-1348
Hammerstad, Charles	IND110	2-1350
Hammerstad, Chuck	IND122	2-1350
Haselden, Julie	IND392	2-1350

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Haufler, James	IND430	2-1351
Haupt, Kenneth	IND379	2-1351
Hauser, Dan	IND133	2-1352
Henderson, Peggy	IND165	2-1353
Heneveld, Trevor	IND207	2-1355
Hickox, Robert	IND291	2-1355
Hill, Michelle	IND335	2-1356
Hineser, Mark	IND354	2-1357
Hogue, Marc	IND364	2-1357
Hohler, David	IND145	2-1358
Holloway, David	IND150	2-1359
Howard, Jeff	IND421	2-1360
Hrobuchak, David	IND146	2-1360
Hull, Danny	IND156 IND157 IND158 IND177	2-1361
Humphreys, Chad	IND108	2-1388
Humphreys, Tim	IND220	2-1389
Ihara, Nancy	IND320	2-1389
Imatani, Kenneth	IND378	2-1390
Israel, Joshua	IND397	2-1390
Jansen, Marty	IND351	2-1390
Jepson, Oliver	IND319	2-1391
Johnson, Dan	IND134	2-1392
Johnson, Daniel	IND138 IND139	2-1393
Johnson, David	IND147	2-1393
Johnson, Drake	IND194	2-1394
Johnson, Kenneth	IND377	2-1395
Johnson, R.B.	IND301	2-1396
Johns, Don	IND182	2-1396
Joost, William, Jr.	IND192	2-1397
Kaar, Susan	IND234	2-1398
Kalinowski, John	IND405	2-1398
Keegan, Kyle	IND373	2-1399
Kennedy, Mark	IND353	2-1400
Kent, Bart and Mary Cunningham	IND154	2-1400
Khartchenko, Alexander	IND68	2-1402
Kiefer, Marc	IND363	2-1404
Klein, Dorothy and Rodney	IND175	2-1405

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Koch, David	IND148	2-1405
Kohlman, Brian	IND90	2-1406
Kosh, Ryan	IND266	2-1407
Kress, Larry	IND372	2-1407
Krivan, William	IND190	2-1408
Krizo, David	IND270 IND271	2-1409
Krizo, Jacqui	IND272	2-1411
Kroeker, Curtis	IND128	2-1417
Krohn, Jerry	IND415	2-1418
Krupinski, K	IND389	2-1419
Kryger, Robert	IND288	2-1419
Kuhwarth, Richard	IND299	2-1420
Kwok, Steven	IND240	2-1421
L. Martin, William	IND188	2-1421
Lahti, Derald	IND168	2-1422
Lapcevic, William	IND187	2-1422
Larson, Edward	IND201	2-1423
Lee, Scott	IND261	2-1424
Lester, Paul	IND314	2-1424
Lima, Chris	IND117	2-1425
Lonergan, David	IND149	2-1426
Lorenson, R.B.	IND303	2-1427
Luby-Prikot, Lukas	IND366	2-1427
Mace, Bruce	IND99	2-1428
Maier, Kenny	IND376	2-1429
Makshanoff, William	IND186	2-1429
Maniatis, Terez	IND227	2-1430
Manning-Brown, Helen	IND436	2-1430
Mar, Terry	IND232	2-1431
Marsden, Michael	IND341	2-1432
Marta, Michele	IND336	2-1433
Martin, Rosada	IND279	2-1433
Mattson, William	IND195	2-1434
McCalister, R.B.	IND302	2-1435
McClintock, Robert	IND289	2-1435
Mcgee, Thomas Sr.	IND224	2-1436
McGrew, Marisa	IND359 IND360	2-1437
McKernan, Patrick	IND317	2-1438
McKinley, Charles	IND111	2-1438

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McLaren, Graham	IND443	2-1439
McMorrow, John	IND404	2-1440
Meamber, Sheila and Don	IND185	2-1440
Mees, Michael	IND340	2-1442
Menard, Robert	IND287	2-1442
Merlone, Steven	IND239	2-1443
Metzler, Michael	IND339	2-1444
Michaelides, Peter	IND309	2-1445
Mikeska, Jeff	IND273	2-1445
Miller, Susan	IND233	2-1446
Moitoza, Franklin	IND213	2-1449
Montes, Luis	IND367	2-1450
Moran, Michael	IND343	2-1451
Most, Stephen	IND248	2-1451
Muller, Trevor	IND206	2-1452
Murphy, Dennis	IND167	2-1452
Murphy, John	IND403	2-1453
Murphy, Ronald	IND280	2-1454
Muscatine, Jeffrey	IND419	2-1454
Muzzio, Andy	IND74	2-1455
Myers, Cynthia	IND130	2-1456
Naughton, James	IND429	2-1457
Neal, David	IND151	2-1457
Nelson, Greg	IND441	2-1458
Nelson, Sarah	IND264	2-1459
Nelson, Steven	IND238	2-1459
Netti, Steve	IND244	2-1460
Neuman, Dick	IND174	2-1460
Newton, Jerry and Linda	IND173	2-1461
Nguyen, Megan	IND346	2-1462
Nickelson, Thomas	IND222	2-1462
Niebruegge, Dave	IND140	2-1463
Nilsson, Tim and Debbie	IND152	2-1464
Nomellini, Angela	IND75	2-1466
Nourish, Bruce	IND100	2-1467
O'Brien, Jess	IND412	2-1468
O'Callaghan, Dennis	IND164	2-1468
O'Dowd, Alison	IND70	2-1469
Ohara, Stanley	IND252	2-1470
Olitzky, Bruce	IND101	2-1471
Pace, Felice	IND161	2-1471

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Pagliaro, Ignacio	IND435	2-1475
Pagones, Dennis	IND166	2-1476
Palmer, Neil	IND329	2-1477
Paoluccio, Joseph	IND399	2-1478
Parcell, Ruth	IND277	2-1478
Parry, Stephen	IND247	2-1479
Peck, Medwin	IND347	2-1480
Pendergast, Fred	IND217	2-1480
Perry, Stan	IND253	2-1481
Person, Molly	IND332	2-1482
Piimauna, Kevin	IND374	2-1483
Piziali, Robert	IND286	2-1483
Plopper, Charles	IND112	2-1484
Preskenis, Dan	IND136	2-1484
Pryor, Geoff	IND228	2-1485
Raddue, Rick	IND297	2-1486
Raffel, Corey	IND125	2-1486
Raivio, Matt	IND350	2-1487
Ramp, Rudy	IND278	2-1488
Reynolds, Phil	IND285	2-1489
Robb, Carol	IND106	2-1490
Roff, Gabriella	IND225	2-1491
Rogers, Anna	IND77	2-1492
Rogers, Hamilton	IND439	2-1492
Rogers, Mike	IND334	2-1493
Romberger, Christian	IND119	2-1494
Rood, Edson	IND199	2-1494
Rosenberg, Bob	IND85	2-1495
Rusert, Frieda	IND221	2-1496
Ryan, Bill	IND83	2-1496
S., Ron	IND281	2-1497
Salkas, Jim	IND410	2-1498
Salle, Nicholas	IND327	2-1498
Schaaf, Cody	IND123	2-1499
Schadlich, Daisy	IND131 IND155	2-1500
Schmidt, Bill	IND180	2-1500
Schoettgen, Scott	IND260	2-1504
Schramm, Steve	IND243	2-1505
Schug, Axel	IND81	2-1506
Schweitz, Joshua	IND396	2-1506

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Sedlock, Evan	IND210	2-1507
Segelke, Trevor	IND204	2-1508
Self, Ann	IND76	2-1509
Shadden, Bryan	IND104	2-1509
Shank, Amelia	IND71	2-1510
Shaw, William	IND184	2-1511
Shell, Christopher	IND121	2-1511
Shields, Thomas	IND226	2-1512
Shin, Donald	IND189	2-1513
Shoop, Carter	IND107	2-1514
Sieber, Michael	IND338	2-1514
Sievert, Jane	IND424	2-1515
Silver, Dan	IND137	2-1516
Simon, James	IND428	2-1516
Sinclair, Kimberly	IND275	2-1517
Skenes, Joshua	IND395	2-1519
Skinner, R.B.	IND305	2-1519
Slightom, Bruce	IND102	2-1519
Smaldino, Eric	IND205	2-1521
Smith, Harry	IND438	2-1521
Smith, Karri	IND387	2-1522
Solway, Sean	IND257	2-1523
Sommer, Karen	IND315	2-1523
Sosnove, Nancy	IND331	2-1524
Sowell, Margaret	IND361	2-1524
Spaller, William	IND183	2-1525
Spurr, Jeffrey	IND420	2-1526
Stanley, Brent	IND88	2-1526
Stauss, Arthur	IND78	2-1527
Steffan, Fred	IND219	2-1528
Steinhart, John	IND64	2-1529
Stewart, James	IND427	2-1529
Stokes, John	IND402	2-1530
Street, Bill	IND84	2-1531
Suarez, Alicia	IND69	2-1531
Swan, Tim	IND218	2-1532
Sway, Scott	IND259	2-1533
Teakle, Ken	IND380	2-1533
Tomlinson, Michael	IND337	2-1534
Tone, Jerry	IND414	2-1535
Tontz, Rick	IND296	2-1535

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Toretta, Tom	IND209	2-1536
Torre, Robert	IND284	2-1537
Toth, Rob	IND267	2-1537
Trafican, Jeffrey	IND418	2-1539
Triska, Mark	IND352	2-1540
Tucker, Scott	IND258	2-1540
Turner, Eli	IND202	2-1541
Turner, Todd	IND211 IND212	2-1542
Umeda, Marc	IND362	2-1543
Van De Hey, Abigail	IND65	2-1543
Vincent, Bruce	IND103	2-1544
Volk, Grant	IND442	2-1544
Vorik, Dmitriy	IND176	2-1545
Waite, Ryan	IND265	2-1550
Walden, Charlene and James	IND109	2-1550
Wangerin, Joyce	IND394	2-1554
Ward, Charles	IND114	2-1554
Warner, Patrick	IND316	2-1555
Waters, Brian	IND91	2-1556
Webb, David	IND159 IND160	2-1556
Weber, Eugene	IND208	2-1558
Weddle, Pat	IND318	2-1558
Weeder, Julie	IND391	2-1559
Weidenfeld, Jessica	IND411	2-1560
Weiner, Andrew	IND72	2-1560
West, Richard	IND298	2-1561
Westberg, Paul	IND312	2-1562
Whelan, Bruce	IND96	2-1562
White, Adam	IND66	2-1563
Whitton, James	IND426	2-1564
Williamson, Peter	IND307 IND308	2-1565
Wilson, Eric	IND203	2-1565
Windflower, Lisa	IND369	2-1566
Wong, James	IND425	2-1567
Worcester, Chris	IND118	2-1567
Wrisley, Gregg	IND440	2-1568
Wrisley, Michael	IND342	2-1569
Wyro, John	IND401	2-1569

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Yyeki, William	IND181	2-1570
Zampino, Jerry	IND413	2-1570
Zufelt, Steven	IND237	2-1571

Table 2-2. Summary of Written Comments on the Lower Klamath Project Draft EIR, Volumes I and II Organized by Commenter Identification Code.

Commenter Identification[1]	Commenter Affiliation (Commenter Last Name, First Name)	Page
State Agencies		
SA3	California Department of Fish and Wildlife, Tina Bartlett, Jeffrey Stoddard, Tiffany Manko	2-139
SA4	CAL FIRE, Mike Hebrard	2-138
Local Agencies		
LA4	Humboldt County Board of Supervisors, Rex Bohn, Hank Seemann	2-282
LA5	Board of Harbor Commissioners of the Crescent City Harbor District, James Ramsey	2-145
LA6	Del Norte County Board of Supervisors, Taylor Carsley, Lori L. Cowan	2-276
LA7	City of Crescent City, Blake Inscore	2-146
LA8	City of Yreka, Steven Baker, Don Henion	2-147
LA9	County of Siskiyou, Ashley J. Remilllard	2-193
LA10	Humboldt County Department of Health, John H. Moseman IV	2-283
Native American Tribes		
TR17	Hoopa Valley Tribe, Tom Schlosser	2-284
TR18	Karuk Tribe, Chairman Attebery	2-289
TR19	Yurok Tribe, Vice Chairman Franklin Joseph Myers, Michael Belchik	2-351
TR20	Quartz Valley Indian Reservation, Crystal Robinson	2-322
TR22	Karuk Tribe, Alex Watts-Tobin	2-288
TR23	Shasta Indian Nation, Chair Janice Crowe, Sami Jo Difuntorum	2-341
TR24	Shasta Nation, Chairman Roy Hall	2-345

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Organizations		
ORG25	League of Women Voters, Andrew Muse-Fisher, Helen Hutchinson, Rollin Richmond	2-442
ORG26 ORG40	Mount Shasta Bioregional Ecology Center, Arielle Halpern	2-444
ORG27	American Rivers, California Trout Incorporated, Trout Unlimited, Sustainable Northwest, Steve Rothert, Curtis Knight, Brian Johnson, Greg Block	2-366
ORG28	Whale and Dolphin Conservation, Colleen Weiler	2-1174
ORG29	Pacific Coast Federation of Fishermans Association, Glen Spain	2-479
ORG30	Siskiyou County Water Users Association, Richard Marshall, Rex Cozzalio	2-1101
ORG32	Oregon Wild, Doug Heiken	2-471
ORG33	Native Fish Society, Wild Fish Conservancy, Patagonia Inc., Fly Water Travel, University of Montana, Stoecker Ecological, Conrad Gowell, Jake Crawford, Mark Sherwood, Kurt Beardslee, Jamie Glasglow, Hans Cole, Charles Gehr, Jack Stanford, and Matt Stoecker	2-445
ORG34	Native Fish Society, Wild Fish Conservancy, Patagonia Inc., Fly Water Travel, University of Montana, Stoecker Ecological, World Salmon Forum, Jake Crawford, Conrad Gowell, Mark Sherwood, Kurt Beardslee, Jamie Glasgow, Yvon Chouinard, Hans Cole, Charles Gehr, Jack Stanford, Matt Stoecker, and Bruce McNae	2-447
ORG35	Endangered Habitat League, Dan Silver	2-369
ORG36	Friends of Del Norte, Eileen Cooper	2-369
ORG38	Trout Unlimited, Cindy Noble, Jason Lindberg, Michael Caranci, Patrick Kallerman, Charlie Schneider, Christy Fischer, Erik Young, Bob Blankenship, Trevor Fagerskog, James Polfer, Sam Davidson	2-1173
ORG41	Save California Salmon, Save the Klamath Trinity Salmon, Regina Chichizola	2-1095
ORG42 ORG45	Patagonia Works, Thomas R. Wilmoth, Kennon Meyer	2-1073
ORG43	Sierra Club, John Livingston	2-1100

Commenter Identification[1]	Commenter Affiliation (Commenter Last Name, First Name)	Page
ORG44	Institute for Trade, Standards and Sustainable Development, Inc., Lawrence Kogan	2-370
ORG46	PacifiCorp Energy, Tim Hemstreet, Mark Sturtevant	2-499
ORG25	Klamath River Renewal Corporation, Laura Zagar, Mark Bransom	2-394
ORG26 ORG40	American Rivers, Mark Busto	2-366
Individuals		
IND63	[No last name given], Aaron	2-1190
IND64	Steinhart, John	2-1529
IND65	Van De Hey, Abigail	2-1543
IND66	White, Adam	2-1563
IND67	Bliss, Alexander	2-1256
IND68	Khartchenko, Alexander	2-1402
IND69	Suarez, Alicia	2-1531
IND70	O'Dowd, Alison	2-1469
IND71	Shank, Amelia	2-1510
IND72	Weiner, Andrew	2-1560
IND73	Benkert, Andy	2-1251
IND74	Muzzio, Andy	2-1455
IND75	Nomellini, Angela	2-1466
IND76	Self, Ann	2-1509
IND77	Rogers, Anna	2-1492
IND78	Stauss, Arthur	2-1527
IND79 IND80	Cantwell, Austin	2-1266
IND81	Schug, Axel	2-1506
IND82	[No last name given], Barry	2-1191
IND83	Ryan, Bill	2-1496
IND84	Street, Bill	2-1531
IND85	Rosenberg, Bob	2-1495
IND86	Gee, Brad	2-1320
IND87	Burnett, Brenda	2-1262
IND88	Stanley, Brent	2-1526
IND89	Babb, Brian	2-1206
IND90	Kohlman, Brian	2-1406
IND91	Waters, Brian	2-1556
IND92	Antoniw, Brittany	2-1201
IND93	Cheek, Bruce	2-1274
IND94	Cuningham, Bruce	2-1282
IND95	Dau, Bruce	2-1287

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IND96	Whelan, Bruce	2-1562
IND97	Campbell, Bruce	2-1264
IND98	Forsythe, Bruce	2-1317
IND99	Mace, Bruce	2-1428
IND100	Nourish, Bruce	2-1467
IND101	Olitzky, Bruce	2-1471
IND102	Slightom, Bruce	2-1519
IND103	Vincent, Bruce	2-1544
IND104	Shadden, Bryan	2-1509
IND105	Baker, Carli	2-1222
IND106	Robb, Carol	2-1490
IND107	Shoop, Carter	2-1514
IND108	Humphreys, Chad	2-1388
IND109	Walden, Charlene and James	2-1550
IND110	Hammerstad, Charles	2-1350
IND111	McKinley, Charles	2-1438
IND112	Plopper, Charles	2-1484
IND113	Goodwin, Charles	2-1332
IND114	Ward, Charles	2-1554
IND115	Armstrong, Chris	2-1202
IND116	Barger, Christian	2-1225
IND117	Lima, Chris	2-1425
IND118	Worcester, Chris	2-1567
IND119	Romberger, Christian	2-1494
IND120	Bucklin, Christine	2-1261
IND121	Shell, Christopher	2-1511
IND122	Hammerstad, Chuck	2-1350
IND123	Schaaf, Cody	2-1499
IND124	Bamberger, Cole	2-1225
IND125	Raffel, Corey	2-1486
IND126	Cohen, Corrina	2-1276
IND127	Ashmun, Craig	2-1205
IND128	Kroeker, Curtis	2-1417
IND129	Greyraven, Cynthia	2-1343
IND130	Myers, Cynthia	2-1456
IND131 IND155	Schadlich, Daisy	2-1500
IND132	Goldsmith, Dan	2-1331
IND133	Hauser, Dan	2-1352
IND134	Johnson, Dan	2-1392
IND135	Casas, Dan	2-1270
IND136	Preskenis, Dan	2-1484
IND137	Silver, Dan	2-1516

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IND140	Niebruegge, Dave	2-1463
IND141	Beste, David	2-1253
IND142	Boggess, David	2-1256
IND143	Callow, David	2-1263
IND144	Distad, David	2-1289
IND145	Hohler, David	2-1358
IND146	Hrobuchak, David	2-1360
IND147	Johnson, David	2-1393
IND148	Koch, David	2-1405
IND149	Lonergan, David	2-1426
IND150	Holloway, David	2-1359
IND151	Neal, David	2-1457
IND152	Nilsson, Tim and Debbie	2-1464
IND153	Eckersley, April	2-1297
IND154	Kent, Bart and Mary Cunningham	2-1400
IND156 IND157 IND158 IND177	Hull, Danny	2-1361
IND159 IND160	Webb, David	2-1556
IND161	Pace, Felice	2-1471
IND162	Gehring, Delbert	2-1320
IND163	[No last name given], Dennis	2-1191
IND164	O'Callaghan, Dennis	2-1468
IND165	Henderson, Peggy	2-1353
IND166	Pagones, Dennis	2-1476
IND167	Murphy, Dennis	2-1452
IND168	Lahti, Derald	2-1422
IND169	Campbell, Derek	2-1264
IND170	Englert, Lissa	2-1298
IND171	Farrell, Devin	2-1300
IND172	Brink, Diane	2-1259
IND173	Newton, Jerry and Linda	2-1461
IND174	Neuman, Dick	2-1460
IND175	Klein, Dorothy and Rodney	2-1405
IND176	Vorik, Dmitriy	2-1545
IND178	Ebert, Carl and Linda	2-1294
IND179	Campbell, Don	2-1265
IND180	Schmidt, Bill	2-1500
IND181	Yyeki, William	2-1570

Commenter Identification[1]	Commenter Affiliation (Commenter Last Name, First Name)	Page
IND182	Jons, Don	2-1393
IND183	Spaller, William	2-1525
IND184	Shaw, William	2-1511
IND185	Meamber, Sheila and Don	2-1440
IND186	Makshanoff, William	2-1429
IND187	Lapcevic, William	2-1422
IND188	L. Martin, William	2-1421
IND189	Shin, Donald	2-1513
IND190	Krivan, William	2-1408
IND191	Ballinger, Doug	2-1223
IND192	Joost, William, Jr.	2-1397
IND193	Hagen, William	2-1346
IND194	Johnson, Drake	2-1394
IND195	Mattson, William	2-1434
IND196	Filice, Ed	2-1303
IND197	Bramley, William	2-1258
IND198	[No last name given], Trinity, Ari, and Adam	2-1192
IND199	Rood, Edson	2-1494
IND200	Dryg, Edward	2-1291
IND201	Larson, Edward	2-1423
IND202	Turner, Eli	2-1541
IND203	Wilson, Eric	2-1565
IND204	Segelke, Trevor	2-1508
IND205	Smaldino, Eric	2-1521
IND206	Muller, Trevor	2-1452
IND207	Heneveld, Trevor	2-1355
IND208	Weber, Eugene	2-1558
IND209	Toretta, Tom	2-1536
IND210	Sedlock, Evan	2-1507
IND211 IND212	Turner, Todd	2-1542
IND213	Moitoza, Franklin	2-1449
IND214	Enders, Todd	2-1298
IND215	Feller, Fred	2-1301
IND216	Devine, Timothy	2-1288
IND217	Pendergast, Fred	2-1480
IND218	Swan, Tim	2-1532
IND219	Steffan, Fred	2-1528
IND220	Humphreys, Tim	2-1389
IND221	Rusert, Frieda	2-1496
IND222	Nickelson, Thomas	2-1462
IND223	Goff, Gabreil	2-1330
IND224	Mcgee, Thomas Sr.	2-1436

Commenter Identification[1]	Commenter Affiliation (Commenter Last Name, First Name)	Page
IND225	Roff, Gabriella	2-1491
IND226	Shields, Thomas	2-1512
IND227	Maniatis, Terez	2-1430
IND228	Pryor, Geoff	2-1485
IND229	Counts, Thomas	2-1279
IND230	Burdon, Thomas	2-1261
IND231	Allen, Thomas	2-1197
IND232	Mar, Terry	2-1431
IND233	Miller, Susan	2-1446
IND234	Kaar, Susan	2-1398
IND235	Cunningham, Storm	2-1282
IND236	Alsop, Stewart	2-1198
IND237	Zufelt, Steven	2-1571
IND238	Nelson, Steven	2-1459
IND239	Merlone, Steven	2-14432-1435
IND240	Kwok, Steven	2-1421
IND241	Hager, Steven	2-1347
IND242	Graff, Steven	2-1332
IND243	Schramm, Steve	2-1505
IND244	Netti, Steve	2-1460
IND245	Flannes, Steve	2-1312
IND246	Cavellini, Steve	2-1271
IND247	Parry, Stephen	2-1479
IND248	Most, Stephen	2-1451
IND249	Black, Stephen	2-1253
IND250	Bartlett-Ré, Stephen	2-1227
IND251	Arnold, Stephen	2-1203
IND252	Ohara, Stanley	2-1470
IND253	Perry, Stan	2-1481
IND254	Becker, Stacy	2-1250
IND255	Abidi, Shayda	2-1194
IND256	Gustafson, Sharon	2-1345
IND257	Solway, Sean	2-1523
IND258	Tucker, Scott	2-1540
IND259	Sway, Scott	2-1533
IND260	Schoettgen, Scott	2-1504
IND261	Lee, Scott	2-1424
IND262	Bohannan, Scott	2-1257
IND263	Ballinger, Scott	2-1224
IND264	Nelson, Sarah	2-1459
IND265	Waite, Ryan	2-1550
IND266	Kosh, Ryan	2-1407

Commenter Identification[1]	Commenter Affiliation (Commenter Last Name, First Name)	Page
IND267	Toth, Rob	2-1537
IND268	Gierak, Richard and Chris Stein	2-1321
IND269	Bacigalupi, Jerry	2-1206
IND270 IND271	Krizo, David	2-1409
IND272	Krizo, Jacqui	2-1411
IND273	Mikeska, Jeff	2-1445
IND274	Carpenter, John	2-1267
IND275	Sinclair, Kimberly	2-1517
IND276	Blaich, Ryan	2-1254
IND277	Parcell, Ruth	2-1478
IND278	Ramp, Rudy	2-1488
IND279	Martin, Rosada	2-1433
IND280	Murphy, Ronald	2-1454
IND281	S., Ron	2-1497
IND282	DeWter-Durham, Robin	2-1289
IND283	Fujimura, Robert	2-1318
IND284	Torre, Robert	2-1537
IND285	Reynolds, Phil	2-1489
IND286	Piziali, Robert	2-1483
IND287	Menard, Robert	2-1442
IND288	Kryger, Robert	2-1419
IND289	McClintock, Robert	2-1435
IND290	Flanagan, Robert	2-1312
IND291	Hickox, Robert	2-1355
IND292	Ferroggiaro, Robert	2-1303
IND293	Adams, Robert	2-1196
IND294	Fischer, Mark and Lisa	2-1304
IND295	Chacon, Robert	2-1273
IND296	Tontz, Rick	2-1535
IND297	Raddue, Rick	2-1486
IND298	West, Richard	2-1561
IND299	Kuhwarth, Richard	2-1420
IND300	Draeger, R.B.	2-1291
IND301	Johnson, R.B.	2-1396
IND302	McCalister, R.B.	2-1435
IND303	Lorenson, R.B.	2-1427
IND304	Hamann, R.B.	2-1348
IND305	Skinner, R.B.	2-1519
IND306	Flynn, Pierce	2-1314
IND307 IND308	Williamson, Peter	2-1565
IND309	Michaelides, Peter	2-1445

Commenter Identification[1]	Commenter Affiliation (Commenter Last Name, First Name)	Page
IND310	Douglas, Peter	2-1290
IND311	Crosby, Peter	2-1281
IND312	Westberg, Paul	2-1562
IND313	Boero, Paul	2-1252
IND314	Lester, Paul	2-1424
IND315	Sommer, Karen	2-1523
IND316	Warner, Patrick	2-1555
IND317	McKernan, Patrick	2-1438
IND318	Weddle, Pat	2-1558
IND319	Jepson, Oliver	2-1391
IND320	Ihara, Nancy	2-1389
IND321 IND322 IND323	Grant, Nora and Clancy	2-1334
IND324	Anderson, Ni-Galth	2-1200
IND325	Caudana, Nicole	2-1270
IND326	Bauer, Nick	2-1228
IND327	Salle, Nicholas	2-1498
IND328	Anderson, Nicholas	2-1199
IND329	Palmer, Neil	2-1477
IND330	Cook, Nathan	2-1278
IND331	Sosnove, Nancy	2-1524
IND332	Person, Molly	2-1482
IND333	Forster, Mitchell	2-1316
IND334	Rogers, Mike	2-1493
IND335	Hill, Michelle	2-1356
IND336	Marta, Michele	2-1433
IND337	Tomlinson, Michael	2-1534
IND338	Sieber, Michael	2-1514
IND339	Metzler, Michael	2-1444
IND340	Mees, Michael	2-1442
IND 341	Marsden, Michael	2-1432
IND342	Wrisley, Michael	2-1569
IND343	Moran, Michael	2-1451
IND344	Bland, Michael	2-1255
IND345	Bailey, Michael	2-1222
IND346	Nguyen, Megan	2-1462
IND347	Peck, Medwin	2-1480
IND348	Clark, Matthew	2-1275
IND349	Andrus, Matt	2-1200
IND350	Raivio, Matt	2-1487
IND351	Jansen, Marty	2-1390
IND352	Triska, Mark	2-1540

Commenter Identification[1]	Commenter Affiliation (Commenter Last Name, First Name)	Page
IND353	Kennedy, Mark	2-1400
IND354	Hineser, Mark	2-1357
IND355	Flo, Mark	2-1313
IND356	Dana, Mark	2-1283
IND357	Cederwall, Mark	2-1272
IND358	Adler, Marjorie	2-1196
IND359 IND360	McGrew, Marisa	2-1437
IND361	Sowell, Margaret	2-1524
IND362	Umeda, Marc	2-1543
IND363	Kiefer, Marc	2-1404
IND364	Hogue, Marc	2-1357
IND365	Ellis, Lynn	2-1297
IND366	Luby-Prikot, Lukas	2-1427
IND367	Montes, Luis	2-1450
IND368	Beardsmore, Loy and John	2-1228
IND369	Windflower, Lisa	2-1566
IND370	Friedman, Linda	2-1317
IND371	Connolly, Leo	2-1277
IND372	Kress, Larry	2-1407
IND373	Keegan, Kyle	2-1399
IND374	Piimauna, Kevin	2-1483
IND375	Fee, Kevin	2-1301
IND376	Maier, Kenny	2-1429
IND377	Johnson, Kenneth	2-1395
IND378	Imatani, Kenneth	2-1390
IND379	Haupt, Kenneth	2-1351
IND380	Teakle, Ken	2-1533
IND381	Carter, Ken	2-1269
IND382	Briscoe, Laura and Ken	2-1259
IND383	Barlow, Kelly	2-1226
IND384	Halvorson, Keith	2-1348
IND385 IND386	Bentz, Keith	2-1251
IND387	Smith, Karri	2-1522
IND388	Growney, Karen	2-1345
IND389	Krupinski, K	2-1419
IND390	Durack, Justin	2-1293
IND391	Weeder, Julie	2-1559
IND392	Haselden, Julie	2-1350
IND393	Ford, Julie	2-1315
IND394	Wangerin, Joyce	2-1554
IND395	Skenes, Joshua	2-1519

Commenter Identification[1]	Commenter Affiliation (Commenter Last Name, First Name)	Page
IND396	Schweitz, Joshua	2-1506
IND397	Israel, Joshua	2-1390
IND398	Asel, Josh	2-1204
IND399	Paoluccio, Joseph	2-1478
IND400	Covault, Jonnel	2-1280
IND401	Wyro, John	2-1569
IND402	Stokes, John	2-1530
IND403	Murphy, John	2-1453
IND404	McMorrow, John	2-1440
IND405	Kalinowski, John	2-1398
IND406	Gross, John	2-1344
IND407	Fochetti, John	2-1315
IND408	Ferguson, John	2-1302
IND409	Arnold, JoEllen	2-1203
IND410	Salkas, Jim	2-1498
IND411	Weidenfeld, Jessica	2-1560
IND412	O'Brien, Jess	2-1468
IND413	Zampino, Jerry	2-1570
IND414	Tone, Jerry	2-1535
IND415	Krohn, Jerry	2-1418
IND416	Bender, Jerry	2-1250
IND417	Bernard, Jeffry	2-1252
IND418	Trafican, Jeffrey	2-1539
IND419	Muscatine, Jeffrey	2-1454
IND420	Spurr, Jeffrey	2-1526
IND421	Howard, Jeff	2-1360
IND422	Gallegos, Jeff	2-1319
IND423	Bright, Jeff	2-1258
IND424	Sievert, Jane	2-1515
IND425	Wong, James	2-1567
IND426	Whitton, James	2-1564
IND427	Stewart, James	2-1529
IND428	Simon, James	2-1516
IND429	Naughton, James	2-1457
IND430	Haufler, James	2-1351
IND431	Collins, James	2-1277
IND432	Apodaca, Jacob	2-1201
IND433	Campbell, Jack	2-1266
IND434	About, JR	2-1192
IND435	Pagliaro, Ignacio	2-1475
IND436	Manning-Brown, Helen	2-1430
IND437	Clapp, Heather	2-1275
IND438	Smith, Harry	2-1521

Commenter Identification[1]	Commenter Affiliation (Commenter Last Name, First Name)	Page
IND439	Rogers, Hamilton	2-1492
IND440	Wrisley, Gregg	2-1568
IND441	Nelson, Greg	2-1458
IND442	Volk, Grant	2-1544
IND443	McLaren, Graham	2-1439
IND444	Dow, Gordon	2-1291
IND445	Graham, Glenn	2-1333
IND446	Anderson, Glen	2-1198
IND447	Cotsirilos, George	2-1279
IND448	Burton, Don	2-1263
IND449	Charles, Cindy	2-1273

[1] Comments were coded in the order that they were received and thus the commenter identification codes may skip numbers in this table. Please refer to Table 2-3 for additional commenter identification codes associated with oral comments.

Table 2-3. Summary of Oral Comments on the Lower Klamath Project Draft EIR, Volumes I and II Organized by Commenter Identification Code.

Commenter Affiliation and Name	Commenter Identification [1]	Page
Yreka - February 5, 2019		
State Agencies		
Office of Assemblymember Brian Dahle, Bruce Ross	SA1-ORAL	2-1575
California State Assemblymember, Kevin Kiley	SA2-ORAL	2-1575
Local Agencies		
County of Siskiyou, Board of Supervisors, Brandon Criss	LA1-ORAL	2-1580
County of Siskiyou, Wayne Hammar	LA3-ORAL	2-1576
Native American Tribes		
Karuk Tribe, Alex Watts-Tobin	TR2-ORAL	2-1585
Karuk Tribe, Robert J. Super	TR1-ORAL	2-1585
Karuk Tribe, Sammi Jo Goodwin	TR5-ORAL	2-1587
Karuk Tribe, Taylor Tupper	TR4-ORAL	2-1587
Karuk Tribe, Vikki Preston	TR3-ORAL	2-1590
Shasta Nation, Betty Hall	TR21-ORAL	2-1597

Commenter Affiliation and Name	Commenter Identification [1]	Page
Organizations		
California Trout Incorporated, Andrew Braugh	ORG3-ORAL	2-1576
Environmental Protection Information Center, Rogue Climate, Allie Rosenbluth	ORG1-ORAL	2-1584
Klamath River Renewal Corporation, Matt Cox	ORG14-ORAL	2-1585
McCloud Watershed Council, Angelina Cook	ORG4-ORAL	2-1594
Mid Klamath Watershed Council, Devin Finegan	ORG9-ORAL	2-1595
Pacific Coast Federation of Fishermans Association, Glen Spain	ORG12-ORAL	2-1597
Salmon Recovery Funding Board, Monica Harle	ORG16-ORAL	2-1599
Salmon River Restoration Council, Stefan Dosch	ORG20-ORAL	2-1600
Siskiyou County Water Users Association, Richard Marshall	ORG18-ORAL	2-1604
Klamath Riverkeeper, Andrew Marx	ORG49-ORAL	2-1584
Individuals		
Andrews, Esther	IND3-ORAL	2-1606
Banzali, Francine	IND24-ORAL	2-1607
Chichizola, Malcolm	IND62-ORAL	2-1607
Chichizola, Regina	IND44-ORAL	2-1608
Corcoran, James	IND28-ORAL	2-1610
County of Siskiyou, Board of Supervisors, Lisa L. Nixon	IND60-ORAL	2-1583
Cozzales, Rex	IND45-ORAL	2-1610
Fischer, Stephen	IND51-ORAL	2-1614
Foster, John	IND31-ORAL	2-1615
Grunbaum, Jon	IND32-ORAL	2-1615
Hendricks, Nicholas	IND40-ORAL	2-1615
Jones, Marva	IND37-ORAL	2-1615
Joseph, Patricia	IND42-ORAL	2-1615
Joseph, Thomas	IND53-ORAL	2-1615
Khart, Al	IND1-ORAL	2-1584
Kramer, Richard	IND46-ORAL	2-1621
Mackintosh, Don	IND18-ORAL	2-1626
Meamber, Sheila and Brett, and Krista Grassi	IND49-ORAL	2-1626
Meamber, Don	IND19-ORAL	2-1626
Reynolds, Chrissie	IND11-ORAL	2-1621
Schmidt, Bill	IND7-ORAL	2-1651
Silva, Veronica	IND61-ORAL	2-1651
Staats, Jenny	IND29-ORAL	2-1653

Commenter Affiliation and Name	Commenter Identification [1]	Page
Still, Nita	IND41-ORAL	2-1653
Tibbetts, Isabella	IND27-ORAL	2-1655
Utley, Chloe	IND10-ORAL	2-1651
Warner, Grace	IND25-ORAL	2-1657
Arcata - February 6, 2019		
Local Agencies		
County of Humboldt, Steve Madrone	LA2-ORAL	2-1659
Native American Tribes		
Yurok Tribe, Frankie Joe Myers	TR7-ORAL	2-1674
Yurok Tribe, Joe James	TR6-ORAL	2-1675
Yurok Tribe, Mike Belchik	TR8-ORAL	2-1676
Yurok Tribe, Toby Vanlandingham	TR9-ORAL	2-1677
Organizations		
Del Norte Economic Development Corporation, Eli Naffah	ORG11-ORAL	2-1661
Environmental Protection Information Center, Native Rights Council, Amber Jamieson	ORG2-ORAL	2-1659
Friends of Del Norte, Eileen Cooper	ORG10-ORAL	2-1663
Friends of the Eel River, Scott Greacen	ORG19-ORAL	2-1663
Green Party of Humboldt County, Move to Amend, Kelsey Reedy	ORG13-ORAL	2-1665
Klamath River Renewal Corporation, Dave Meurer	ORG7-ORAL	2-1665
Pacific Coast Federation of Fishermans Association, Institute for Fisheries Resources, Vivian Helliwell	ORG21-ORAL	2-1671
Pacific Coast Federation of Fishermans Association, Regina Chichizola, Malcom Chichizola	ORG17-ORAL	2-1669
Pacific Coast Federation of Fishermans Association/HEMA, Dave Bitts	ORG6-ORAL	2-1665
Green Party of Humboldt County, Erik Rydberg	ORG50-ORAL	2-1663
Seventh Generation Fund for Indigenous Peoples, Inc., Carlrey Arroyo	ORG51-ORAL	2-1663

Commenter Affiliation and Name	Commenter Identification [1]	Page
Individuals		
Benson, Craig	IND12-ORAL	2-1674
Lincoln, Bernadette	IND5-ORAL	2-1681
Lowry, K'neK'neK'	IND33-ORAL	2-1682
Lowry, Merry	IND39-ORAL	2-1682
Luckey, Donna	IND20-ORAL	2-1683
Martin, Rosada	IND47-ORAL	2-1683
McCovey, Jene	IND59-ORAL	2-1684
Mees, Meriel	IND38-ORAL	2-1684
Nelson, Denver	IND16-ORAL	2-1682
Ohman, Scott	IND48-ORAL	2-1684
Pace, Felice	IND23-ORAL	2-1691
Paniak, Walter	IND54-ORAL	2-1689
Ryerson, Diane	IND17-ORAL	2-1691
Silvaggio, Anthony	IND13-ORAL	2-1681
Wagenaur, Brian	IND14-ORAL	2-1691
Orleans - February 7, 2019		
Native American Tribes		
Karuk Tribe, Craig Tucker	TR12-ORAL	2-1696
Karuk Tribe, Josh Saxon	TR11-ORAL	2-1699
Karuk Tribe, Kathy McCovey	TR10-ORAL	2-1696
Karuk Tribe, Leaf Hillman	TR13-ORAL	2-1700
Karuk Tribe, Sinead Talley	TR14-ORAL	2-1706
Organizations		
Klamath Justice Coalition, Dana Colegrove	ORG5-ORAL	2-1696
Klamath River Renewal Corporation, Dave Meurer	ORG8-ORAL	2-1705
Mid Klamath Watershed Council, Mitzi Wickman	ORG15-ORAL	2-1706
Individuals		
Chichizola, Regina	IND43-ORAL	2-1706
Dosch, Stefan	IND50-ORAL	2-1706
Eckert, David	IND15-ORAL	2-1709
Englert, Lissa	IND35-ORAL	2-1712
Kertzman, Eileen	IND21-ORAL	2-1712
Kinney, Isaac	IND26-ORAL	2-1712
Myers, Jesse	IND30-ORAL	2-1715
Reise, Blythe	IND8-ORAL	2-1716
Robbi, Marc	IND36-ORAL	2-1717
Short, Barbara	IND4-ORAL	2-1719
Stender, Laura	IND34-ORAL	2-1719

Commenter Affiliation and Name	Commenter Identification [1]	Page
Stoats, Stormy	IND52-ORAL	2-1722
Sacramento - February 15, 2019		
Native American Tribes		
Yurok Tribe, Joelene McCovey	TR15-ORAL	2-1726
Yurok Tribe, Melissa Eidmar	TR16-ORAL	2-1727
Organizations		
Auburn Dam Council, Ken Payne	ORG22-ORAL	2-1723
Klamath River Renewal Corporation, Matt Cox	ORG23-ORAL	2-1724
Trout Unlimited, Samuel Sedillo	ORG24-ORAL	2-1725
Individuals		
Bacigalupi, Debbie	IND55-ORAL	2-1723
Feher, Rick	IND57-ORAL	2-1734
Hendrick, Veronica	IND450-ORAL	2-1734
Jones, Marva	IND56-ORAL	2-1734
Joseph, Thomas	IND58-ORAL	2-1740

[1] Comments were coded in the order that they were received and thus the commenter identification codes may skip numbers in this table. Please refer to Table 2-1 and Table 2-2 for additional commenter identification codes associated with written comments.

Table 2-4. Summary of Written Comments on the Lower Klamath Project Recirculated Portions of the EIR Organized by Commenter Affiliation.

Commenter Affiliation (Commenter Last Name, First Name)	Commenter Identification	Page
Local Agencies		
County of Siskiyou, Paul S. Weiland	RE-8	2-1742
Native American Tribes		
Yurok Tribe, Joseph L. James, Chairman	RE-2	2-1753
Organizations		
Fly Fishers International, C. Mark Rockwell	RE-12	2-1755
Klamath River Renewal Corporation, James G. Moose	RE-11	2-1756
Native Fish Society, Kevin P. Bundy	RE-16	2-1771
Native Fish Society, Mark Sherwood	RE-1	2-1786
Sierra Club, John Livingston	RE-9	2-1787
Siskiyou County Water Users Association, Rex Cozzalio	RE-7	2-1789
Individuals		
Alderton, Janet	RE-14	2-1797
Beardsmore, Loy and John	RE-10	2-1797
Gierak, Richard	RE-15 RE-17	2-1816
Krizo, Jacqui	RE-3	2-1816
Marquis, Tor	RE-5 RE-6	2-1817
Reynolds, Chrissie	RE-4	2-1818
Ward, Brian	RE13	2-1820

Table 2-5. Summary of Written Comments on the Lower Klamath Project Recirculated Portions of the EIR Organized by Commenter Identification Code.

Commenter Identification[1]	Commenter Affiliation (Commenter Last Name, First Name)	Page
Local Agencies		
RE-8	County of Siskiyou, Paul S. Weiland	2-1742
Native American Tribes		
RE-2	Yurok Tribe, Joseph L. James, Chairman	2-1753
Organizations		
RE-1	Native Fish Society, Mark Sherwood	2-1786
RE-7	Siskiyou County Water Users Association, Rex Cozzalio	2-1789
RE-9	Sierra Club, John Livingston	2-1787
RE-11	Klamath River Renewal Corporation, James G. Moose	2-1756
RE-12	Fly Fishers International, C. Mark Rockwell	2-1755
RE-16	Native Fish Society, Kevin P. Bundy	2-1771
Individuals		
RE-3	Krizo, Jacqui	2-1816
RE-4	Reynolds, Chrissie	2-1818
RE-5 RE-6	Marquis, Tor	2-1817
RE-10	Beardsmore, Loy and John	2-1797
RE-13	Ward, Brian	2-1820
RE-14	Alderton, Janet	2-1797
RE-15 RE-16	Gierak, Richard	2-1816

[1] Comments were coded in the order that they were received and thus the commenter identification codes may skip numbers in this table. Please refer to Table 2-4 for additional commenter identification codes associated with written comments on recirculated portions of the Draft EIR.

2.2 Master Responses

Certain topics associated with the Lower Klamath Project EIR received numerous public comments, or received multiple comments that depend on shared background information or analysis. For these topics, the State Water Board has developed a set of master responses to reduce the amount of repetition necessary in Volume III, to provide useful context to common comments, and to ensure that responses to public comments are consistent across a large number of comments. As appropriate, the responses to comments on the Draft EIR and the recirculated portions of the Draft EIR include a reference to the master responses using a short code. The master responses short codes and titles are presented below, by topic area.

2.2.1 General Master Responses

GEN-1 Dam Removal Support and Opposition

The State Water Board acknowledges that there are many people who support dam removal and there are many people who support the dams remaining in place. Although statements expressing a project or policy preference are noted, a response is not required under CEQA in the absence of a comment on a significant environmental issue (e.g., the identification and analysis of potential significant impacts of the Lower Klamath Project on the environment, the identification of alternatives to the Lower Klamath Project, or the manner in which significant impacts can be mitigated or avoided) (CEQA Guidelines sections 15088(a), 21002.1 (a)). The EIR acknowledges in Volume I Table ES-2 on page ES-23 and in Volume I Section 2 *Proposed Project* (page 2-21) that during the Siskiyou County Advisory Election Vote on November 2, 2010 (Measure G), approximately 79 percent of voters expressed their opinion and voted "No" to dam removal, while 22 percent voted "Yes". It further discusses that a range of parties have entered into an agreement predicated on dam removal.

GEN-2 Comment Included as Part of the Record

Many comments received by the State Water Board expressed personal opinions, histories, or experiences with the Klamath River Basin and/or Lower Klamath Project dams and associated facilities, including the reservoirs. A response to these comments is not required under CEQA because these comments do not raise a significant environmental issue (CEQA Guidelines, section 15088). Regardless, these comments are included as part of the record and will be considered by the State Water Board before certifying the EIR (CEQA Guidelines section 15090).

Further, the Lower Klamath Project EIR presents a range of reasonable alternatives to the Proposed Project. Volume I Section 4.1 *Alternatives Selection/Overview* (pages 4-1 to 4-15) discusses 17 potential alternatives in relation to the Proposed Project's underlying purpose and objectives, six of which are examined in detail. Of these six alternatives, two involve removal of all four

Lower Klamath Project dams, and four involve two or three dams remaining in place. Potential impacts and beneficial effects are identified for each of these alternatives in the EIR and each will be fully considered by the State Water Board before certifying the EIR (CEQA Guidelines section 15090).

2.2.2 CEQA Requirements Master Responses

CEQ-1 Coordination Between CEQA and NEPA Lead Agencies

Some comments assert that the EIR is not in compliance with California Environmental Quality Act (CEQA) Guidelines section 15222 or is otherwise deficient in its coordination with federal environmental review by the Federal Energy Regulatory Commission (FERC), under the National Environmental Policy Act (NEPA). These comments do not raise a significant environmental issue requiring response under CEQA Guidelines section 15088. However, the State Water Resources Control Board (State Water Board) is providing additional information on the relationship between NEPA and CEQA in a FERC hydroelectric relicensing context.

CEQA Guidelines, Article 14, sections 15220, et seq., address ways to avoid unnecessarily duplicating efforts for projects that require review under both NEPA and CEQA. In this case, the Klamath River Renewal Corporation (KRRC) filed a water quality certification application with the State Water Board prior to the decision by FERC to start review under the National Environmental Policy Act. When, as in this case, CEQA review occurs before NEPA review ends, Article 14 recommends preparing a joint NEPA/CEQA document and combining environmental review procedures – but Article 14 also acknowledges that this may not be possible. (See Cal. Code Regs., tit. 14, §§ 15222, 15226, 15228.) FERC's rules include a broad "ex parte communication" ban that prevents FERC staff from talking about the substance of a license application except with notice on a formal record. FERC interprets these rules to preclude communications required for preparation of joint documents if the agency they are communicating with is a party to the licensing proceeding. See Statement of Administrative Policy on Separation of Functions (2002) 101 FERC 61, 340; FERC Order 607-A (2000), FERC Order 607 (1999). The State Water Board is a party to FERC licensing proceedings in order to be able to protect the state's interest in water quality. The State Water Board has developed a Memorandum of Understanding with FERC to reduce redundancy and delays in environmental review of hydroelectric licensing projects prior to application submittal and FERC's implementation of an ex parte communication bar. However, in light of the communications bar currently in place, the coordination required for a joint document is not possible.

The State Water Board provided FERC notice of its intent to prepare a CEQA document and the notice of preparation (NOP). Additionally, the State Water Board has provided updates on the CEQA process at semi-annual meetings with FERC. FERC has elected not to provide comments on the document. However,

the State Water Board anticipates that the information developed in the EIR will be helpful in the NEPA process for the Proposed Project in light of the similarity between the two environmental review statutes, and because the EIR was informed by two previous NEPA documents (the 2007 FERC EIS for relicensing of the Klamath Hydroelectric Project and the 2012 Klamath Hydropower Settlement Agreement Environmental Impact Statement/Environmental Impact Report (KHSA EIS/EIR) for Klamath facilities removal).

CEQ-2 Federal Power Act Preemption of State and Local Authority

A number of comments raise concerns or questions about how the EIR addresses the preemption of state and local authority under the Federal Power Act.

Some comments suggest that the State Water Board should treat certain state or local agencies as responsible agencies and that it is premature or otherwise inappropriate to consider other state or local agencies' authority preempted. Several comments raise concern with the EIR's discussion of Recommended Measures and the feasibility of mitigation measures that are outside of the State Water Board's water quality certification authority. Some claim that the EIR's Recommended Measures (which the EIR analyzes but does not describe as feasible mitigation measures due to Federal Power Act preemption) are actually feasible despite preemption. For example, some comments state that the EIR must consider Recommended Measures feasible due to state or local authority or because it is reasonable to expect the Federal Energy Regulatory Commission (FERC) or another federal agency to enforce them. Similarly, some commenters have suggested that some Recommended Measures are feasible because they may be required in federal permits, particularly under the Endangered Species Act (ESA).

Other comments state that some Mitigation Measures described in the EIR are not actually feasible because they are outside of State Water Board authority. This Master Response first discusses the scope of Federal Power Act preemption. It then discusses the how the EIR applied that principle to responsible agencies and to Recommended Measures and Mitigation Measures.

Federal Power Act "Field Preemption"

As explained in Volume I Section 2.8 *Intended Uses of the EIR* (pages 2-110 and 2-111), the Federal Power Act gives FERC broad authority to regulate power production facilities in a manner that FERC "occupies the field" of power regulation. This means that there is no authority for state- or local-level regulation except where there is an exception to the general rule of preemption (see for example Volume I Section 2.8, page 2-110). Both the United States Supreme Court and the Ninth Circuit Court of Appeals have clarified the broad preemptive reach of the Federal Power Act vis-à-vis state authority in hydropower licensing decisions, emphasizing that elimination of state authority is part of implementing Congress' comprehensive plan for power development.

California v. FERC (1990) 495 U.S. 490; *First Iowa Coop. v Power Comm'n* (1946) 328 U.S. 152; *Sales-Hydro v. Maughn* (9th Cir. 1993) 985 F.2d 451. Similarly, the California Court of Appeals for the Third District has acknowledged the broad preemptive reach of the Federal Power Act. *Karuk Tribe of Northern California v. California Regional Water Quality Control Board, North Coast Region* (2010) 183 Cal.App.4th 330.

The Federal Power Act's "field preemption" applies to hydropower licensing decisions – such as the KRRC's decommissioning application – unless there is an exception to the preemption. One exception from the Federal Power Act's "field preemption" is state water quality certification under Clean Water Act Section 401. *PUD No. 1 of Jefferson Co. v. Washington Department of Ecology* (1994) 511 U.S. 700. While the state's water quality authority is broad, it does not extend beyond water quality-related matters. *Id.* The State Water Board is not aware of any other exceptions to preemption that would apply here, as the facilities are privately-owned, single-use hydropower facilities.

Effect of Federal Power Act preemption on responsible agencies

Under CEQA, a lead agency is the public agency with the "principal responsibility for carrying out or approving" a project. Pub. Resc. Code, § 21067. A responsible agency under CEQA is a state or local agency, other than the lead agency under CEQA, that has "responsibility for carrying out or approving a project." Pub. Resc. Code, § 21069. Thus, a responsible agency must have responsibility for or authority over the project. As discussed above, the Federal Power Act preempts the field of hydropower regulation, leaving no room for state or local agencies to exert authority. As noted, the applicable exception to this broad preemption of state authority over the Proposed Project is water quality certification under Clean Water Act Section 401. The State Water Board is the California agency charged with implementing Section 401 of the Clean Water Act for FERC-licensed hydroelectric facilities. Since the exception to FERC preemption under Clean Water Act Section 401 is only for water quality certification, the authority of other agencies remains preempted, and other agencies cannot have the responsibility over the project that would make them "responsible agencies" under CEQA.

Regardless of preemption, the State Water Board has noticed the State Clearinghouse for distribution and notified state and local agencies in the same manner as if state authority were not preempted. (See CEQA Guidelines, §§ 15082, 15085, 15086.) The State Water Board has sought agency input through an expansive scoping, comment and engagement process that provides the same opportunities for state and local input to the analysis as if agencies were able to exert authority over the project. This consultation with state and local agencies allows the document to be informed by the wealth of expertise in state and local agencies that exists regardless of Federal Power Act preemption, and fulfills the purpose of responsible agency consultation, even though it is not foreseeable that other agencies will need to rely on the document for their own

discretionary actions. State and local agencies had the opportunity to participate – and have engaged –in the CEQA process in the same manner as responsible agencies, including comments and input on the scope of review, materials for consideration, potential impacts, potential mitigation measures, and significance of potential environmental impacts. The State Water Board expects that this information will be valuable not only to the State Water Board, but also to the KRRC in implementation and to FERC in its license surrender process.
As noted by commenters, FERC has a policy encouraging licensees to adopt "good neighbor" agreements regarding power facilities that can provide an ability for licensees to engage with local authorities and comply with local standards and regulations. However, such "good neighbor" agreements do not contract the scope of preemption or provide state agencies with permitting authority and its accompanying requirement to comply with CEQA as either a lead or a responsible agency.

Additionally, commenters have raised two examples of dam removal proceedings in which FERC has required licensees to obtain limited local permits. In both instances, those permits were required as part of water quality certification. *Arizona Public Service Co*., 109 FERC 61036, 61149 (2004); *Wisconsin Electric Power Co.* 94 FERC 61038; see also *Wisconsin Electric Power Co*. 96 FERC 61009, pp. 5-6 [clarifying that the requirement to obtain a permit from the Land and Water Management Division of the Michigan Department of Environmental Quality and a county soil erosion and sedimentation control permit were 401 water quality certification requirements]. Siskiyou County presented these examples of "FERC requiring compliance with all local permitting in other dam removal contexts." However, these examples do not require compliance with all local permitting – rather, the decisions incorporate the terms of water quality certification. The cases cited do not indicate that FERC has either the authority or the intention to allow state or local agencies to exert control over their license outside of the exception to preemption in Clean Water Act Section 401.

Effect of Federal Power Act preemption on mitigation measures
CEQA requires that mitigation measures be "fully enforceable through permit conditions, agreements, or other legally-binding instruments." CEQA Guidelines Section 15126.4(a)(2). As discussed above, because of preemption under the Federal Power Act, the only state or local permit that will be issued is for state water quality certification.

Broad state substantive requirements for water-quality-related impacts may be incorporated into the water quality certification. *PUD No. 1 of Jefferson Co. v. Washington Department of Ecology* (1994) 511 U.S. 700. Therefore, the CEQA document can evaluate measures to mitigate water-quality-related impacts as enforceable mitigation measures. For example, the state requirements to consult with trustee agencies of, and mitigate impacts to, the aquatic ecosystem can be incorporated into the water quality certification. However, for the EIR to evaluate a mitigation measure outside of the State Water Board's water quality

certification authority, it must be otherwise enforceable, i.e., the subject of a federal permit, an agreement or other legally-binding instrument.
Commenters refer to several state environmental and health protection laws as potential sources of authority for mitigation measures, and request that the EIR disclose these measures and these authorities, or reconsider recommended measures as enforceable mitigation measures in light of these authorities. However, application of state laws unrelated to water quality and outside the parameters of water quality certification is preempted.

Recommended Measures
The State Water Board understands that KRRC is currently in discussions with various state and local agencies to develop agreements regarding other resource protection measures (see, e.g. KRRC Comment Letter ORG47-2). However, because these measures are not yet final, it would be premature to consider these to be enforceable mitigation measures. Doing so would mislead readers as to the finality and enforceability of potential steps to protect the environment. Instead, the EIR discloses and evaluates Recommended Measures in order to provide decisionmakers and the public with information on measures that – while not currently enforceable – have potential to be implemented. By describing Recommended Measures, the EIR discloses both the availability of measures to protect the environment and the lack of an enforcement mechanism for such measures. This provides information regarding available steps to protect the environment that could be developed (e.g., through enforceable good neighbor agreements), even though it is currently not possible to rely on those measures in assessing the impacts of the Proposed Project. Generally, the Recommended Measures stem from some mixture of recommendations from agencies with specific expertise, from submittals by the applicant, or from common industry practice. In addition to providing information for "good neighbor" agreement efforts, disclosure and analysis of these measures can serve as a recommendation for adoption by FERC or the KRRC outside of a formal agreement with a state or local agency.

Federal Authorities: Federal Power Act, Endangered Species Act, and Bald and Golden Eagle Protection Act
Some comments recommend analyzing all Recommended Measures as enforceable under FERC authority. Some comments also recommend analyzing new measures that could similarly be enforceable under the FERC license. As noted above, under the Federal Power Act, FERC is granted broad authority over all aspects of the Proposed Project and has the authority to require mitigation measures. FERC has not, however, indicated which mitigation measures it intends to require, and is not bound to mitigate effects to a level of less than significant by state standards. Instead, FERC applies a "public interest" standard to license proceedings requesting surrender, providing for safety, disposition of facilities, and a level of environmental protection it considers appropriate. While FERC does allow third parties to comment on its license surrender proceedings, there is no reason to believe that an ability to comment provides a reasonable

basis on which to find that a recommended term will be adopted and thereby become enforceable. Therefore, the existence of FERC authority alone is insufficient certainty for enforcement of a mitigation measure, or for presenting a recommended measure as an enforceable mitigation measure.

In addition to FERC's broad authority, the United States Fish and Wildlife Service (USFWS) conducts Endangered Species Act permitting for hydropower projects.[2] This Endangered Species Act permitting authority includes permitting for terrestrial species not covered under the State Water Board's water quality certification authority. Measures that the USFWS includes in permitting are, therefore, enforceable even without a nexus to water quality. There are indications that USFWS Endangered Species Act permits would impose many of the measures described in Volume I of the EIR as Recommended Terrestrial Measures 1 through 12, because, as noted in the EIR, most of these measures were developed in consultation with KRRC, CDFW, USFWS, and other species experts, and also because the measures largely reflect generally-accepted best practices. Therefore, for species listed under the federal Endangered Species Act, the EIR has been revised to add new Mitigation Measures TER-6 and TER-7 requiring the KRRC to consult with the USFWS and/or CDFW, regarding impacts to listed species, and to obtain necessary permits to protect these species. However, the USFWS Endangered Species Act review and permitting is only for federally protected species, while the recommended terrestrial measures address potential impacts to a broader range sensitive species including species listed at under the California Endangered Species Act and other federal and state programs to identify species requiring special protections. Thus, even with the additional protection of federal permit conditions, the types of actions in the recommended measures are not enforceable for all sensitive species. Therefore, the EIR continues to disclose and evaluate recommended measures. Additionally, USFWS issues any necessary permits under the Bald and Golden Eagle Protection Act for FERC orders on hydropower projects. As Recommended Terrestrial Measure 11 (addressing specific measures for the protection of Bald and Golden Eagles) is within USFWS's permitting authority and was developed in consultation with the USFWS, there is sufficient certainty

[2] As noted by commenters discussing preemption, the National Marine Fisheries Service (NMFS) also conducts federal Endangered Species Act permitting. However, as NMFS' permitting is specific to aquatic species, and impacts to aquatic species are already considered to be enforceable (via the water quality certification) and as NMFS is a federal agency (and therefore not a CEQA responsible agency), NMFS authority does not require further discussion in this comment response. Similarly, some comments discussing preemption have specifically noted the Army Corps of Engineers' authority over projects affecting navigable waterways. As the EIR already considers protection of waterways to be enforceable (via the water quality certification) and as the Army Corps of Engineers is a federal agency (and therefore not a CEQA responsible agency), these comments are not further addressed here.

that the USFWS will require the measure or equally protective conditions. It is also worth noting that a substantial portion of bald eagles' diet consist of fish (Knight et al. 1990). California's wildlife beneficial use[3] includes protecting water quality impacts to bald eagles, and such protections can be included in a water quality certification. This provides an additional layer of certainty for mitigation of potential impacts to bald eagles. Recommended Measure 11 has been revised to be a Mitigation Measure and is updated in Volume III Section 3.5.5.3 *Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities – Recommended Terrestrial Measure 11 – Bald and Golden Eagle*. As disclosed in Volume I Section 3.5.5.3 *Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities* (pages 3-546 and 3-547), implementation of the actions described in Recommended Terrestrial Measure 11, now Mitigation Measure TER-7, would reduce the potential impact to bald and golden eagles to no significant impact with mitigation. Please refer to Volume III Attachment 1 Section 3.5.5.3 *Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities– Recommended Terrestrial Measure 11 – Bald and Golden Eagle* for revisions to Mitigation Measure TER-7.

The grey wolf, a federally endangered species, is protected under the USFWS Endangered Species Act. Because Recommended Terrestrial Measure 8 addresses specific measures for the protection of gray wolves, USFWS was consulted and confirmed that these measures are generally as accepted best practices (Heather Beeler, USFWS, pers. comm, September 2019). Recommended Terrestrial Measure 8 has been revised to be a Mitigation Measure and is updated in Volume III Section 3.5.5.3 *Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities*. The measure, at the request of the USFWS (Heather Beeler, USFWS, pers. comm, September 2019), includes coordination with CDFW biologists and accessing the CDFW gray wolf activity map to inform potential overlap between the wolf and the LKP to evaluate further measures to prevent impacts. Implementation of the actions described in Recommended Terrestrial Measure 8, now Mitigation Measure TER-6, would reduce the potential impact to gray wolf to no significant impact with mitigation. Please refer to Volume III Attachment 1 Section 3.5.5.3 *Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities* for revisions to Mitigation Measure TER-6.

[3] As discussed in Volume I, Section 3.2.3 *Water Quality – Significance Criteria*, and in Table 3.2-2, California water quality standards include the designation of the beneficial uses of the state's waters. Use of the waters by wildlife is one such beneficial use.

Other Recommended or Mitigation Measures

PacifiCorp has suggested that Tribal Cultural Resource Mitigation Measures are not enforceable because they are outside the scope of the State Water Board's water quality certification authority. The KRRC participated in tribal consultation on development of Tribal Cultural Resource Mitigation Measures and has agreed to implement the measures. Additionally, the KRRC has proposed these measures as part of the FERC licensing proceeding. Thus, these measures are enforceable under the requirements of CEQA Guidelines Section 15126.4 (a)(2), because the KRRC has agreed to them.

PacifiCorp has further suggested that the aspects of Mitigation Measure GEO-1 that specify measures to avoid or minimize the impacts of slope instability on structures, and roads are outside of water quality certification authority, even though aspects of the mitigation measure related to slope stabilization to avoid and minimize sediment discharges to water are within such authority. Please note that Mitigation Measure GEO-1 has undergone minor modifications. Please refer to Volume III Attachment 1 Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-3 for the final Mitigation Measure GEO-1. Mitigation Measure GEO-1 addresses the potential for mass wasting (e.g., shallow and deep-seated landsliding), and it requires monitoring for slope instability and measures to address slope instability, including a specific requirement to address slope instability that affects structures and roads. The specific requirements to address instability associated with structures and roads are appropriate to include in a water quality certification because, should mass wasting at the reservoir rim occur during drawdown, it would be important to undertake the actions included Mitigation Measure GEO-1 to avoid and reduce future sediment discharges, and because efforts to protect, repair, or replace the associated structures and/or roads can result in construction-related water quality impacts. Additionally, the KRRC has agreed to implement the mitigation measure. Therefore, the measure is appropriate as a mitigation measure both because it is enforceable in the water quality certification and because KRRC has agreed to implement the measure (please refer to Volume III Section 2.3.4 comment ORG47-51 and L. Zagar, Perkins Coie as KRRC representative, pers. comm., March 2020).

Some commenters asserted that Recommended Measure TR-1, which involved preparation of a Traffic Management Plan (TMP) to address potentially significant traffic impacts from construction activities related to dam removal, should be made an enforceable condition of the water quality certification. The Draft Environmental Impact Report (Draft EIR) included TR-1 among its Recommended Measures because at the time the Draft EIR was being prepared KRRC had not yet committed to preparing a TMP that met clearly discernable standards. On December 3, 2019, KRRC submitted a revised water quality certification application in which it committed to preparing a TMP that adhered to specific state and federal requirements, including the Caltrans California Manual on Uniform Traffic Control Devices (MUTCD), Caltrans Traffic Management Plan

Guidelines, Oregon Department of Transportation (ODOT) Supplement to the MUTCD, ODOT Traffic Control Plans Design Manual, ODOT TMP Project Level Guidance Manual, Caltrans and ODOT's respective Highway Design Manuals, among others. These recent commitments by KRRC in its revised water quality certification application would render TR-1 an enforceable term of the water quality certification. It is therefore appropriate to reclassify TR-1 as a mitigation measure.

The text of the Final EIR has therefore been revised to reflect that Recommended Measure TR-1 is now Mitigation Measure TR-1.
Note that this change results in corresponding revisions to multiple findings regarding the significance of potential traffic impacts. The Draft EIR found that implementation of Recommended Measure TR-1 would reduce Potential Impacts 3.22-1 through 3.22-5 to a less than significant level, but nonetheless concluded that these impacts would be significant and unavoidable based on the fact that Recommended Measure TR-1 was not within the State Water Board's enforcement authority. Because preparation of a TMP in accordance with Mitigation Measure TR-1 now would be an enforceable term in the water quality certification, Potential Impact 3.17-1, Potential Impact 3.21-7, and Potential Impacts 3.22-1 through 3.22-5 have been revised to reflect that implementation of Mitigation Measure TR-1 would reduce these impacts to a less than significant level.

CEQ-3 Definition of 'Substantial' As Used in EIR Significance Criteria

Some comments assert that the EIR should uniformly define the term 'substantial' as used in the significance criteria identified for each environmental resource area analyzed in the EIR. EIRs identify and focus on the significant environmental effects of the proposed project (CEQA Guidelines section 15126.2). A "significant effect on the environment" means a "substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project, including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic significance" (CEQA Guidelines section 15382). CEQA does not require an EIR to deviate from the common English language usage of the word 'substantial' to mean of considerable importance, size, number, and/or amount (Dictionary.com 2019, Lexico 2019); considerable in quantity, significantly great; being largely but not wholly that which is specified (Merriam-Webster 2019). For the analysis of potential impacts in the Lower Klamath Project EIR, significance criteria are identified for each environmental resource area, as described in Volume I Section 3.1 *Introduction* (pages 3-1 and 3-2) and presented in each of the 22 environmental resource areas analyzed in the EIR and the cumulative effects analysis. To the extent that identified significance criteria can be expressed quantitatively, either the 'significance criteria' subsection for each resource area and the analysis of cumulative effects does so explicitly, or the details are provided in the 'impact analysis approach' subsection that appears immediately following the identification of significance criteria. If it is not possible to identify

defensible quantitative significance criteria, or if such criteria would otherwise be inappropriate for a particular analysis, then qualitative thresholds of significance are presented and discussed instead. Together, the stated significance criteria and impact analysis approach subsections for each environmental resource area and the cumulative effects analysis provide the necessary clarity and disclosure regarding any particular use of the word 'substantial' in determining significance for the environmental effects analyzed in the Lower Klamath Project EIR.

Lastly, lacking any specific identification of a problem with an impact analysis in the EIR due to use of the term 'substantial', the repeated assertion that term 'substantial' must be redefined or uniformly defined at each usage in the EIR does not constitute substantial evidence regarding the potential physical impacts of the Proposed Project on the environment (CEQA Guidelines section 15384).

CEQ-4 Klamath River Basin Compact

Multiple commenters have raised concerns regarding the relationship between the Federal Energy Regulatory Commission (FERC) decommissioning process and the California Environmental Quality Act (CEQA) process on the one hand, and the Klamath River Basin Compact (Compact) and the Klamath River Compact Commission (Commission) on the other. These comments do not raise concerns regarding the potential effects of the Proposed Project on the environment or on the measures available to mitigate them. However, the EIR provides the below additional information in light of confusion regarding the perceived role of the Compact and the Commission created by it.

The Klamath River Basin Compact is an agreement entered into by the states of California and Oregon, and ratified by the United States Congress in 1957. Like other interstate river compacts, the Compact is intended to address the equitable distribution of interstate waters. It also sets forth several other terms, including terms addressing pollution and terms referencing hydropower. These three topics included in the Compact are discussed in more detail below.

- **Equitable Distribution of Interstate Waters:** The Compact affirms the validity of existing water appropriations, and clarifies that it does not affect the rights of tribes. The Compact sets forth guidelines and use priorities for the future appropriation of waters in the Klamath River Basin – here, 'future' means appropriations initiated after the 1957 effective date of the Compact. Up to certain irrigation acreage limits, such future appropriations for domestic and agricultural purposes in the Upper Klamath Basin take priority over future appropriations for other purposes in the Klamath Basin in California, or for any use outside of the Klamath River Basin. Future diversions in the Upper Klamath Basin are also subject to export and return-flow restrictions and additional terms. The Compact further establishes the framework for a Klamath River Compact Commission to administer the Compact. The Compact does not, as some comments assert, allocate

water for the Shasta Valley, Butte Valley, or Iron Gate Hatchery. Rather, it sets up a framework for future water allocations between the states and in alignment with prioritizing municipal and irrigation use – especially in the Upper Klamath Basin – over other future uses. The water allocation terms of the Compact are self-executing and do not require Commission action. Further, the Compact does not require the continued exercise of any water rights.

- **Pollution Abatement and Control:** The Compact acknowledges that interstate pollution may affect the beneficial uses of the Klamath River, and it affirms the states' intentions to address such pollution. Each state is charged with the primary responsibility for the control and abatement of interstate pollution. In the event of conflicts regarding interstate pollution, each state's water pollution control agency may file a complaint to the Klamath River Compact Commission. The Commission can then investigate, confer, and recommend actions to abate such pollution. If appropriate action does not occur in a reasonable time, the Commission may then hold hearings that can result in enforceable abatement orders. Additionally, the Commission may coordinate with states and agencies on standard-setting and rulemaking.
- **Hydroelectric Power:** The Compact has miscellaneous other provisions, including a declaration that each state's planning for distribution and use of water in the Klamath River Basin will have an objective of efficient and economic use of available power head to lower the cost of irrigation water deliveries and drainage pumping. This declaration of objectives is relevant to state planning for water distribution and use, and to implementation of such plans. It does not mandate particular actions regarding the Lower Klamath Project facilities or in water quality certifications. The Compact also specifically affirms state authority over regulation of discharges from hydroelectric facilities.

The Compact explicitly affirms the primacy of state action in addressing pollution, hydroelectric-related discharges, and water diversion and use. The Commission is granted specific authorities relating to Compact implementation and resolving conflicts that arise under the Compact, but nothing in the Compact requires the Commission – of its own accord – to take any specific action regarding allocation of water, pollution abatement, or the operation or removal of hydroelectric facilities. Nor does it suggest that the Commission is intended to supplant the role of states. Neither the Compact nor the Commission limit the authority of the states to issue water quality certifications under Section 401 of the Clean Water Act.

The Commission is not acting here with respect to the Proposed Project, and so it cannot be a proper lead agency under CEQA. The State Water Board is the agency charged with issuing water quality certifications in California, and it is the only state agency with a discretionary approval in light of federal preemption. As

the state agency with a discretionary action before it, the State Water Board is the appropriate lead agency to prepare the CEQA analysis.

2.2.3 Klamath River Flow Related Master Responses

HYD-1 Consideration of Klamath River Flows under the 2019 BiOp Operations Criteria for the Klamath Irrigation Project

The Lower Klamath Project Draft EIR considered the potential effects of dam removal using the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) Joint Biological Opinion operations criteria for the Klamath Irrigation Project (2013 BiOp Flows) to represent existing hydrology. This was appropriate because the 2013 BiOp Flows were the standard to which the USBR Klamath Irrigation Project operated at the time of the Notice of Preparation for the Lower Klamath Project EIR (i.e., December 22, 2016). After the issuance of the Lower Klamath Project Draft EIR on December 27, 2018, the applicable biological opinion and the operational flow requirements for the Klamath River changed in March 2019, when the new biological opinions were issued by NMFS (2019) and USFWS (2019a). The 2019 Biological Opinion flows (2019 BiOp Flows) are now the current operational flow requirement for the Klamath River.

The Final EIR analyzes both sets of biological opinion flows, with the 2019 BiOp Flows serving as a second CEQA baseline and representing flows under newly defined existing conditions. Inclusion of two baselines (existing condition and 2019 BiOp Flows hydrology regimes) in the Lower Klamath Project EIR is consistent with CEQA Guidelines section 15125 (a). It also simplifies the process of addressing a previously un-analyzed hydrology regime in a large and complex document by first rigorously comparing the new set of flows (2019 BiOp Flows) to the originally modeled flows for dam removal scenarios (KBRA Flows), as well as to the originally modeled flows for scenarios where the dams remain in place (2010 BiOp Flows). Then, based on the outcome of those comparisons (see below), the EIR adds consideration of the 2019 BiOp Flows to the consideration of the 2013 BiOp Flows in the resource-specific impact analyses (previously circulated in the Draft EIR).

The comparison of the 2019 BiOp Flows to the KBRA Flows, which is relevant to the Proposed Project and alternatives where dams are removed, is presented in Volume III Attachment 1 Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*. This comparison indicates that modeled 2019 BiOp Flows are within the range of modeled KBRA Flows 99.0 percent of the time at Keno Dam and 99.9 percent of the time at Iron Gate Dam. The comparison of the 2019 BiOp Flows to the 2010 BiOp Flows, which is relevant to alternatives where the dams remain in place, is presented in Volume III Attachment 1 Section 4.2.1.1 *No Project Alternative – Introduction – Alternative Description*. This comparison indicates that modeled 2019 BiOp Flows are within

the range of modeled 2010 BiOp Flows 99.9 percent of the time at Keno and Iron Gate dams.

Therefore, the Draft EIR has been revised to add consideration of the 2019 BiOp Flows alongside consideration of the 2013 BiOp Flows in the below sections. Given the similarity of the 2019 BiOp Flows to the other flow regimes analyzed in the Draft EIR, these revisions do not constitute significant new information (CEQA Guidelines section 15088.5 (a)).

Volume I

- Executive Summary
- Section 3 *Environmental Setting, Impacts, and Mitigation Measures*
  - Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*
  - Section 3.2 *Water Quality*
  - Section 3.3 *Aquatic Resources*
  - Section 3.6 *Flood Hydrology*
  - Section 3.8 *Water Supply/Water Rights*
  - Section 3.11 *Geology, Soils, and Mineral Resources*
  - Section 3.20 *Recreation*
  - Section 3.24 *Cumulative Effects*
- Section 4.2 *No Project Alternative*
  - Section 4.2.1.1 *Alternative Description*
  - Section 4.2.2 *Water Quality*
  - Section 4.2.3 *Aquatic Resources*
  - Section 4.2.5 *Terrestrial Resources*
  - Section 4.2.6 *Flood Hydrology*
  - Section 4.2.8 *Water Supply/Water Rights*
  - Section 4.2.11 *Geology, Soils, and Mineral Resources*
- Section 4.4 *Continued Operations Alternative*
  - Section 4.4.1.1 *Alternative Description*
  - Section 4.4.2 *Water Quality*
  - Section 4.4.3 *Aquatic Resources*
  - Section 4.4.8 *Water Supply/Water Rights*
  - Section 4.4.11 *Geology, Soils, and Mineral Resources*
- Section 4.5 *Two Dam Removal Alternative*
  - Section 4.5.1.1 *Alternative Description*
  - Section 4.5.3.4 *Aquatic Resources*
- Section 4.6 *Three Dam Removal Alternative*
  - Section 4.6.1.1 *Alternative Description*
  - Section 4.6.3.4 *Aquatic Resources*

Volume II

- Appendix C *Water Quality Supporting Technical Information,* Section C.1.2
- Appendix E *An Analysis of Potential Suspended Sediment Effects on Anadromous Fish in the Klamath Basin*, Section E.2

- Appendix S *Recreation Supporting Technical Information*, all sections

The 2019 BiOp-related revisions for the aforementioned sections are presented in Volume III Attachment 1.

2.2.4 Water Quality Master Responses

WQ-1 Role of Lower Klamath Project Dams/Reservoirs with Respect to Overall Water Quality

Multiple comments assert that the Lower Klamath Project dams improve water quality, making the water cleaner as it is travels through the reservoirs and into the Klamath River downstream of Iron Gate Dam. Several comments reference visual observations as evidence that the dams improve water quality, suggesting that the commenter is concerned about turbidity. Some comments refer specifically to the settling of suspended material (like algae and sediment) in the relatively calm reservoir environment. Some comments refer to historical accounts of low flows and poor water quality (e.g., taste, odor, and visual quality) as evidence of the asserted beneficial water quality impact of the hydroelectric dams. These include accounts based on personal memory and on pre-dam period writings.

Please refer to Volume III Attachment 1 Section 3.2.2.1 *Water Quality – Environmental Setting – Overview of Water Quality Processes in the Klamath Basin* for a general summary of the effects that Lower Klamath Project hydroelectric facilities and operations have on Klamath River water quality, including changes in water temperature, dissolved oxygen, phytoplankton (suspended algae), nutrients, suspended sediment (turbidity), and periphyton (attached algae). Figure 3.2-2 illustrates the general seasonal influence of reservoirs formed by large dams, such as Copco No. 1 and Iron Gate reservoirs, on water quality parameters. The specific influence of the Lower Klamath Project dams and reservoirs on water quality parameters in the Klamath River are summarized in Volume III Attachment 1 Section 3.2.2 *Water Quality – Environmental Setting* and further detailed in Volume III Attachment 1 Appendix C *Water Quality Supporting Technical Information*.

As described in Volume III Attachment 1 Section 3.2.2.3 *Water Quality – Environmental Setting – Suspended Sediments*, Potential Impacts 3.2-5 and 3.2-6, and Volume III Attachment 1 Appendix C, Section C.2 *Suspended Sediments*, and shown in Figure C-13, suspended material from upstream sources (including Upper Klamath Lake) settles out within the Keno Impoundment/Lake Ewauna in Oregon upstream of the Lower Klamath Project reservoirs, with approximately 50 percent of organic suspended material (measured as total suspended sediments [TSS]) settling out between the mouth of Link River (RM 253.1) and Keno Dam (RM 233.4) based on May to October TSS measurements from 2000 to 2005. Volume III Attachment 1 Section 3.2.2.3 *Water Quality – Environmental Setting – Suspended Sediments* (and Volume III Attachment 1 Appendix C, Section C.2

Suspended Sediments) also describe how additional settling of suspended sediment occurs in the Lower Klamath Project reservoirs on an annual basis, even as algal blooms in the Lower Klamath Project reservoirs during the phytoplankton growth season (May to October) can seasonally increase organic suspended material in the reservoirs and the Klamath River downstream of Iron Gate Dam to Seiad Valley (Figure C-14). Further, Volume I Section 3.4.2.3 *Phytoplankton and Periphyton – Environmental Setting – Hydroelectric Reach – Phytoplankton* (pages 3-405 to 3-413) provides data supporting the assertion that Upper Klamath Lake is not the main source of the toxin-producing blue-green algae (cyanobacteria) *Microcystis aeruginosa* to the Klamath River downstream of Iron Gate Dam; instead, the most likely sources are Copco No. 1 and Iron Gate reservoirs.

Volume III Attachment 1 Section 3.2.2.4 *Water Quality – Environmental Setting – Nutrients* and Volume III Attachment 1 Appendix C, Section C.3 *Nutrients* describe the net annual decrease in nutrients in the Klamath River due to settling of suspended materials and associated nutrients in the reservoirs as well as the seasonal nutrient fluctuations downstream of Iron Gate Dam due to seasonal releases of nutrients from reservoir sediments when anoxic conditions associated with thermal stratification occur in reservoir bottom waters.

Seasonal changes in water quality due to thermal stratification within Copco No. 1 and Iron Gate reservoirs are summarized in Volume III Attachment 1 Section 3.2.2 *Water Quality –Environmental Setting* and further detailed in Volume III Attachment 1 Appendix C *Water Quality Supporting Technical Information* under the individual water quality parameter sub-sections. Figure C-1 highlights the seasonal variations in water temperature within Copco No. 1 and Iron Gate reservoirs, including the formation and breakdown of thermal stratification, while the seasonal variations in dissolved oxygen in J.C. Boyle, Copco No. 1, and Iron Gate reservoirs during the period the reservoirs are thermally stratified are shown in Figure 3.2-4 and Figures C-29, C-30, C-31, and C-32. Seasonal variations in pH within Copco No. 1 and Iron Gate reservoirs during thermal stratification are shown in Figure 3.2-4 and in the Klamath River from upstream of Copco No. 1 Reservoir to downstream of Iron Gate Dam are shown in Figures C-38 and C-39. Seasonal and longitudinal trends in nutrients at Klamath River sites upstream and downstream of the Lower Klamath Project reservoirs are shown in Figures C-24 and C-25 and highlight how nutrients vary during and after thermal stratification in the reservoirs. Seasonal and longitudinal trends in chlorophyll-*a* and algal toxins in the Klamath River and the Lower Klamath Project reservoirs are discussed in Volume III Attachment 1 Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins*, with chlorophyll-*a* longitudinal trends shown in Figure 3.2-5.

Please refer to Volume I Section 3.4.2 *Phytoplankton and Periphyton – Environmental Setting* (pages 3-392 to 3-422) for information on the seasonal trends in phytoplankton and periphyton in the Klamath River from upstream of

J.C. Boyle Reservoir to downstream of Iron Gate Dam. Overall, Volume III Attachment 1 Sections 3.2.2.2 *Water Quality – Environmental Setting – Water Temperature* through 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* and Volume III Attachment 1 Appendix C *Water Quality Supporting Technical Information* provide data on the Lower Klamath Project's adverse impacts to water quality by: 1) increasing the water residence time (days to weeks) in Copco No. 1 and Iron Gate reservoirs and warming summer and fall water temperatures downstream of Iron Gate Dam; 2) exhausting dissolved oxygen in reservoir bottom waters and waters released to the downstream river; and 3) seasonally releasing nutrients stored in reservoir bottom sediments such that nutrients become more available during late summer and fall to support large blooms of toxin-producing blue-green algae (cyanobacteria) that are transported into the downstream river, as well as river periphyton (attached algae) that harbor parasites and potentially cause high levels of fish disease.

As described in Volume III Attachment 1 Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*, the amount of flow in the Klamath River is determined by the operation of the Klamath Irrigation Project and the applicable biological opinion(s) to meet the needs of listed species and maintain full irrigation deliveries in accordance with existing contracts, contingent upon available water supplies. The Proposed Project does not include any changes to the amount of flow released by the Klamath Irrigation Project and the applicable biological opinion(s), so historical observations of low flows and associated poor water quality are not anticipated to reoccur due to removal of the Lower Klamath Project Dams.

Overall, the comments' references to cloudy, 'dirty' water from upstream, and clear, 'clean' water samples from downstream of the Lower Klamath Project dams, and to historical observations of low flows and poor water quality prior to installation of the dams, as proof of water quality improvements due to the dams are unpersuasive. The assertions do not recognize changes in flow regulation since historic accounts or, the more comprehensive set of water quality parameters affected by the Lower Klamath Project dams and operations, as supported by the data and analyses presented in the EIR and summarized above.

WQ-2 Potential for Lower Klamath Project Dams/Reservoirs to Cool River Water During Summer and Fall

Several comments assert that the Lower Klamath Project dams beneficially cool or have the potential to cool Klamath River water downstream of Iron Gate Dam during summer and fall, which would benefit fish. Comments note examples of other dams that provide cool water for fisheries, including Shasta Dam on the Sacramento River in California and Lost Creek Dam on the Rogue River in Oregon. Existing water temperature data and numeric models described in Volume III Attachment 1 Section 3.2.2.2 *Water Quality – Environmental Setting –*

Water Temperature, including Figure 3.2-3, demonstrate that the Lower Klamath Project dams cool the Klamath River water downstream of Iron Gate Dam in the spring by approximately 1.8°F to 4.5°F (approximately 1°C to 2.5°C), and warm the Klamath River water downstream of Iron Gate dam in the late summer and early fall by 4°F to 18°F (approximately 2°C to 10°C). Please refer to Volume III Attachment 1 Section 3.2.2.1 *Water Quality – Environmental Setting – Overview of Water Quality Processes in the Klamath Basin* for a discussion of why reservoirs and hydroelectric project operations affect water temperature, including Figure 3.2-2 that depicts how seasonal thermal stratification occurs in these waterbodies.

Unlike Shasta Dam on the Sacramento River (California), Lost Creek Dam on the Rogue River (Oregon), or other deep reservoirs that support coldwater fisheries just downstream of the dam by releasing cold water from low level outlets, the location of dam outlets in Copco No. 1 and Iron Gate dams cannot be adjusted to access large volumes of cool water in the bottom of the reservoirs on a reliable basis spanning the several month-long reservoir stratification period. This is because summertime bottom waters in Copco No. 1 and Iron Gate reservoirs are of limited volume and poor water quality (e.g., low dissolved oxygen concentrations), and J.C. Boyle and Copco No. 2 reservoirs do not strongly stratify and thus do not provide a pool of cool water in the summer.

Please refer to Volume I *Alternatives – Continued Operations with Fish Passage – Water Quality – Water Temperature* Potential Impact 4.2.2-1 (pages 4-103 to 4-108) for a discussion of why there is currently no reasonable proposal to operate the Lower Klamath Project to reliably cool summer and fall water released from Copco No. 1 and Iron Gate dams, or to achieve the water temperature allocations in the Klamath total maximum daily loads (TMDLs), with the Lower Klamath Project dams remaining in place.

Please refer to Volume III Attachment 1 Section 3.2 *Water Quality – Potential Impacts and Mitigation* Potential Impact 3.2-2 for a discussion of why dam removal under the Proposed Project would cause water temperatures in the Klamath River downstream of Iron Gate Dam to align better with historical anadromous migration and spawning periods, warming earlier in the spring, and cooling earlier in the fall compared to existing conditions, and how this action would rapidly and substantially contribute to Klamath River TMDL compliance.

WQ-3 Adequacy of Modeling for Sediment Deposits and Suspended Sediments During Reservoir Drawdown

Some commenters assert that the suspended sediment modeling conducted by the United States Bureau of Reclamation (USBR) for the 2012 KHSA EIS/EIR does not adequately represent conditions under the Proposed Project. Some of the specific concerns raised include that the estimated mass and/or volume of the reservoir sediment deposits based on reservoir sediment samples collected in 2006 and 2009 is uncertain and will change in the future when the dams would

be removed, that the current Proposed Project involves a faster reservoir drawdown rate than was originally modeled, that the process of sediment jetting was not included in the 2012 project description, and that the models may not represent the hydrology that will occur during dam removal. These commenters express concern that if the suspended sediment modeling approach is not applicable to the Proposed Project, that related impact analyses (e.g., inorganic and organic contaminants) also are not adequately characterized in the EIR.

Please refer to Volume I Section 2.7.3 *Proposed Project – Reservoir Sediment Deposits and Erosion During Drawdown*, specifically page 2-65, for a discussion of the volume and weight of sediment for each reservoir as estimated in 2009, the estimated volume as of 2020 taking into account ongoing annual sediment deposition, and a discussion of why the uncertainty in the sediment volume estimates does not affect the analysis of sediment erosion potential for the reservoirs. Table 2.7-11 (page 2-68) presents the estimated amount of sediment in the Lower Klamath Project reservoirs in 2020 and explains in a footnote that between 2020 and 2021 (i.e., dam removal year 2 when drawdown would primarily occur), the sediment volume present behind the dams would increase by approximately 81,300 cubic yards in Copco No. 1 Reservoir and approximately 100,000 cubic yards in Iron Gate Reservoir based on estimates of annual sedimentation rates for each reservoir. The increase in sediment volume between 2020 and 2021 would be an order of magnitude less than the uncertainty of the 2020 total sediment volume estimates, so the range of model results using the 2020 sediment volumes would still be applicable to the Proposed Project.

Please refer to Volume I Section 2.7.3 *Proposed Project – Reservoir Sediment Deposits and Erosion During Drawdown*, specifically page 2-66, for a discussion of why the rate of reservoir drawdown and the Klamath River Renewal Corporation's proposal for sediment jetting would not substantially affect existing projections of reservoir sediment deposit mobility in the Lower Klamath Project reservoirs during drawdown. This section also explains how in a dry hydrologic year, reservoir pool levels can be drawn down steadily and relatively quickly, resulting in a shorter period of interaction between the flow and sediment deposits, and thus less overall sediment erosion. In a wet hydrologic year, the reservoir pool may experience cycles of drawdown followed by periods of refilling during high flow events, resulting in longer period of interaction between the flow and the sediment deposits, and thus more overall sediment erosion. Please note that the sediment transport model developed by USBR (2012a) for analyzing dam removal scenarios for the Lower Klamath Project was run for 49 water years in the available hydrology record (1961 through 2009), a timespan which includes very dry, dry, normal, wet, and very wet year types, including multiple extreme drought years (i.e., 1977, 1981, 1991, 1992, 1994, 2001, 2005) of similar magnitude to that which occurred more recently (i.e., 2013−2015), and occurrences of back-to-back drought years (i.e., 1990−1992, 2001−2005) (Figure WQ-3-1 and Figure WQ-3-2).

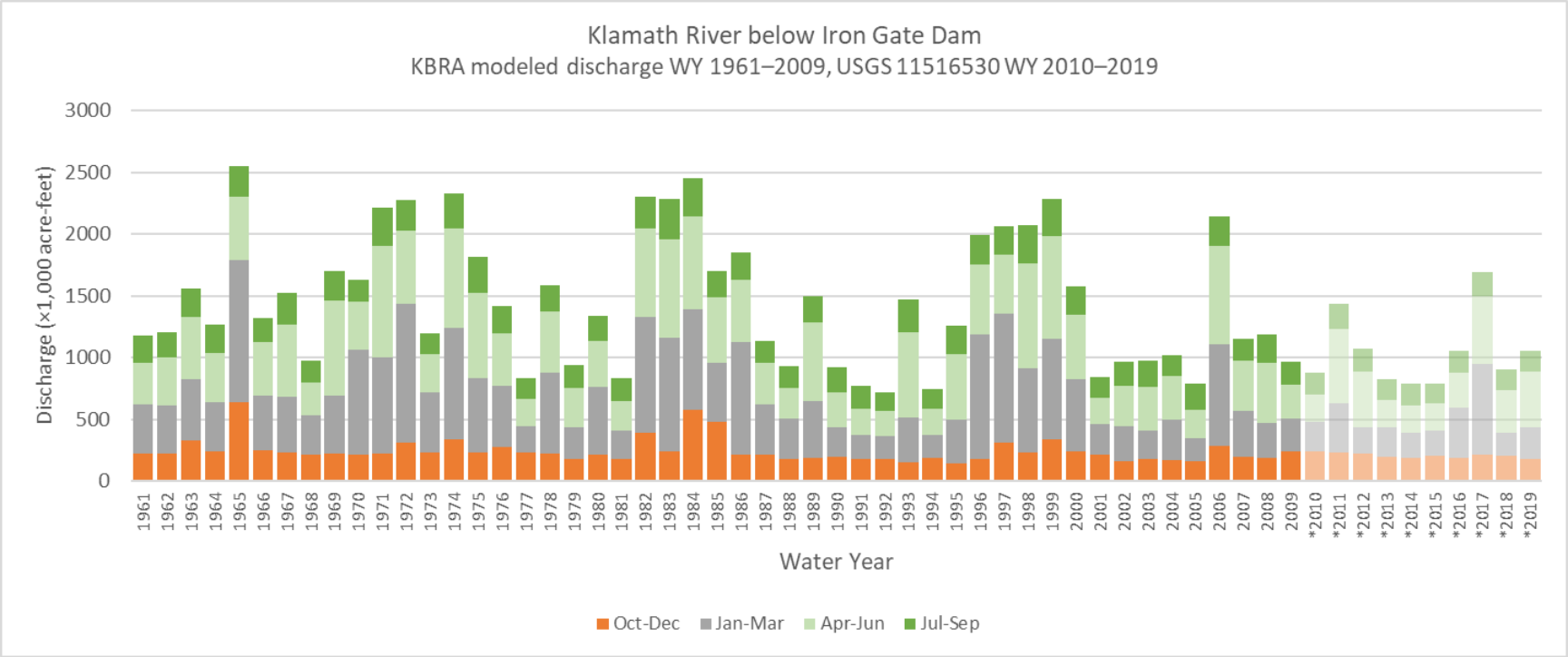

Figure WQ-3-1. Klamath River below Iron Gate Dam KBRA modeled discharge for water years (WY) 1961−2009 used in the USBR (2012a) sediment transport modeling for dam removal analyses and actual flows for WY 2010−2019 (USGS Gage No. 11516530). Water years outside of the hydrology record used in the USBR (2012a) sediment transport modeling are shown with an asterisk and in lighter shading for comparison.

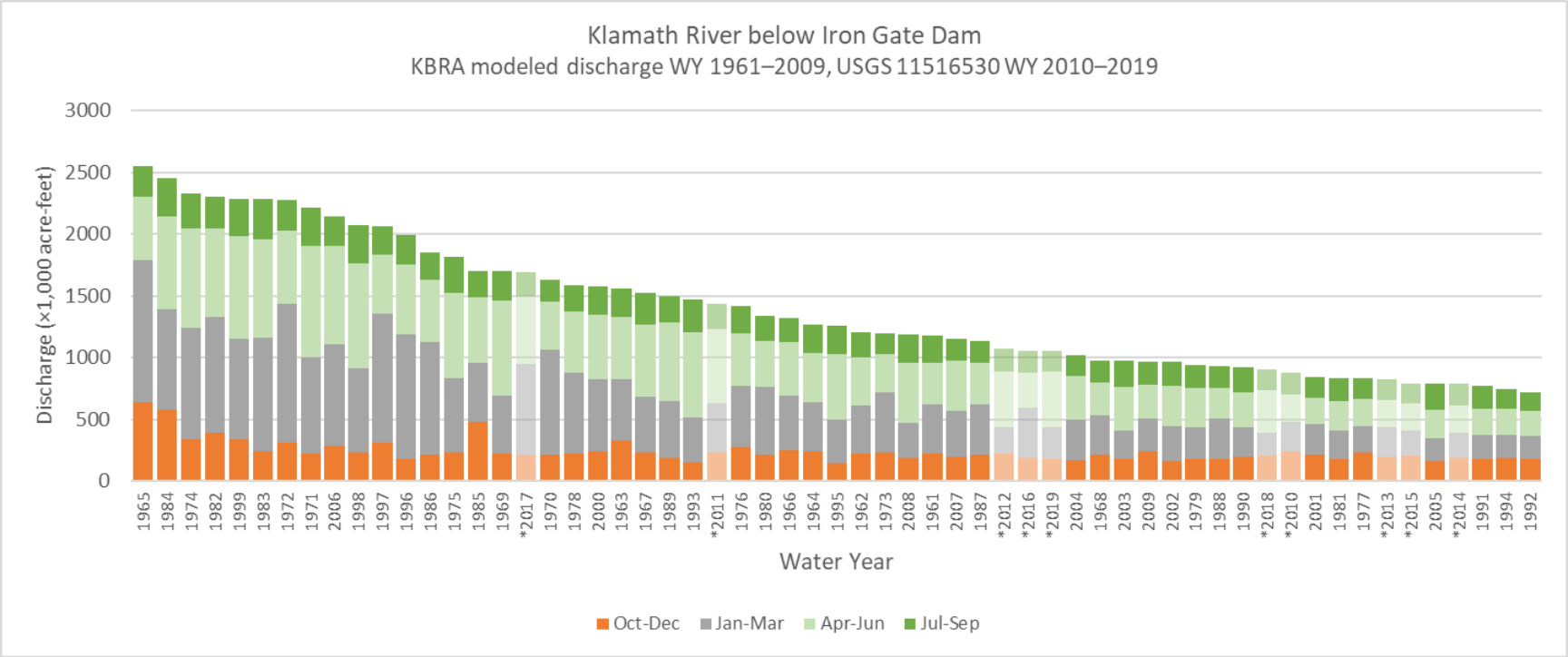

Figure WQ-3-2. Klamath River below Iron Gate Dam KBRA modeled discharge for water years (WY) 1961−2009 used in the USBR (2012a) sediment transport modeling for dam removal analyses and actual flows for WY 2010−2019 (USGS Gage No. 11516530). Water years outside of the hydrology record used in the USBR (2012a) sediment transport modeling are shown with an asterisk and in lighter shading for comparison.

Please refer to Volume III Attachment 1 Section 3.2.4.2 *Water Quality –Impact Analysis Approach – Suspended Sediments* for a discussion of why an adequate analysis of the Proposed Project does not require new suspended sediment modeling despite differences in the reservoir drawdown rates compared with conditions previously modeled by USBR.

Please refer to Volume III Attachment 1 Potential Impact 3.2-3, for an analysis of potential for increases in suspended sediments due to release of sediments currently trapped behind the Lower Klamath Project dams, including detailed consideration of the higher rate of reservoir drawdown and the process of sediment jetting.

WQ-4 Time Period of Water Quality Data

Several commenters assert that the data relied upon for the water quality analysis are too old to adequately assess existing conditions of the project area, specifying that total phosphorus, total nitrogen, dissolved oxygen, pH, inorganic and organic matter, sediment contaminants, and aquatic biota contaminants data are all over ten years old and do not represent the current environment.

Please refer to Volume III Attachment 1 Section 3.2.2 *Water Quality – Environmental Setting* and Volume III Attachment 1 Appendix C *Water Quality Supporting Technical Information* for a general summary of the water quality data collected from 2000 through 2017. Water quality data from 2012 through 2017 are discussed along with water quality data from 2011 or earlier in numerous places throughout Volume III Attachment 1 Section 3.2.2 *Water Quality – Environmental Setting* and Volume III Attachment 1 Appendix C *Water Quality Supporting Technical Information*, and associated citations are provided to the numerous reports that have been published compiling and/or analyzing these water quality data. Interim Measure 15 (IM 15) baseline and public health water quality data collected at multiple locations in the Klamath River from the Link River Dam to the Klamath River Estuary along with locations in the Lower Klamath Project reservoirs is documented in Watercourse Engineering, Inc. (2011a, 2011b, 2012, 2013, 2014, 2015, 2016), and these data are frequently utilized in the EIR. The list of reports published after 2012 considered in the EIR containing water quality data from 2012 to 2017, analysis of water quality data from 2012 to 2017, or analysis of historical water quality data (potentially including data from 2012 to 2017) that provide more recent insight into water quality conditions in the Klamath River include the following:

Asarian, E., and J. Kann. 2013. Synthesis of Continuous Water Quality Data for the Lower and Middle Klamath River, 2001–2011. Prepared by Kier Associates, Eureka, California and Aquatic Ecosystem Sciences, LLC, Ashland, Oregon for the Klamath Basin Tribal Water Quality Work Group.

Asarian, J. E., Y. Pan, N. D. Gillett, and J. Kann. 2015. Periphyton assemblages and associated environmental conditions in the Klamath River 2004 -2013.

Prepared by Riverbend Sciences, Portland State University, and Aquatic Ecosystem Sciences, LLC. for the Klamath Basin Tribal Quality Group.

E&S Environmental Chemistry, Inc. 2017. Results of cyanobacteria and microcystin monitoring in the vicinity of the Klamath Hydroelectric Project. Technical Memorandum. Prepared by E&S Environmental Chemistry, Inc. for PacifiCorp, Portland, Oregon.

Gibson, M. 2016. 2010-2015 Klamath River Blue-Green Algae Summary Report. Final Report. Prepared by Yurok Tribe Environmental Program: Water Division, Klamath, California.

Hanington, M. 2013. 2012 Klamath River continuous water quality monitoring summary report. Final Report. Prepared by Yurok Tribe Environmental Program: Water Division, Klamath, California.

Hanington, M. and K. Torso. 2013. 2012 Klamath River nutrient summary report. Final Report. Prepared by Yurok Tribe Environmental Program: Water Division, Klamath, California.

Hanington, M., and K. Ellien. 2013. 2013 Klamath River continuous water quality monitoring summary report. Final Report. Prepared by Yurok Tribe Environmental Program: Water Division, Klamath, California.

Hanington, M. and S. Stawasz. 2014. 2013 Klamath River nutrient summary report. Final Report. Prepared by Yurok Tribe Environmental Program: Water Division, Klamath, California.

Hanington, M. and R. Cooper-Carouseli. 2014. 2014 Klamath River nutrient summary report. Final Report. Prepared by Yurok Tribe Environmental Program: Water Division, Klamath, California.

HVTEPA. 2013. Water Quality Monitoring by the Hoopa Tribal Environmental Protection Agency 2008-2012. Prepared by the Hoopa Tribal Environmental Protection Agency in cooperation with Kier Associates. Hoopa Valley Tribal Environmental Protection Agency, Hoopa, California.

Kann, J. 2014. Evaluation of cyanobacteria and cyanobacterial toxins with reference to selection of water quality criteria for the Karuk Tribe of California. Technical Memorandum. Prepared by Aquatic Ecosystem Sciences, LLC, Ashland, Oregon for the Klamath Tribe of California, Natural Resources Department, Orleans, California.

Kann, J., C. Bowman, L. Bowater, G. Johnson, and S. Raverty. 2013. Microcystin bioaccumulation in Klamath River salmonids; 2010 Study Results (Updated 6-12-2013). Technical memorandum. Prepared by Aquatic Ecosystem

Sciences for the Karuk Tribe Department of Natural Resources, Orleans California.

Karuk Tribe of California. 2013. 2013 Water quality assessment report: Klamath River, Salmon River, Scott River, Shasta River, and Camp Creek. Prepared by Karuk Tribe of California, Water Quality Program, Department of Natural Resources, Orleans, California.

KRRC (Klamath River Renewal Corporation). 2018. Draft water temperature data collection at Shovel Creek. Prepared by KRRC, San Francisco, California for State Water Resources Control Board, Sacramento, California.

Oliver A. A., R. A. Dahlgren, and M. L. Deas. 2014. The upside-down river: Reservoirs, algal blooms, and tributaries affect temporal and spatial patterns in nitrogen and phosphorus in the Klamath River, USA. Journal of Hydrology 519: 164–176. http://dx.doi.org/10.1016/j.jhydrol.2014.06.025

Otten, T. G., J. R. Crosswell, S. Mackey, and T. W. Dreher. 2015. Application of molecular tools for microbial source tracking and public health risk assessment of a Microcystis bloom traversing 300 km of the Klamath River. Harmful Algae 46: 71–81. http://dx.doi.org/10.1016/j.hal.2015.05.007.

Otten, T. 2017. Application of genetic tools for improved cyanobacterial bloom monitoring in the Klamath River system: Implications for public health monitoring. Prepared by Bend Genetics, LLC., Sacramento, California.

PacifiCorp. 2013. Final dataSonde data from below Iron Gate Dam. Water quality preliminary raw data collected with a YSI 6600 DataSonde on the Klamath River downstream from Iron Gate Dam (RM 193.1) from January 1 thru December 31, 2013. Collected by PacifiCorp, Portland, Oregon. http://www.pacificorp.com/es/hydro/hl/kr.html# [Accessed on 11 December 2018].

PacifiCorp. 2014. Final dataSonde data from below Iron Gate Dam. Water quality preliminary raw data collected with a YSI 6600 DataSonde on the Klamath River downstream from Iron Gate Dam (RM 193.1) from January 1 thru December 31, 2014. Collected by PacifiCorp, Portland, Oregon. http://www.pacificorp.com/es/hydro/hl/kr.html# [Accessed on 11 December 2018].

PacifiCorp. 2015. Final dataSonde data from below Iron Gate Dam. Water quality preliminary raw data collected with a YSI 6600 DataSonde on the Klamath River downstream from Iron Gate Dam (RM 193.1) from January 1 thru December 31, 2015. Collected by PacifiCorp, Portland, Oregon. http://www.pacificorp.com/es/hydro/hl/kr.html# [Accessed on 11 December 2018].

PacifiCorp. 2016. Final dataSonde data from below Iron Gate Dam. Water quality preliminary raw data collected with a YSI 6600 DataSonde on the Klamath River downstream from Iron Gate Dam (RM 193.1) from January 1 thru December 31, 2016. Collected by PacifiCorp, Portland, Oregon. http://www.pacificorp.com/es/hydro/hl/kr.html# [Accessed on 11 December 2018].

PacifiCorp. 2017. Final dataSonde data from below Iron Gate Dam. Water quality preliminary raw data collected with a YSI 6600 DataSonde on the Klamath River downstream from Iron Gate Dam (RM 193.1) from January 1 thru December 31, 2017. Collected by PacifiCorp, Portland, Oregon. http://www.pacificorp.com/es/hydro/hl/kr.html# [Accessed on 11 December 2018].

Sullivan, A. B. and S. A. Rounds. 2016. Modeling water quality, temperature, and flow in Link River, South-Central Oregon. U.S. Geological Survey Open-File Report 2106- 1146. http://dx.doi.org/10.3133/ofr20161146.

Watercourse Engineering, Inc. 2013. Klamath River baseline water quality sampling, 2012 Annual Report. Prepared for the KHSA Water Quality Monitoring Group.

Watercourse Engineering, Inc. 2014. Klamath River baseline water quality sampling, 2013 Annual Report. Prepared for the KHSA Water Quality Monitoring Group.

Watercourse Engineering, Inc. 2015. Klamath River baseline water quality sampling, 2014 Annual Report. Prepared for the KHSA Water Quality Monitoring Group.

Watercourse Engineering, Inc. 2016. Klamath River baseline water quality sampling, 2015 Annual Report. Prepared for the KHSA Water Quality Monitoring Group.

YTEP. 2014. Aug 5-6, 2014 Microcystin Results. Yurok Tribe Environmental Program (YTEP) Memorandum. Prepared by Yurok Tribe Environmental Program, Klamath, California.

YTEP. 2015. July 28 & 29 BGA Results. Yurok Tribe Environmental Program (YTEP) Memorandum. Prepared by Yurok Tribe Environmental Program, Klamath, California.

While many of the studies and models developed for the 2012 KHSA EIS/EIR (and included in this Lower Klamath Project EIR) use data from 2000 through 2011, data from 2012 through 2017 were also reviewed and included in the

overview of existing water quality conditions and considered in this Lower Klamath Project EIR analyses of potential water quality impacts. Further, comparisons of more recent and historical water quality data indicate that adding more recent available water quality data to existing model and/or analysis results would not materially change anticipated water quality parameter responses to dam removal. For example, in Volume III Attachment 1 Appendix C, Section C.1.2.1 *Iron Gate to Salmon River* (page C-5) the Klamath River water temperature trends at monitoring sites between Iron Gate Dam and the confluence with the Salmon River between 2001 and 2012 are specifically compared with the water temperature trends between 2013 and 2015 and, as described in the appendix, water temperature trends are consistent from 2001 through 2015. As such, Potential Impact 3.2-1 uses an analysis of existing water temperature data along with previous water temperature modeling results based upon historical data (i.e., pre-2013) to evaluate the potential for short-term and long-term alterations in water temperatures due to conversion of the reservoir areas to a free-flowing river. Assessments of available suspended sediment, nutrient, dissolved oxygen, pH, chlorophyll-*a*, and algal toxin data from 2013 through 2017 are used along with historical data (i.e., 2012 or earlier) in EIR discussions of the range of variation in water quality parameters over time, especially for chlorophyll-*a* and algal toxins (see Volume III Attachment 1 Appendix C in their respective sections and Klamath River reaches).

As further clarification, Figure WQ-4-1 and Figure WQ-4-2 (below) present graphical comparisons of the available IM15 water temperature, dissolved oxygen, pH, total phosphorous, and total nitrogen from 2000 through 2017 at the Klamath River monitoring site downstream of Iron Gate Dam (approximately RM 192.75), demonstrating that the range of historical (i.e., 2012 or earlier) and more recent (i.e., 2013 to 2017) total nitrogen and total phosphorus concentrations are similar. Please note that the IM15 data through 2015 was generally considered in Appendix C. Figure WQ-4-1 shows the IM15 water temperature, dissolved oxygen, pH, total phosphorous, and total nitrogen data for the period before and after 2012, with the mean values shown as a black line and the 95 percent confidence bands around the mean shown in cyan. The 95 percent confidence bands indicate that there is a 95 percent probability that the mean value would occur within the band. While there are differences between the means before and after 2012 downstream of Iron Gate Dam, those differences are small relative to the range of values for the water quality parameters. Additionally, the 95 percent confidence bands for the means before and after 2012 partially overlap for all water quality parameters, indicating that the mean values for each individual water quality parameter before and after 2012 are likely to be statistically the same and the difference in the mean values before and after 2012 is only due to the water quality being sampled periodically.

Figure WQ-4-2 also presents the IM15 data, but this figure displays an estimate of seasonal water quality variation downstream of Iron Gate Dam from 2000 to 2017, by using a non-parametric smoothing regression line with a time-step of

three months (each season is approximately three months long). The associated 95 percent confidence bands are shown in cyan and they are calculated for the pre-2012 and the post-2012 IM 15 data to characterize how water quality varied seasonally during these two periods. No IM 15 data were reported during 2006, so the seasonal water quality trends in the three months before and the three-months after 2006 are based on limited data and do not likely represent the longer-term trends. As highlighted by Figure WQ-4-2, the seasonal variations in water temperature, dissolved oxygen, pH, total phosphorus, and total nitrogen are generally similar between pre-2012 and post-2012 periods, with most post-2012 variations in water quality parameters also within the range of pre-2012 variations. Seasonal pH trends during 2013 and 2014 downstream of Iron Gate Dam tended to peak higher than those pre-2012, but the seasonal pH trends in subsequent years (i.e., 2015 to 2017) were generally similar to those pre-2012.

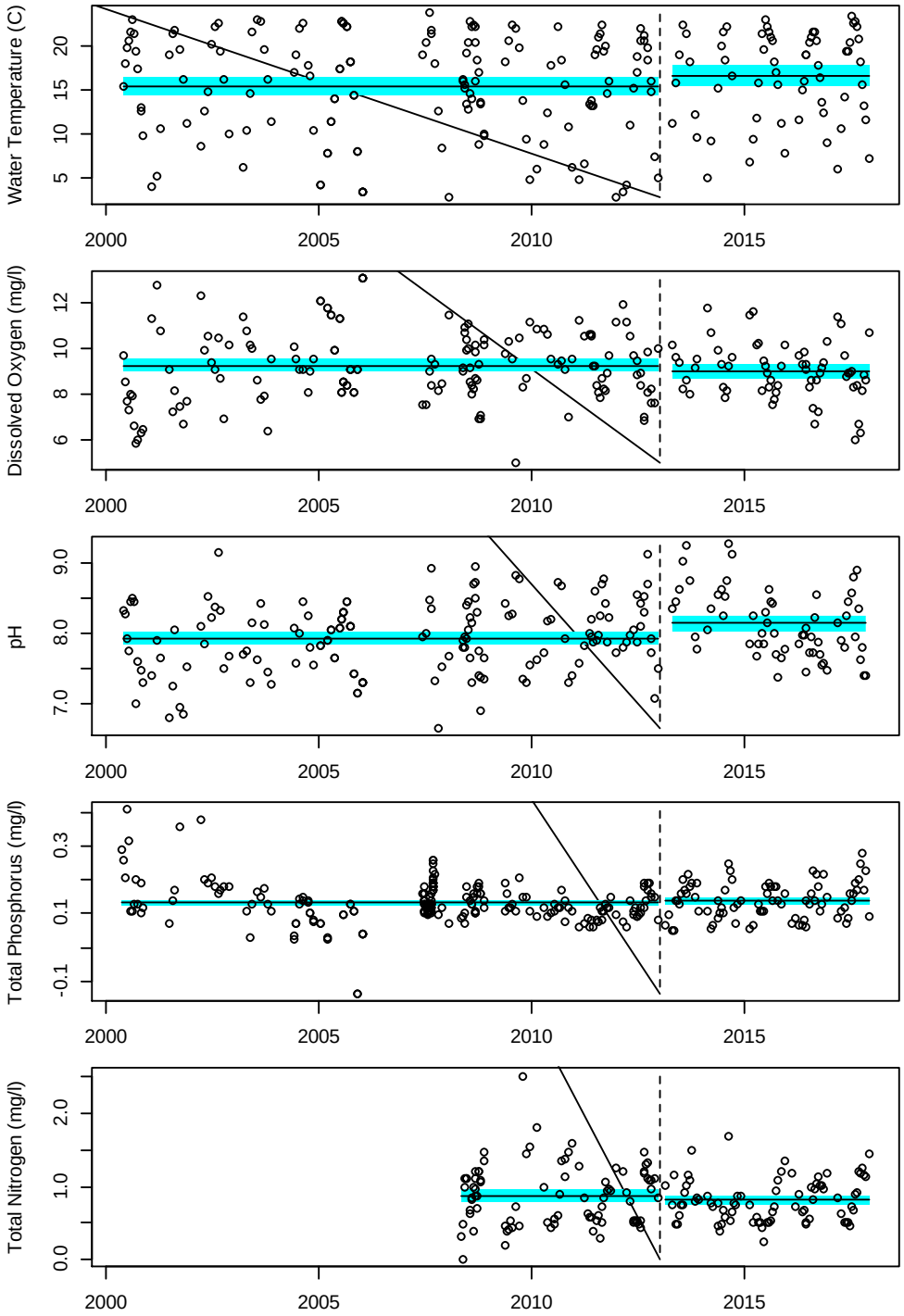

Figure WQ-4-1. Interim Measure 15 Data at the Klamath River Monitoring Site Downstream of Iron Gate Dam (Approximately RM 192.75) from 2000 to 2017 Along with the Mean Values and 95 Percent Confidence Bands (in cyan). Source: PacifiCorp 2003a, 2004b, 2005b, 2007, 2008b, 2009, 2010, 2011, 2012, 2013, 2014c, 2015b, 2016b, 2017b.

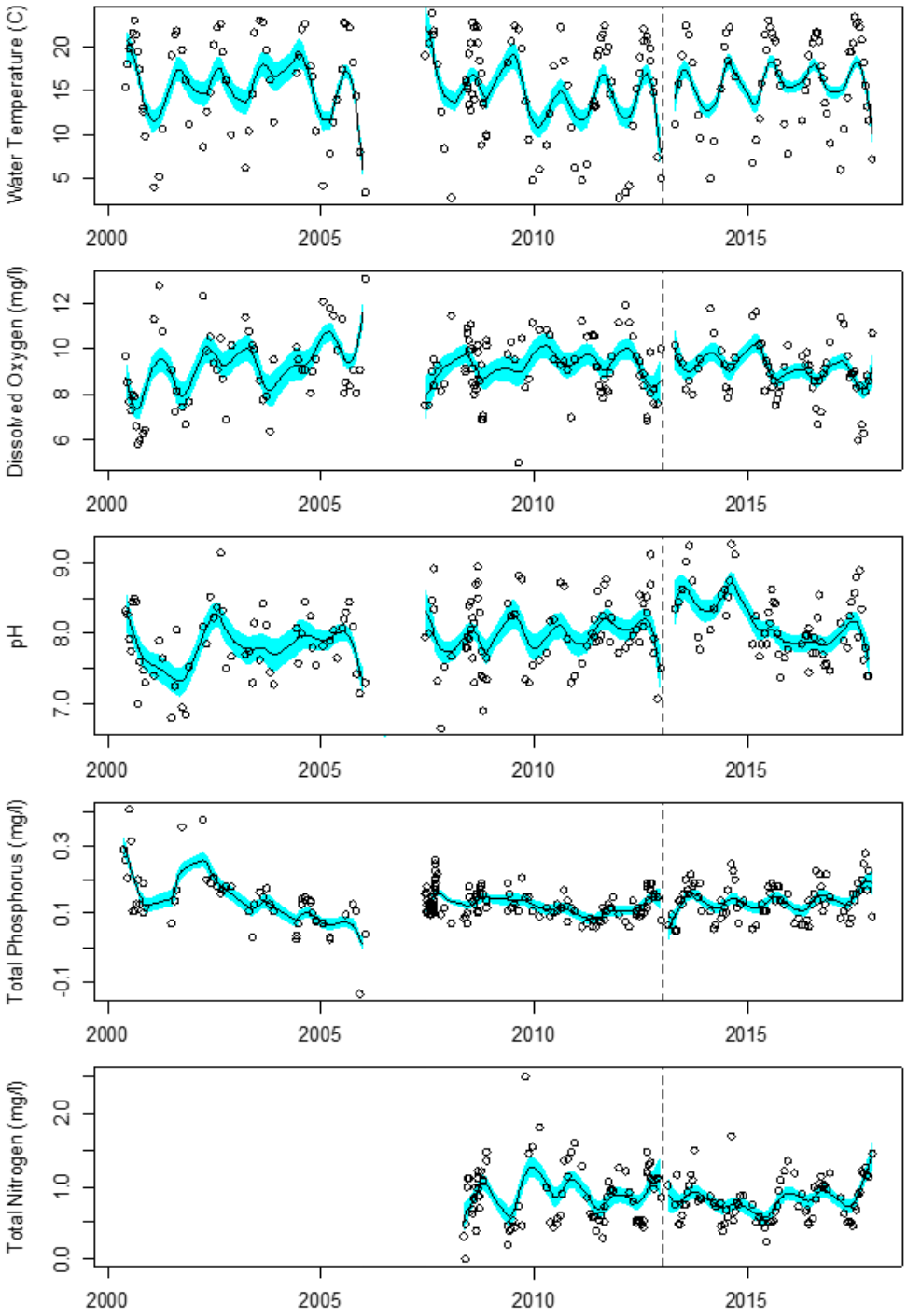

Figure WQ-4-2. Interim Measure 15 Data at the Klamath River Monitoring Site Downstream of Iron Gate Dam (Approximately RM 192.75) from 2000 to 2017 Along with a Non-parametric 3-month Smoothing Regression Curve Representing the Seasonal Water Quality Trends and the Associated 95 Percent Confidence Bands (in cyan). Source: PacifiCorp 2003a, 2004b, 2005b, 2007, 2008b, 2009, 2010, 2011, 2012, 2013, 2014c, 2015b, 2016b, 2017b.

Insofar as the data are available and applicable to the reaches being evaluated, the potential impacts to water quality under the Proposed Project are analyzed using the synthesis of the historical (i.e., 2012 or earlier) and more recent (i.e., 2013 to 2017) water quality data, modeling using historical data (e.g., Klamath River TMDL [total maximum daily loads] model of pH), modeling using historical data supplemented with additional analysis based on current conditions (e.g., variations in modeled suspended sediment concentrations [SSCs] during drawdown due to modifications in drawdown rates), and/or new modeling (e.g., short-term dissolved oxygen decreases in the Klamath River during reservoir drawdown assuming an initial dissolved oxygen saturation at Iron Gate Dam of zero).

In the EIR water quality data summary and analysis (Volume III Attachment 1 Section 3.2.2.8 *Water Quality – Environmental Setting – Inorganic and Organic Contaminants*, Volume III Attachment 1 Appendix C, Section C.7 *Inorganic and Organic Contaminants*, and Volume III Attachment 1 Section 3.2.5.7 *Water Quality – Environmental Setting – Inorganic and Organic Contaminants*), existing inorganic and organic contaminant data in the Lower Klamath Project reservoirs and Klamath River monitoring sites were compared with more recent available screening levels; there are no readily available inorganic or organic sediment contaminant data from the reservoirs after 2010 or for Klamath River monitoring sites after 2013. However, concentrations of inorganic and organic contaminants in the reservoirs or the Klamath River are not expected to vary significantly after 2010 or 2013 respectively. The State Water Board is unaware of any new sources of inorganic or organic contaminants due to climate or local land-use alterations that would alter the concentration of contaminants accumulated in Lower Klamath Project reservoir sediments since 2010. Additionally, the sediment that will have accumulated in the reservoirs between 2010 and the projected year of dam removal (2021) ranges from approximately 11 to 21 percent of the total sediment volume, so potential deposition of contaminants between 2010 and dam removal would have a limited influence on the overall contaminant concentration that would occur during and after dam removal. Concentrations of contaminants in aquatic biota are related to concentrations of contaminants in the water column and sediment, so no substantial change in the water column or sediment contaminant concentrations would be expected to result in a substantial change in aquatic biota contaminant concentrations. Lastly, the comments expressing concern regarding the time period for the sediment contaminant data reported in the EIR do not provide substantial evidence regarding the potential for any new data of this type. Overall, the inorganic and organic contaminant data summarized in Volume III Attachment 1 Section 3.2.2.8 *Water Quality – Environmental Setting – Inorganic and Organic Contaminants* and Volume III Attachment 1 Appendix C, Section C.7 *Inorganic and Organic Contaminants* are representative of existing conditions and the analysis of this data in Volume III Attachment 1 Section 3.2.5.7 *Water Quality – Potential Impacts and Mitigation – Inorganic and Organic Contaminants*

sufficiently characterizes the potential impacts under the Proposed Project and the alternatives.

WQ-5 Inclusion of Klamath River TMDL Model in the EIR Analysis

Commenters express several concerns related to the use of the Klamath River TMDL models in the EIR analysis. Some commenters assert that the model assumption that all waters entering the state of California are fully compliant with applicable Total Maximum Daily Loads (TMDLs) results in an overestimate of the effects of dam removal on TMDL target constituents since it is not likely that TMDLs would be met at the Oregon-California state line when the dams would be removed. Several commenters also assert that the Oregon and California TMDL modeling results are flawed; the EIR does not adequately summarize the disagreement about the TMDL modeling approach; the EIR does not provide substantial evidence supporting the use of the TMDL model results in the EIR analysis; and the Oregon TMDL was withdrawn.

The EIR addresses how and why certain models, including the applicable California and Oregon TMDL models, are considered in the analysis of the Proposed Project and the alternatives. Volume III Attachment 1 Section 3.2.4 *Water Quality – Impact Analysis Approach* explains that the EIR water quality impact analysis relies on multiple numeric models, including the California Klamath River TMDL model, because no single existing numeric model captures all of the water quality conditions anticipated for and encompassed by the Proposed Project (see also Volume II Appendix D, Section D.1).

Volume III Attachment 1 Section 3.2.4 *Water Quality – Impact Analysis Approach* states that the California Klamath River TMDL model stemmed from a significant five-year effort by the North Coast Regional Water Quality Control Board (North Coast Regional Board) in collaboration with PacifiCorp and working jointly with the U.S. Environmental Protection Agency (USEPA) Regions 9 and 10 and the Oregon Department of Environmental Quality. That work was subject to extensive peer review and public comment before adoption by the North Coast Regional Board. It was further reviewed and subject to additional public comment before being approved unanimously by the State Water Board. It was then subsequently reviewed and approved by USEPA in December 2010. This information is fully consistent with the definition of “substantial evidence” under CEQA Guidelines Section 15384.

The Oregon Klamath River TMDL model was developed by the Oregon Department of Environmental Quality in cooperation with the North Coast Regional Board, PacifiCorp, and USEPA Regions 9 and 10, and also underwent peer review and public comment prior to its adoption. Results from this model are not analyzed directly in the Lower Klamath Project EIR because the Klamath River reaches to which this TMDL applies are in Oregon. However, key concerns with respect to the Oregon TMDL model are included in the summary

below because the output from this model sets the upstream boundary condition for the California Klamath River TMDL model at the Oregon-California state line. Consistent with CEQA Guidelines Section 15151, the following minor modification has been made to Section 3.2.4 *Water Quality – Impact Analysis Approach* to summarize the main points of disagreement among the experts regarding the Klamath TMDL models:

"Key concerns with respect to the California and Oregon TMDL models, which were raised during the respective public comment processes, include concerns regarding how the natural condition was determined, how model uncertainty was considered in the analysis, and need for additional years of data for calibration of the model. As discussed in North Coast Regional Board (2010) Appendix 10 *Public Comments & Responses*, the North Coast Regional Board found the uncertainty associated with the Klamath TMDL models to be minimal relative to the magnitude of the source load reductions needed to meet water quality standards in both Oregon and California and that any additional analysis would bring diminishing returns for determining implementation actions for the basin. The North Coast Regional Board indicated that if updates to the California model demonstrate that TMDL allocations and targets should be adjusted, the Regional Water Board staff would propose changes to the TMDL. To date, no such changes have been proposed. The North Coast Regional Board also provided extensive documentation describing the development of the modeled natural condition and indicated that the year chosen for developing the model and establishing the TMDL was selected because it included periods of critical low flow and poor water quality conditions, consistent with the margin of safety requirement and the goal of developing environmentally conservative allocations. While the Oregon portion of the model was calibrated using two model years, there were not sufficient data to evaluate the California portion of the model for the second year. The North Coast Board indicated that adding more model years to the model development process would not significantly change the model parameters, given the within-year variability in the Klamath River system (North Coast Regional Board 2010)."

The Oregon Klamath River water temperature and nutrient TMDLs were reissued in 2019. Oregon Department of Environmental Quality made minor modifications to the tributary inflow water temperatures for the natural conditions baseline model scenario, as well as minor modifications to point source water temperatures for the allocation scenario. Because the Oregon water temperature TMDL (ODEQ 2010) and the Oregon water temperature TMDL (ODEQ 2019) present modeling results using different averaging functions of water temperature, the exact range of differences between water temperature model outputs cannot be compared between the two versions of the model. However, general seasonal trends in water temperature with distance downstream in the Upper Klamath River are consistent with those analyzed in the EIR, and the EIR's conclusion that conditions under the Proposed Project would better align with the California Thermal Plan's prohibitions and move waters within the

hydroelectric reach towards TMDL compliance (see discussion under Volume III Attachment 1 Potential Impact 3.2-1) would not be altered by revisions to the water temperature portion of the Oregon TMDL (ODEQ 2019). Oregon Department of Environmental Quality also reissued the Klamath River nutrient TMDL (ODEQ 2019), which updated the ammonia analysis, modified the requirements of water treatment facilities operated in the Upper Klamath Basin from an annual to a seasonal wasteload allocation, and specified allowable reductions in dissolved oxygen from the natural conditions baseline. These changes would have no effect on the analysis of potential impacts of the Proposed Project or alternatives on total nitrogen in the EIR. While these changes would increase total phosphorus concentrations in the spring at the Oregon-California state line, which could increase the potential for seasonal periphyton growth in the Hydroelectric Reach under the Proposed Project, as well as associated increases in daily maximum pH, this would not alter the EIR's conclusion that the potential for establishment and growth of periphyton or specifically nuisance periphyton within the Hydroelectric Reach from Copco No. 1 Reservoir to Iron Gate Dam would be significant and unavoidable in the long term (see discussion under Volume I Potential Impact 3.4-4).

Volume III Attachment 1 Section 3.2.4 *Water Quality – Impact Analysis Approach* also acknowledges limitations of the TMDL models in analyzing the impact of the Proposed Project, because of its assumption of full TMDL implementation for both the dams-in and dams-out scenarios. The EIR recognizes that the mechanisms for implementation and the timing required to achieve future TMDL compliance are speculative. Despite this assumption, the Klamath River TMDL model results are still a useful source of information with respect to the EIR analyses, particularly in light of the TMDL models' inclusion of a "natural condition". The EIR appropriately includes the TMDL models in the EIR analysis, along with a suite of other available facts and credible information.

Please refer to Volume III Attachment 1 Section 3.2.4 *Water Quality – Impact Analysis Approach* for a general discussion of how TMDL model results are considered in the analysis of potential water temperature impacts, potential nutrient impacts, potential dissolved oxygen impacts, and pH impacts due to implementation of the Proposed Project. The section also discloses that the TMDL output was not used for analysis of chlorophyll-*a*. The TMDL model does not provide output for, and is thus not utilized in the EIR analysis of, suspended sediments, algal toxins, or inorganic and organic contaminants.

In analyzing the potential impacts to various parameters, the EIR further contextualizes the use of the Klamath TMDL models in light of the assumption of full compliance and the other information available. For example, for water temperature, Volume III Attachment 1 Section 3.2.5 *Water Quality – Potential Impacts and Mitigation* Potential Impact 3.2-1 describes how the Klamath TMDL models are useful for determining the dominance of Lower Klamath Project removal in achieving a water temperature response, in light of the comparatively

negligible impact of other upstream temperature point sources. This is helpful context, despite the disclosure that the models' assumption of compliance does not reflect the existing condition. Similarly, for dissolved oxygen, Volume III Attachment 1 Section 3.2.5 *Water Quality – Potential Impacts and Mitigation* Potential Impact 3.2-10, explains that the dissolved oxygen mechanism modeled for the Klamath River TMDLs would be the same even if model inputs for dissolved oxygen were changed from the TMDL compliance values to concentrations less than existing conditions (i.e., worse dissolved oxygen baseline); thus, the general trends indicated by the Klamath TMDL models output are still informative for conditions where full TMDL compliance has not occurred. The EIR provides similar context for nutrients and pH, and in all cases where the TMDL model output is used, the results are considered with respect to general trends only and they are used along with the results of other available numerical model output.

WQ-6 Potential Contaminants in Sediments

Several commenters have expressed general concern regarding the impact of contaminants in reservoir sediments, including concern that the release of reservoir sediments could cause contamination of the Klamath River. Some comments assert that sediment sampling to date has been inadequate because it has not extended deep enough into the sediments to be accurate. Comments express concern that release of sediments with certain contaminants, including poly-chlorinated biphenyls (PCBs), lead, mercury, and dichlorodiphenyltrichloroethane (DDT), would not comply with California laws. Other comments express concern that the human health risk assessment is not adequate.

Please refer to Volume III Attachment 1 Section 3.2.2.8 *Water Quality – Environmental Setting – Inorganic and Organic Contaminants* for a general summary of the inorganic and organic contaminants measured in the Klamath River waters, the reservoir sediments, and aquatic biota. Please also refer to Volume III Attachment 1 Appendix C, Section C.7 *Inorganic and Organic Contaminants* for further details about the inorganic and organic contaminants measured in the Klamath River waters, the reservoir sediments, and aquatic biota. Volume III Attachment 1 Section 3.2.2.8 *Water Quality – Environmental Setting – Inorganic and Organic Contaminants* includes the chemicals of potential concern detected in reservoir samples, sediment toxicity test results for benchmark benthic indicator species, and comparisons of detected chemical concentrations with USEPA and California Environmental Protection Agency (CalEPA) human health screening levels to assess human health risk as well as with National Oceanic and Atmospheric Administration (NOAA), U.S. Fish and Wildlife Service (USFWS), and Oregon Department of Environmental Quality (ODEQ) ecological screening levels to assess ecological health risk. As explained in Volume III Attachment 1 Section 3.2.2.8 *Water Quality – Environmental Setting – Inorganic and Organic Contaminants, Sediment Contaminants*, on-site geologists verified that sediment cores collected during

2009 and 2010 reached the reservoir-deposited/pre-reservoir sediment boundary to characterize the inorganic and organic contaminants throughout the entire depth of the existing reservoir sediments. Thus, the depth of the samples was sufficient.

Please refer to Volume III Attachment 1 Section 3.2.5.7 *Water Quality – Potential Impacts and Mitigation – Inorganic and Organic Contaminants* Potential Impact 3.2-13 for the evaluation of the potential impacts of human exposure to inorganic and organic contaminants in reservoir sediments due to the release of these sediments during dam removal and exposure to these sediments during and following dam removal. Human exposure is assessed for both direct contact with reservoir sediments and subsistence eating of fish or shellfish exposed to inorganic and organic contaminants in reservoir sediments using USEPA and CalEPA screening levels that are conservatively protective of human health and available screening level values to assess whether contaminants would bioaccumulate to unhealthy levels for humans who eat them.

Please refer to Volume III Attachment 1 Section 3.2.5.7 *Water Quality – Potential Impacts and Mitigation – Inorganic and Organic Contaminants* Potential Impact 3.2-14 for the evaluation of the potential impacts of freshwater and marine aquatic exposure to inorganic and organic contaminants in reservoir sediments due to the release of these sediments during dam removal and exposure to these sediments during and following dam removal.

WQ-7 Algal Toxicity

Several comments assert that algae in the Iron Gate and Copco No. 1 reservoirs and the Klamath River do not cause health problems. The comments base this statement on the commenters' personal experience swimming in the lake and river during the summer without resulting health problems or their understanding that people, dogs, cattle, and wildlife interact with water in the river and lakes during summer months without any associated deaths. Some comments express mistrust of state water quality postings explaining the potential harmful, deadly effects of algal toxins on human and animal health. Others note that blue-green algae is a natural health supplement.

While is it true that some types of blue-green algae (e.g., "spirulina" which includes the species *Arthrospira platensis* and *Arthrospira maxima*) are used as a dietary food supplement, it is also true that some blue-green algae species (including spirulina) produce algal toxins (also referred to as cyanotoxins). As stated in Volume III Attachment 1 Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins*, while exposure to cyanotoxins can in extreme cases cause death to exposed organisms including humans, chronic exposure symptoms include a number of forms of physical irritation and sickness (e.g., visual disturbance, nausea, vomiting, muscle weakness) such that a lack of reported deaths associated with exposure to seasonal cyanotoxins in the

Klamath River and/or the Lower Klamath Project reservoirs does not represent substantial evidence demonstrating that there is no potential risk to public health due to the presence of cyanotoxins. Please refer to Volume III Attachment 1 Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* and Volume III Attachment 1 Appendix C, Section C.6 *Algal Toxins and Chlorophyll-a* for a summary of the potential health impacts of exposure to cyanotoxins citing credible studies by national, federal, and state agencies including the World Health Organization (WHO), the United States Environmental Protection Agency (USEPA), and the California Office of Environmental Health Hazard Assessment (OEHAA). These sections also present algal toxin concentrations measured in the Lower Klamath Project reservoirs and the Klamath River from 2005 to 2016. As noted in these sections, cyanotoxins (e.g., microcystin) are produced only periodically and by only specific species of blue-green algae [cyanobacteria] (e.g., *Microcystis aeruginosa*) found in the Lower Klamath Project reservoirs and the Klamath River. Other species of algae and blue-green algae present in the Lower Klamath Project reservoirs and the Klamath River may not produce cyanotoxins or may not produce them at high enough levels to cause health impacts for humans, dogs, cattle, and/or wildlife.

Please also refer to Volume I Section 3.4 *Phytoplankton and Periphyton* (pages 3-389 to 3-440) for a discussion of the phytoplankton and periphyton communities in the Klamath River, including diatoms, green algae, and blue-green algae [cyanobacteria]. As described in Volume I Section 3.4.2.1 *Phytoplankton and Periphyton – Environmental Setting – Phytoplankton* (page 3-392 to 3-403), algae like diatoms and green algae are generally considered to be beneficial to the ecosystem, but algal blooms primarily composed of the blue-green algae species *Aphanizomenon flos-aquae, Anabaena flos-aquae*, and *Microcystis aeruginosa* in the Lower Klamath Project reservoirs and the Klamath River are the cause of water quality or human health concerns since these blue-green algae species are associated with the release of cyanotoxins on a seasonal basis.

2.2.5 Aquatic Resources Master Responses

AQF-1 Removal of Lower Klamath Project Reservoirs and Lost River and Shortnose Sucker Populations

Several comments assert that removal of the Lower Klamath Project reservoirs will eliminate Lost River and shortnose sucker populations in those reservoirs, resulting in take of a fully protected species under California Fish and Game Code.

Please refer to Volume III Attachment 1 Section 3.3 *Aquatic Resources*, Potential Impact 3.3-13 for a summary of the anticipated effects of removing the Lower Klamath Project reservoirs on Lost River and shortnose sucker populations. The EIR notes that the reservoir habitat for these species would be removed and evaluates the effect of this loss on the populations. As described in Potential

Impact 3.3-13, the Lost River and shortnose suckers in Copco No. 1 and Iron Gate reservoirs are considered by the USFWS (2012) as "sink populations", citing Moyle (2002) and NRC (2004). These sucker groups are not likely to be self-sustaining due to a lack of access to spawning habitat, which results in low recruitment (i.e., success of juveniles living to adulthood). Buettner et al. (2006) conclude that since little or no reproduction occurs downstream from Keno Dam, and there is no potential for interaction with upstream populations, these sucker groups are not considered to substantially contribute to the achievement of conservation goals or recovery for these two species. This finding is also consistent with the findings of Hamilton et al. (2011) and NRC (2004). In addition, and as described in Potential Impact 3.3-13, Assembly Bill Number 2640 (Wood 2018) added Section 2081.11 to the Fish and Game Code to allow the take of both sucker species resulting from impacts attributable to the decommissioning and removal of the Lower Klamath Project and associated facilities, consistent with CDFW take provisions. Finally, Potential Impact 3.3-13 describes that the Proposed Project includes measures to conduct genetic testing of the sucker populations prior to dam removal, and to relocate individual suckers.

AQF-2 Fate of Hatchery Operations

Several comments express the concern that under the Proposed Project, and alternatives that involve removal of Iron Gate Dam, the term of hatchery operations should extend until successful recolonization of both Chinook and coho has occurred and not be limited to eight years of operations. Additionally, comments asserted hatchery production goals as listed in the Proposed Project should be increased. Conversely, other comments express the opinion that hatchery production should be eliminated, or that the No Hatchery Alternative be selected as the preferred alternative.

As discussed in Volume III Attachment 1 Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Fish Hatcheries*, Iron Gate Hatchery was built to mitigate for the loss of spawning and rearing habitat resulting from the construction of Iron Gate Dam. Under the Proposed Project and alternatives that would remove Iron Gate Dam (i.e., Partial Removal, Two Dam Removal, Three Dam Removal, and No Hatchery alternatives), the Iron Gate Hatchery facilities located at the base of Iron Gate Dam, including the adult fish ladder and holding tanks at the toe of the dam, would be removed. Similarly, removal of Iron Gate Reservoir would eliminate the cold-water supply and aerator for the hatchery. With the exception of the No Hatchery Alternative, under alternatives that remove Iron Gate Dam, portions of Iron Gate Hatchery located downstream near the confluence of Klamath River and Bogus Creek would remain in place or would be altered, including conversion of two of the existing raceways to adult holding tanks, and construction of a new spawning facility, so that more limited operations could continue at the facility for eight years following dam removal (please also refer to

Volume I Section 2.7.6.1 *Proposed Project – Hatchery Operations – Iron Gate Hatchery* [pages 2-77 to 2-80]).

The EIR does not evaluate an alternative or mitigation measure of extended (beyond eight years) hatchery operations for two primary reasons. First, such an alternative or mitigation measure would not reduce an identified significant impact to fisheries associated with implementation of the Proposed Project. The EIR's analysis indicates that the Proposed Project is likely to result in long-term benefits to fish populations. (See Volume III Attachment 1 Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts*). Secondly, there is currently no feasible plan for extended operations, as contemplated under CEQA Guidelines, sections 15126.4 and 15126.6. No funding source for the considerable cost of hatchery operations after eight years has been identified. The hatchery operator and owners have not proposed to continue operations themselves or to pass on operations to a different entity with the capacity to operate the hatcheries. Additionally, long-term operation of the hatchery or hatcheries outside of the larger restoration project of dam removal would potentially require additional water treatment actions and facilities modifications for which there is no identified plan or funding source. In light of the lack of identified funding or plan for continuation of facilities operation after eight years, the EIR assumes a cessation of operations: however, it is worth noting that neither the EIR nor the water quality certification requires elimination of hatchery operations. Should the population improvements anticipated in the EIR prove to be incorrect, or should hatchery operation be called for as an appropriate response to address circumstances unrelated to the Proposed Project, CDFW or another entity or group of entities could seek to overcome the above-described technical and financial barriers to continue hatchery operations beyond the eight years proposed by the Project. Such a decision would not be barred by either the current EIR or the water quality certification but would be subject to additional environmental review.

Similar to comment recommendations to evaluate hatcheries' operations beyond eight years, the recommendation to increase production goals beyond those identified in Volume I Section 2 *Proposed Project* Table 2.7-13 (page 2-80) would not reduce an identified significant impact of the Proposed Project. Additionally, water supply analysis suggests that there would be water supply limitations at Iron Gate Hatchery that would prohibit increased production over the goals proposed. KRRC (2017) conducted an analysis of water supply needs and associated production at the Iron Gate Hatchery during and following dam decommissioning under the Proposed Project and identified and evaluated four potential options to supply water to the hatchery in its current location. KRRC concluded that a direct Klamath River water diversion was not feasible due to suspended sediment concentrations and summer water temperatures. Further, KRRC found that groundwater sources are limited to a supply of approximately five or ten cfs to the hatchery, and that even such amounts would require additional evaluation. Additionally, the investigation did not indicate that supplies

from Fall Creek and Bogus Creek would be sufficient to meet higher production goals. For additional discussion of the limits of water supply from Bogus Creek, please also see Vol. III, *Potential Impact 3.3-23 Effects on anadromous salmonid populations due to short-term and long-term Bogus Creek flow diversions for the Iron Gate Hatchery*. Please note that the diversion from Fall Creek analyzed in KRRC 2017 for use at Iron Gate Hatchery is now proposed for hatchery use at Fall Creek Hatchery (FCH).

With regard to increased production, nothing in the EIR or Section 401 water quality certification prohibits a reevaluation of production numbers at a later date in the future, should additional water sources or new information become available. Such a change would be subject to additional environmental review.

In response to comments expressing the view that hatchery production should be eliminated, or that the No Hatchery Alternative should be selected as the preferred alternative, please note that Volume I Section 4.7 *No Hatchery Alternative* (pages 4-301 to 4-323) analyzes the No Hatchery Alternative, and finds no significant impacts on aquatic resources due to the elimination of hatchery production.

This alternative would also eliminate potentially significant short-term water quality impacts related to hatchery operation on Fall Creek (Potential Impact 3.2-17). As described in Potential Impact 3.2-17, the temporary exceedances of the water quality standards for temperature at Fall Creek Hatchery are expected to be small (-0.5 – 2.2° F) and to occur intermittently, rather than constantly. Any temporary exceedances of the dissolved oxygen standards resulting from Fall Creek Hatchery are expected to be infrequent under the Proposed Project.

Though the EIR finds no significant impact to aquatic resources due to the elimination of hatchery production, the elimination of hatchery produced fall-run Chinook salmon and coho salmon under this alternative would likely result in a reduction in adult returns in post-dam removal years for an indeterminate period of potentially one to five years (i.e., short-term), before the benefits of dam removal are realized. The potential for the reduction in fish available for tribal harvest results in a potentially significant short-term impact on the Klamath Riverscape as a tribal cultural resource (Potential Impact 3.12-9). The lack of access to fish has profound effects for many tribal people in the Klamath Basin (see e.g., Sowerwine et al. 2019, Mozingo 2017).

In contrast, under the Proposed Project, returns to the newly accessible habitat and hatchery returns would occur in the short-term. Please note that the EIR differentiates between an increase in abundance of naturally produced fall-run Chinook salmon, and an increase in total adult returns (which could include adults produced from either hatchery or natural production). The elimination of hatchery produced fall-run Chinook salmon and coho salmon under the No Hatchery Alternative is predicted to result in a faster increase in *naturally*

produced salmon, mostly because there would be no competition or other impacts from hatchery produced fish. However, under the Proposed Project, both hatchery returns and natural returns from newly accessible habitat would occur in the short-term. Thus, the *total* adult returns from naturally produced and hatchery released production are anticipated to be greater in the short-term than natural production alone. The combined production under the Proposed Project is anticipated to increase the rate of reintroduction of fall-run Chinook salmon and coho salmon into newly accessible habitat, with the hatchery-origin strays into the new habitat becoming part of the new natural fish population. This increase in population as well as the hatchery production itself are anticipated to provide increased resiliency to unforeseen environmental disturbance or other threats to the populations (NMFS 2017b), and more rapid realization of the other benefits of increased habitat access to these populations. Further, it is worth noting that the coho salmon hatchery is managed under a Hatchery Genetic Management Plan HGMP to address any potential negative genetic impacts of hatchery operations and has been deemed necessary to protect the remaining genetic resources of the Upper Klamath River Population unit (PacifiCorp and CDFW 2014). NMFS (2016) reported that, "The implementation of the HGMP is a positive step toward meeting viability targets for the Upper Klamath population unit, the diversity stratum, and the ESU." Both naturally produced and naturalized hatchery strays will increase the natural population available to recolonize newly accessible habitat following dam removal.

One of the environmental objectives of the proposed Project is to *timely* "advance the long-term restoration of the natural fish populations in the Klamath Basin, with particular emphasis on restoring the salmonid fisheries used for subsistence, commerce, tribal cultural purposes, and recreation."

Thus, on balance, the Proposed Project is the environmentally superior alternative.

Please note that the EIR's evaluation of the proposed production goals and operations as well as a No Hatchery Alternative brackets a range of production goals and operations that can be relied upon in developing an initial Hatchery Operations Plan, or as part of future adaptive management decisions in light of the expected repopulation of new habitat or other factors influencing salmon in the Klamath Basin.

AQF-3 Chinook Salmon Abundance for Harvest

Several comments express concern that a reduction in hatchery operations for fall-run Chinook salmon under the Proposed Project could reduce harvest for salmonids, including for commercial, recreational, and tribal harvests. Some comments question the EIR's analysis of the combined long-term effect of reintroduction and reduced hatchery production, and its potential effects on harvest, while others express support for the analysis.

Please refer to Volume III Attachment 1 Section 3.3 *Aquatic Resources – Potential Impacts and Mitigation* Potential Impact 3.3-7 for analysis of predicted escapement of fall-run Chinook salmon following reduced hatchery production under the Proposed Project, and Potential Impact 3.12-9 for additional discussion of the effect of anticipated changes in fall-run Chinook salmon abundance (including reduced hatchery production) on tribal fisheries. These sections include revised averages of the predicted impact on fall-run Chinook returns that take the differences in smolt and yearling production goals into account. The revised analysis indicates that the average reduction in adult returns will be 3,552, rather than 7,120 as estimated in the draft EIR. The revised analysis does not change significance determinations. Volume I Section 5.4.1.1 *Consideration of Economic Information for Resources Potentially Affected by Dam Removal – Commercial Fishing* (pages 5-5 to 5-7) and Volume I Section 5.4.1.2 *Consideration of Economic Information for Resources Potentially Affected by Dam Removal – Ocean Sport Fishing* (page 5-7) provides a discussion of the potential economic effects of the Proposed Project for commercial and ocean sport fishing.

As described in Volume 1 Section 2.1 *Proposed Project – Project Objectives* (page 2-1), one of the primary objectives of the Proposed Project is to advance the long-term restoration of the natural fish populations in the Klamath Basin, with particular emphasis on restoring the salmonid fisheries used for subsistence, commerce, tribal cultural purposes, and recreation. Overall, the EIR finds that implementing the Proposed Project would further that objective. Dam removal would improve and expand spawning and rearing habitat for salmon on the Klamath River, improve water quality, reduce the incidence of disease, and restore more natural variation in the flow regime in the areas currently affected by Lower Klamath Project, all of which would benefit salmon populations over the long term.

As described in Volume III Attachment 1 Section 3.3.5.6 *Aquatic Resources – Potential Impacts and Mitigation – Fish Hatcheries* and Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-7, the EIR acknowledges that fewer hatchery adults are likely to return starting in post-dam-removal-year three, and that there is uncertainty as to the rate at which these stocks would be replaced through increases in wild-spawned salmonids and expected improved survival of both hatchery and wild fish in light of the Proposed Project. The EIR ultimately finds that dam removal would benefit the fish population in the long term, and would not significantly reduce fish populations – including fish available for harvest – in the short term (Potential Impact 3.3-7, Potential Impact 3.12-9).

Overall, multiple lines of evidence discussed in the EIR (both quantitative and qualitative), including consideration for the uncertainty in predicting adult abundance following the Proposed Project (which is discussed in Master Response AQF-8), support a prediction of increased fall-run Chinook salmon

abundance available for commercial, recreational, and traditional cultural uses of salmon.

The multiple lines of evidence evaluated in the EIR include the following:

- limited duration of expected suspended sediment effects from dam removal;
- expected improved survival for both wild and hatchery-spawned juvenile salmonids after dam removal, based on improved water quality conditions and reduced disease;
- continued hatchery operations for eight years post-dam-removal;
- quantitative fish population modeling output from multiple studies;
- multiple overview studies, including Expert Panel consideration, indicating that dam removal is likely to result in increased anadromous fish abundance;
- availability of additional high-quality spawning and rearing habitat; and
- available observations in other watersheds of rates of recolonization after dam removal projects and other major habitat accessibility events.

Please note that potential effects from implementing a project that are solely social or economic in nature – such as reduced income from fisheries harvests – are not environmental impacts that must be analyzed under CEQA (please also refer to Volume I Section 5.4 *Social and Economic Factors Under CEQA* [pages 5-3 to 5-12]). Economic and related social effects form the core of some commenters concerns. Because these issues are a profound concern for affected communities, this response summarizes the results of an analysis conducted by the United States Bureau of Reclamation (USBR) for development of the 2012 KHSA EIS/EIR. In summary, USBR found that commercial fishing landings would increase in the long-term following dam removal because salmon would have access to more habitat upstream of Iron Gate Dam, which would increase salmon abundance that would also be likely to increase fishing revenues. Increased salmon populations would also attract more ocean recreational fishing, which would be likely to increase spending in the regional economy (USBR 2012c). Dam removal would increase fish harvest for subsistence, cultural practices, and commercial uses, and it would be likely to provide economically beneficial opportunities for Native American Tribes residing on the Klamath River, as described in Volume III Attachment 1 Section 3.12 *Historical Resources and Tribal Cultural Resources* Potential Impact 3.12-9. These conditions are also likely to result in increased opportunities and revenue for recreational fishing guides.

AQF-4 Historical Abundance of Salmonids

Several comments assert that historical salmonid abundance was low in the Klamath River, or that historical abundance of salmonids upstream of Iron Gate Dam was low, or that no anadromous fish occurred upstream of the current location of Iron Gate Dam. Some comments make assertions about particular

species of salmonids. Other comments assert that strong salmon runs were found upstream of the current Hydroelectric Reach. These comments do not address the EIR's analysis of the Proposed Project's and project alternatives' respective potential impacts on salmonid abundance as compared to baseline conditions.

The EIR was developed to analyze environmental impacts from the KRRC's Proposed Project as well as alternatives to the KRRC's Proposed Project and does not include a comprehensive history detailing the physical extent of each anadromous fish species in the Klamath Watershed. Available data on historical abundance of salmon in the Klamath River watershed prior to Lower Klamath Project construction is summarized in the Volume III Attachment 1 Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species – Anadromous Fish Species*, specifically Table 3.3-2.

AQF-5 Disease Risk Upstream of Iron Gate Dam

Several comments assert that disease risk will increase upstream of Iron Gate Dam under the Proposed Project, and that the EIR does not provide an accurate prediction of disease risk or use best available information for the analysis.

Factors that Influence Development of a Nidus

As described in Volume III Attachment 1 Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites*, the current infectious nidus (reach with high infectivity) for *C. shasta* and *P. minibicornis* is located in the Klamath River downstream of Iron Gate Dam, where returning adult spawners congregate. As summarized in this section, the current infectious zone and high parasite loads below Iron Gate Dam are the result of a synergistic effect of numerous factors that occur downstream of Iron Gate Dam, and result in a observed high incidence of disease in the Klamath River from the confluence with the Shasta River downstream to Seiad Valley (FERC 2007, Hamilton et al. 2011, Bartholomew and Foott 2010). These factors include: (1) close proximity of myxospore-shedding carcasses (high concentration of carcasses); (2) abundant polychaete populations that are found in atypically stable habitats; (3) disease-suitable water temperatures (greater than 59°F) during periods when juvenile salmonids are present; and (4) low flow variability (Bartholomew and Foott 2010). Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources.*

Bartholomew and Foott (2010) report that it is uncertain what threshold density of salmon carcasses is required to maintain infection in polychaetes, and suggest that when returning adult salmon migrate past Iron Gate Dam into upriver tributaries to spawn there may be a reduction in myxospore availability in the current nidus downstream of Iron Gate Dam. PacifiCorp cites Foott et al. (2016) to claim that the concentration of carcasses does not influence the formation of a nidus, pointing to the Foott et al. (2016) finding that relatively few, very highly infected, adult Chinook carcasses are capable of fully seeding polychaete

populations in the river reaches. However, Foott et al (2016) experimentally tested the effect of removing carcasses from the river after spawning on future disease transmission – their work did not examine the effect of reduced congregations of spawners on the formation of a nidus. Foott et al. (2016) recommended that mitigation measures should focus on the reduction of polychaetes or increased flows rather than the labor-intensive effort of removing carcasses. The study did not conclude that spawning congregations do not contribute to the formation of a nidus.

Consistent with Foott el al (2016) recommendations, removal of the Lower Klamath Project dams under the Proposed Project would disrupt polychaete microhabitat conditions. Dam removal is expected to reduce polychaete populations (Stocking and Bartholomew 2007, Bartholomew and Foott 2010) and presumably reduce infection rates within polychaete populations both in the short and long term (Hetrick et al. 2009).

Additionally, implementation of the 2019 BiOp flows (see Master Response HYD-1), coupled with implementation of the Proposed Project, would increase flushing flows above the 2016 existing conditions baseline, which relied on the 2013 biological opinion flows that did not include a flushing flow requirement. These flushing flows would be managed with the intent of mobilizing bedload sediments to disrupt the periphyton intermediate host of the polychaete.

PacifiCorp also cites the summaries of Som and Hetrick (2016) and the results from 2016 monitoring reported by Bartholomew et al. (2017) to note that highest prevalence of mortality from disease has shifted over the years from Beaver Creek (RM 163.4) downstream to Seiad Valley (RM 132.7). PacifiCorp contends that this suggests that congregations of spawners do not contribute to the formation of a nidus. However, in contrast to PacifiCorp's contention, Bartholomew and Foott (2010) state that the spatial overlap of both carcasses resulting from large spawning congregations and polychaetes is a key factor in predicting where parasite abundance would increase. Furthermore, the formation of a nidus between the Shasta River and Indian Creek could be explained by a high concentration of spawning adult salmon within the same river reach, since a high concentration of spawning adult salmon creates carcasses that provides myxospores the ability to infect the dense polychaete populations in the reach downstream of Iron Gate Dam.

In addition, Som and Hetrick (2016), summarized results examining a range of potential variables for myxospore concentration. Som and Hetrick (2016) cited "a decade of monitoring" and the work of Foott et al. (2016), to conclude that Iron Gate Hatchery and Iron Gate Dam influence the current concentration of adult carcasses upstream of the Shasta River confluence. Som and Hetrick (2016) explain that the high concentration of adult salmon that return to the Iron Gate Hatchery area congregate below the dam due to homing and the elimination of upstream migration due to Iron Gate Dam. Congregation of adult salmon below

Iron Gate Dam contributes the bulk of myxospores due to adult spawners' close proximity to each other, a concentration of fish carcasses, and the stable river substrate that provides polychaete habitat allowing myxospores to continue the parasites life cycle within the nidus.

Bartholomew et al. (2017) reported lower infection at all monitoring sites in 2016, particularly from Beaver Creek and other upstream locations, which they attribute to the effectiveness of high flows that occurred in March 2016 and resulted in decreased polychaete densities at the upstream sites. Bartholomew et al. (2017) suggest that polychaetes displaced from reaches downstream of Iron Gate Dam during the high magnitude, short duration flood in March 2016, settled out further downstream resulting in the relatively high polychaete densities detected at the Orleans site. Bartholomew el al. did not conclude that congregations of adult Chinook salmon are not contributors to the formation of a nidus, as suggested by PacifiCorp.

In summary, none of the sources cited in the comments indicate that the EIR erred in identifying and analyzing multiple factors relating to the formation of reaches of high disease transmission, including crowding and its relation to migration barriers.

Risk of Nidus Forming Upstream of Iron Gate Dam

As discussed in Volume III Attachment 1 Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites*, it is unlikely that a new infectious nidus would be created upstream following implementation of the Proposed Project. The likelihood of the synergistic factors described above in *Factors that Influence Development of a Nidus* (AQF-5) developing upstream of Iron Gate Dam would be reduced (Hamilton et al. 2011). Close proximity of myxospore-shedding carcasses would be reduced because salmonid carcasses would be more likely to be dispersed over a greater area in the watershed upstream of Iron Gate Dam as well as downstream of Iron Gate Dam, than currently occurring under existing conditions (Foott et al. 2012, Som and Hetrick (2016), suitable water temperatures (greater than 59°F) would be reduced, and flow variability would be increased.

The Federal Energy Regulatory Commission (FERC) has determined that restoring access to reaches upstream of Iron Gate Dam for anadromous fish would allow adult fall-run Chinook salmon to distribute over a greater length of the river, reducing crowding and the concentration of disease pathogens that currently occur in the reach between Iron Gate Dam and the Shasta River (FERC 2007). Under the Proposed Project, the hatchery would reduce production numbers, and then ultimately cease operations, reducing the number of adult spawners returning to the site of the current nidus by post-dam removal year 3, and then further by post-dam removal year 11 (Volume III Attachment 1 Section 3.3.5.6 *Aquatic Resources – Potential Impacts and Mitigation – Fish Hatcheries*).

At this time, Iron Gate Dam is both the limit of anadromy, and the site of the fish hatchery.

Nidus Risk Downstream of Keno Impoundment/Lake Ewuana

As discussed in Volume III Attachment 1 Section 3.3.5.3 *Aquatic Resources – Potential Impacts and Mitigation – Water Quality*, the Keno Impoundment/Lake Ewuana has the potential to be a habitat barrier during most years for fall-run Chinook during July through October due to poor water quality. In light of this, NMFS and USFWS had prescribed fish passage measures for the Keno Impoundment/Lake Ewuana to be implemented during periods of poor water quality as part of the previous relicensing efforts for the then PacifiCorp owned Klamath Hydroelectric Project (DOI 2007). Currently, fish passage around the Keno Impoundment/Lake Ewana at times of poor water quality is not proposed under the Proposed Project. Comments have suggested that if fish passage were not provided around the Keno reach, fall-run Chinook salmon could congregate downstream of Keno Impoundment/Lake Ewuana thereby creating the crowding conditions related to increased fish disease transmission. However, as discussed in the Volume III Attachment 1 Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites*, if fish passage were not provided at Keno Impoundment/Lake Ewuana, likely fewer fall-run Chinook salmon would migrate past this location, and therefore fewer smolts would return from reaches above Keno. This means that fewer returning adults would have a natal cue to migrate past this location, and so congregations of adult fall-run Chinook salmon would be less likely to gather downstream of Keno Dam. In contrast, downstream of Iron Gate Dam, thousands of adults return to the hatchery, and congregations annually occur during the fall.

Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites* has been revised to provide additional information regarding the potential for a fish disease nidus to form upstream of Iron Gate Dam (including at Keno Impoundment/Lake Ewuana) under the Proposed Project. Please refer to Volume III Attachment 1 Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites* for the revisions.

Nidus Risk Within the Sprague River

Regarding the potential for a disease nidus upstream of Keno Dam, it appears that historically, spawning concentrations of Chinook salmon in the Upper Klamath Basin were located primarily in the Sprague River (Lane and Lane Associates 1981). However, there is no information indicating that high densities of polychaetes historically occurred in the Sprague River (Foott et al. 2012), there are not fish passage obstacles or other factors leading to large congregations of adults, and water temperatures are low (< 59ºF). Thus, the synergistic factors that currently contribute to an infectious nidus for emigrants below Iron Gate Dam and near the Iron Gate Hatchery are unlikely to occur just downstream of Keno Impoundment/Lake Ewuana under the Proposed Project or farther upstream.

Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites* has been revised to provide additional information regarding the potential for a fish disease nidus to form in the Sprague River under the Proposed Project. Please refer to Volume III Attachment 1 Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites* for the revisions.

Periphyton Growth and Polychaete Habitat

Comments also assert that under the Proposed Project increased periphyton[4] growth downstream of Keno Dam in the Hydroelectric Reach would increase habitat for the polychaete intermediate host of *C. shasta* and *P. minibicornis* and citing Bartholomew et al. (2017) as evidence of high polychaete density in that reach. Other comments note that the J.C. Boyle Bypass Reach also has a high density of periphyton. Some comments assert that the Draft EIR does not consider increased habitat for polychaetes as a potential for increased disease risk upstream of Iron Gate Dam.

Volume III Attachment 1 Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites* considers factors under the Proposed Project anticipated to result in a potential for increased periphyton growth, as well as factors anticipated to result in a reduction in periphyton growth. The EIR acknowledges that some of the Proposed Project's anticipated effects (such as the elimination of lotic reservoir habitat) would tend to support increased periphyton growth in the Hydroelectric reach. Volume III Attachment 1 Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites* also discloses that other anticipated effects of the Proposed Project would reduce periphyton growth from existing conditions by removing adverse environmental effects of continued operations of the Lower Klamath Project and restoring more natural conditions such as bedload transport processes and natural temperature regimes. Overall, the EIR finds that under the Proposed Project additional periphytic growth including *Cladophora* is anticipated within the Hydroelectric Reach, which would continue to provide habitat for the intermediate host of *C. shasta* and *P. minibicornis*. This anticipated increase in the intermediate host in the Hydroelectric Reach is one of the considerations the EIR evaluates in discussing the risk of formation of a new nidus upstream of Iron Gate Dam. As noted above, this is one factor in a multi-factor causation that can contribute to nidus formation and as implementation of the Proposed Project removes several other factors needed for formation of a nidus, it is not anticipated that an increase in periphyton in the Hydroelectric Reach would result in the formation of a nidus upstream of Iron Gate Dam.

[4] Periphyton is a complex mixture of algae, cyanobacteria, heterotrophic microbes, and detritus that is attached to submerged surfaces in most aquatic ecosystems.

Flushing Flows

As described in Volume III Attachment 1 Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*, 2017 court-ordered flushing flows were required downstream of Iron Gate Dam between February 2017 and March 2019, with the intent of reducing disease in the Lower Klamath River by mobilizing bedload sediments to disrupt the polychaete intermediate host that lives within periphyton mats. As described in Volume III Attachment 1 Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites*, under the Proposed Project, if a nidus were to form within newly accessible upstream habitat (as discussed above), flushing and emergency dilution flow releases as required by the 2017 court order may be required from a new upstream location to achieve the same ecological benefits (i.e., disruption of nidus).

After the issuance of the Lower Klamath Project Draft EIR on December 27, 2018, the applicable biological opinion and the operational flow requirements for the Klamath River changed again in March 2019, when the new biological opinions were issued by NMFS (2019) and USFWS (2019a), which continue the requirements for surface flushing flows. The 2019 BiOp Flows are now the current operational flow requirement for the Klamath River.

Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites* has been revised to clarify how the 2019 BiOp Flows would likely affect the potential for a new infectious nidus to form downstream of Keno Dam. The addition of 2019 BiOp flows do not change the significance determinations of the EIR. Please refer to Volume III Attachment 1 Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites* for revisions regarding BiOp flow requirements.

Migration Distance and Actinospore Exposure Duration

Comments also assert that juvenile salmon spawned and reared upstream of Iron Gate Dam would be exposed to actinospores for a longer period of time than salmon spawned and reared downstream, since the migration distance to the Klamath River Estuary is greater. Actinospores are a life history stage of the parasite released by the polychaete host – these actinospores can then infect salmonids. Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Disease and Parasites* discusses the available scientific data on actinospore exposure of juvenile salmonids and resulting disease risk.

Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites* has been revised to discuss actinospore exposure upstream of Iron Gate Dam. Please refer to Volume III Attachment 1 Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites* for the revisions.

While migration distance and time for salmonids accessing historical habitat upstream of Iron Gate Dam would be greater than under the current conditions, environmental conditions resulting in disease infection are a result of several variables in addition to migration distance, as discussed in more detail in Volume III Attachment 1 Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites,* and in *Factors that Influence Development of a Nidus* (AQF-5) above.

AQF-6 Disease Risk Downstream of Iron Gate Dam

Several comments assert that disease risk will not improve downstream of Iron Gate Dam under the Proposed Project, while other comments express support for the EIR's conclusion that the Proposed Project is likely to reduce disease risk, and that the Proposed Project is urgently needed to improve survival of salmonids produced in the Klamath River Basin. Some comments point to declines in disease rates in 2017 and 2018, and/or to recent information on the number of infected carcasses necessary to seed a stream reach, to suggest that the Proposed Project will not reduce disease risk downstream of Iron Gate Dam.

As discussed in detail in Volume III Attachment 1 Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Diseases and Parasites* and Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites*, fish diseases that may affect fish in the Klamath Basin include the external protozoan parasite *Ichthyophthirius multifis* ("Ich") and the bacterial pathogen *Flavobacterium columnare* ("columnaris disease"). There is increasing evidence to suggest that disease levels are adversely affecting freshwater production of Chinook and coho salmon in the Lower Klamath River, particularly during periods of high ocean productivity. Additional fish diseases periodically result in substantial mortality for Klamath River salmonids – including most prominently diseases resulting from infection by two parasites from a class of parasites called "myxozoa" *Ceratomyxa shasta (C. shasta)* and *Parvicapsula minibicornis (P. minibicornis)*. These parasites require two hosts – one salmonid, and the other a type of worm called a polycheate that lives in stable river sediments, and particularly prefers habitats created by attached algae that forms matts, like *Cladophora*. High infection rates have been documented in emigrating juvenile Chinook and coho salmon, primarily by one or both of these myxozoan parasites. Steelhead can become infected as well, though steelhead are generally resistant to *C. shasta*. Fish health studies have consistently documented high infection incidence in the Klamath River during the spring and summer. Infection by *C. shasta* has been identified as the most significant disease for juvenile salmon in the lower Klamath River and salmon that become are not likely to survive to adulthood. FERC (2007) concluded that dam removal would enhance water quality and reduce the cumulative water quality and habitat effects that contribute to disease-induced fish kills in the Klamath River downstream of Iron Gate Dam. In general, improvements to water quality, increased bedload mobility (i.e., scour of stable substrate), diversity of flows, water temperature regimes unaltered by

reservoir storage, and reduced planktonic drift from reservoirs with dam removal would alleviate many of the conditions conducive to salmon disease downstream of Iron Gate Dam.

This master response summarizes the key factors that affect disease risk downstream of Iron Gate Dam, which are detailed in the EIR, including the location of the infectious nidus, trends in the prevalence of infection, polychaete population resilience to flow-mediated disturbance, and water temperature and disease risk downstream of Iron Gate Dam.

Location of Infectious Nidus

As described in Volume III Attachment 1 Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites, and AQF Master Response 5* the current infectious nidus (portion of the Klamath River with high infectivity) for *C. shasta* and *P. minibicornis* can vary among years, but is primarily located in the Klamath River downstream of Iron Gate Dam, often in the reach from the confluence of the Shasta River to Seiad, where returning adults spawners congregate. The current infectious nidus and high parasite loads downstream of Iron Gate Dam are the result of a synergistic effect of numerous factors, some of which result from the presence of Iron Gate Dam and operations of the Lower Klamath Project, including close proximity of myxospore-shedding carcasses (concentration of carcasses), abundant polychaete populations that are found in atypically stable habitats, suitable water temperatures (greater than 59°F) during periods when juvenile salmonids are present, and low flow variability (Bartholomew and Foott 2010).

Please also see further discussion in Volume III Attachment 1 Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Disease and Parasites*, which provides further explanation of the connection between the atypical stability of the river channel downstream from Iron Gate Dam since dam construction, and the corresponding favorable habitat for the polychaete worm host, which, in turn, likely increases the parasite load to which the fish are exposed.

Removing the Lower Klamath Project dams would improve flow variability, increase substrate mobility, reduce seasonally warm water temperatures in key juvenile outmigration periods, and reduce planktonic food sources for polychaetes, disrupting these factors that favor polychaetes and *C. shasta* and *P. minibicornis* infection (Hetrick et al. 2009). Dam removal would also remove a major barrier to fish migration and reduce the concentration of spawners and carcasses that presently occurs downstream from the dam and contributes to disease. Greater dispersal of salmon spawners (and thus their carcasses) would reduce their proximity to dense populations of polychaetes.

As described in Volume III Attachment 1 Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites,* FERC's analysis

(FERC 2007) concluded that restoring access to reaches above Iron Gate Dam for anadromous fish would allow adult fall-run Chinook salmon to distribute over a greater length of the river, reducing crowding and the concentration of disease pathogens that currently occur in the reach between Iron Gate Dam and the Shasta River. The effect of carcass density on infection risk is discussed in additional detail in Master Response AQF-5. Additionally, FERC (2007) concluded that restoring natural sediment transport processes would likely contribute to the scour of periphyton downstream from the current location of Iron Gate Dam, and deposited gravel and sand would provide a less favorable substrate for periphyton because of its greater mobility during high flow events than the existing armored substrate. The reduction in periphyton would provide less habitat for the polychaete intermediate host of *C. shasta* and *P. minibicornis*, which is predicted to reduce the infection rate of juvenile salmonids downstream from Iron Gate Dam (FERC 2007).

Trends in Prevalence of Infection (POI)

Volume III Attachment 1 Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Disease and Parasites* discusses available data on infection rates for fish disease and parasites in the Klamath River. The section has been revised to incorporate fish infection information from True et al. (2017) and Voss et al. (2018) as cited by commenters. Please see Volume III Attachment 1 Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Disease and Parasites* for the revisions.

However, contrary to some comments' assertions, existing data is insufficient to identify a declining trend in fish disease. Voss et. al. (2018), and True et. al. (2017) do not conclude that there has been a significant decline in infection rates or suggest that disease is no longer a substantial limitation to salmonid production in the Klamath River. The lower disease numbers after years of much higher disease rates are within the variability of the past decade, and do not warrant a shift in the EIR's approach to analyzing disease dynamics. Following surface flushing flows in 2019, POI in juvenile Chinook salmon captured in the Klamath River in the reach from Shasta to Scott River confluences ranged from 60 percent in late April to 80 percent in early May (USFWS 2019b).

Polychaete Population Resilience to Flow-Mediated Disturbance

Several comments cite Malakauskas et al. (2013) and Shea et al. (2016) to assert that polychaete populations likely exhibit high resilience to flow-mediated disturbance, and that the flows that may be necessary to induce scour and disrupt polychaete habitat are above flow thresholds that are expected to be achieved following implementation of the Proposed Project. As discussed in Volume III Attachment 1 Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Disease and Parasites*, the highest densities of polychaetes have been observed in areas with stable substrates (Bartholomew and Foott 2010). The mobilization

of particles on the bed of the channel downstream from Iron Gate Dam depends directly upon the size of the substrate and magnitude of peak flows. The greater the flows, the larger the particles likely to be moved, and the smaller the particles, the lower the flows required for mobilization. As assessed by Shea et al. (2016), under existing conditions with dams in place, sediment supply is reduced, flow variability is decreased, and conditions supporting the persistence of polychaetes are more prevalent (Shea et al. 2016).

The study cited by comments (Malakauskas et al. 2013) does not provide support for the suggestion that the relatively high flows that may be needed to scour polychaete habitat under current conditions are above thresholds of flows that are expected to be achieved under the Proposed Project. Furthermore, restoring natural sediment supply under the Proposed Project would reduce the threshold flow required to achieve effective surface flushing flows in the reach immediately downstream of Iron Gate Dam. While the Proposed Project itself does not substantially affect flows, it would contribute to the frequency with which flows result in bed mobilization.

Malakauskas et al. (2013) performed flume experiments to evaluate flow requirements for dislodging polychaetes. Their results highlight the resilience to flow-mediated disturbance, but the authors do not conclude that disruption is ineffective. Rather, their findings indicate that substrate size has a great influence of resilience of polychates to disruption (smaller particles, greater susceptibility), and that when sheer velocities are sufficient, polychaetes are dislodged. The authors speculate that dislodged polychaetes have high survival in the short-term but are more susceptible to predation, and to settling in suboptimal habitat, thus decreasing their longer-term survival.

Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Disease and Parasites* has been revised to include recent work by Malakauskas et al. (2013) as discussed above. Please see Volume III Attachment 1 Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Disease and Parasites* for the revisions.

Water Temperature and Disease Risk Downstream of Iron Gate Dam

PacifiCorp and other commenters have asserted that water temperature changes under the Proposed Project would increase disease risk downstream of Iron Gate Dam and claim that the DEIR does not appropriately examine the potential for increased spring temperatures to exacerbate *C. shasta* infection prevalence.

The EIR includes a broad discussion of the effects of water quality (including water temperatures) on disease risk based on available scientific data. As discussed in Volume III Attachment 1 Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Diseases and Parasites*, the water quality conditions that

may increase fish stress levels (thereby reducing fitness and increasing risk of disease infection) include: (1) increased water temperatures in the late summer and fall; (2) swings in DO, pH, and ammonia levels associated with algal blooms in Lower Klamath Project reservoirs; and (3) effects of exposure to elevated levels of the algal toxin microcystin produced during intense blooms of blue-green algae (cyanobacteria) in Copco No. 1 and Iron Gate reservoirs, which may also result in direct mortality. Of these water quality factors; water temperature is the most directly studied and also is likely to have the greatest direct effect on disease transmission: it was also the parameter raised specifically in the comments this master response addresses. Thus, this master response focuses on water temperature-related disease risk, with the overall improvements expected from other parameters as background context. Volume III Attachment 1 Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites* discusses increased risk of disease transmission with warmer water, and that dam removal would mean cooler temperatures in the late summer and fall, but slightly warmer temperatures during spring and early summer. Based on existing scientific assessments (e.g., FERC 2007, Bartholomew and Foott 2010), it appears that a reduction in temperature during late summer and fall would have the overall effect of reducing disease rates despite a slight increase in water temperatures during early spring.

Volume III Attachment 1 Section 3.3.5.3 *Aquatic Resources – Potential Impacts and Mitigation – Water Temperature* considers the potential that the presence of the Lower Klamath Project dams reduces fish stress during the spring by delaying the increase in water temperature. However, Bartholow et al. (2005) suggests that earlier warming of the river system may trigger juvenile salmonids rearing within the mainstem Klamath River to outmigrate earlier, which would allow them to avoid prolonged exposure to disease factors that are in part caused by the Lower Klamath Project dams.

Similarly, FERC concluded that more rapid cooling of river temperatures in the fall may also allow fall-run Chinook salmon in the mainstem to spawn earlier in the fall than observed under existing conditions with the Lower Klamath Project dams in place. More rapid cooling of river temperatures in the fall would likely result in earlier emergence and growth (for mainstem spawners), and encourage earlier emigration (FERC 2007). This is consistent with findings that accumulated temperature units are more important predictors of migration of juvenile Chinook salmon than flow or photoperiod (duration of day receiving sunlight) (Sykes et al. 2009). A predicted earlier outmigration in response to elevated water temperatures in the spring is also supported by a vast body of literature relating to increased growth rates and thermal response of emigrating salmonids (Hoar 1988). Many emigrants would avoid the unsuitably warm water temperatures that currently occur in late spring to midsummer in most years. This post-emergence growth and outmigration dynamic is predicted for all salmonids migrating in the mainstem Klamath River, regardless of whether they originated within tributaries or the mainstem Klamath River. Under the dam

removal scenarios analyzed in the EIR, these emigrants would thus minimize their exposure to disease.

AQF-7 Bedload Sediment and Aquatic Habitat

Several comments assert that under the Proposed Project deposition of bedload sediment in the river reaches downstream of Iron Gate Dam would be detrimental to aquatic resources.

Bedload sediment is sediment that moves along the riverbed. The EIR assesses the potential for dam removal to release coarse sediment stored behind the dams to the Middle and Lower Klamath River, where it could be deposited on the riverbed and adversely impact aquatic habitat in the Middle and Lower Klamath River. For a discussion of how the EIR analyzes the potential impacts of fine sediment related to dam removal, please refer to Master Response GEO-1.

As described in Volume III Attachment 1 Section 3.3.5.2 *Aquatic Resources – Potential Impacts and Mitigation – Bed Elevation and Grain Size Distribution*, Volume II Appendix F *An Analysis of Potential Bedload Sediment Effects on Anadromous Fish in the Klamath Basin*, Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 (pages 3-265 to 3-776), and USBR (2012a), the reservoirs created by the Lower Klamath Project dams have trapped most of the fine sediment (silt and clay sized material) and all of the coarse sediment (sands, gravels, and cobbles) from upstream sources since their construction.

Interception of coarse sediment by the dams has caused the bed material in both riffle and pool sections downstream from the dams to be less mobile than it would be under natural conditions, creating conditions that increase the risk of fish disease (please refer to Master Responses AQF-5 and AQF-6), and that reduce salmonid spawning gravel quality. The presence of the dams has reduced the bed mobility of gravels and cobbles in the Klamath River between Copco No. 1 Reservoir and Cottonwood Creek (USBR 2012a).

AQF-8 Uncertainty in Fall-run Chinook Salmon Production and Recolonization

Several comments assert that the EIR does not adequately address uncertainty associated with fall-run Chinook salmon production and recolonization under the Proposed Project.

Please refer to Volume III Attachment 1 Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-7 for a discussion of the best available and most current scientific and factual data on the likely response of fall-run Chinook salmon to the Proposed Project. In this section, the EIR states that no particular fall-run Chinook population change in abundance associated with dam removal is certain. In light of the

uncertainty, the EIR predicts the *likelihood* of *increased* fall-run Chinook abundance under the Proposed Project based on multiple lines of evidence, including:

- limited duration of expected suspended sediment effects from dam removal;
- expected improved survival for both wild and hatchery-spawned juvenile salmonids after dam removal, based on improved water quality conditions and reduced disease;
- continued hatchery operations for eight years post-dam-removal;
- quantitative fish population modeling output from multiple studies;
- multiple overview studies, including Expert Panel consideration, indicating that dam removal is likely to result in increased anadromous fish abundance;
- availability of additional high-quality spawning and rearing habitat; and
- available observations in other watersheds of rates of recolonization after dam removal projects and other major habitat accessibility events.

The EIR does not solely rely on any one particular source.

As discussed in Volume III Attachment 1 Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-7, quantitative modeling of fall-run Chinook salmon populations predicts that the Proposed Project would increase Chinook salmon abundance. Modeling of dam removal and existing conditions by Oosterhout (2005) suggests that dam removal would substantially increase Chinook fall-run spawners over a 50-year period relative to other management scenarios. Additional population capacity and modeling efforts support this conclusion (Huntington 2006, Dunsmoor and Huntington 2006, Hendrix 2011, Lindley and Davis 2011).

Of the available models, the Hendrix (2011) life-cycle model (Evaluation of Dam Removal and Restoration of Anadromy [EDRRA]) approach is considered the most intensive and robust model undertaken to date, because it explicitly addressed the Proposed Project, used stock-recruitment data from the Klamath River, explicitly incorporated variability in watershed and ocean conditions, and notably, presented variance estimates of uncertainty. In the development of this model, Hendrix analyzed a time series of spawner and recruitment data from 1979 to 2000 in the Lower Klamath Basin (STT 2005) and used the results of this analysis to forecast future productivity of Chinook salmon in the Lower Klamath River Basin. Therefore, results of the EDRRA model implicitly incorporate varying ocean and freshwater conditions encountered in the Klamath Basin and nearshore ocean environment that influenced survival Chinook salmon historically.

As described in Volume III Attachment 1 Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-7, results of the model indicate that there is a substantial uncertainty in

Chinook salmon stock recruitment dynamics, resulting in uncertain escapement and harvest abundance forecasts. Despite this uncertainty, modeling results indicate that the Proposed Project would result in higher abundances of Chinook salmon relative to the No Project Alternative. The median numbers of adult spawners that return to the Klamath Basin are predicted to be higher under the Proposed Project than under existing conditions. Harvest is also predicted to be greater under the Proposed Project, and the probability of low escapement leading to fishery closures is less under the Proposed Project as compared with existing conditions. Finally, model simulations predict that there is approximately a 75 percent probability that there would be higher escapement, and approximately a 70 percent probability of higher annual harvest, under the Proposed Project as compared with existing conditions.

In addition to quantitative modeling results (Hendrix 2011), FERC (2007), Hetrick et al. (2009), and Hamilton et al. (2011) synthesized available information and concluded that increased habitat access following dam removal would result in an increase in the abundance of Chinook salmon population in the Klamath River Watershed.

The Expert Panel Reports are an important part of the diverse and extensive scientific record for the Klamath Basin. The Expert Panel reports, while acknowledging that there is a degree of uncertainty in their findings and identifying several challenges to restoration of fishery resources in the Klamath Basin, conclude an increased probability of successfully restoring Chinook, coho, and steelhead runs with dam removal.

The U.S. Fish and Wildlife Service (USFWS) convened the Expert Panels to review, evaluate, synthesize, and provide scientific assessments regarding the likely trajectories of fish populations with and without implementation of dam removal and other restoration actions. The Expert Panels provided valuable independent reviews in addition to the various studies, reports, and scientific information considered in this EIR. Having the Expert Panel reports as a part of the robust analyses considered when preparing the EIR provides increased confidence in the EIR findings regarding fish and fisheries.

In addition to quantitative and qualitative predictions of fall-run Chinook salmon abundance, Volume III Attachment 1 Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-7 summarizes observations of fall-run Chinook salmon recolonization following dam removal in other watersheds. Recolonization success and rate is a function of fish straying into newly available habitats (Pess 2009). Typical stray rates for Chinook salmon are around six percent (Hendry et al. 2004), and 95 percent of strays migrate less than 20 miles from their natal area (Quinn and Fresh 1984, Quinn et al. 1991). However, following major changes in environmental conditions (e.g., dam removal, high SSC), salmonid stray rates have been observed to increase. The time period of colonization (historical or

new habitat) has been reported to occur within months to years, and most typically within one to two decades (Withler 1982, Bryant 1999, Burger et al 2000, Glen 2002, Pess et al. 2003, Milner et al. 2008, Kiffney et al. 2009). Recolonization was observed for fall-run Chinook salmon within months of removal of Condit Dam on the White Salmon River, Washington (Allen et al. 2016). Fall-run Chinook salmon were observed to recolonize habitat upstream of the former location of the Elwha Dam within the first year of dam removal, and within five years of dam removal a majority of returning adults were spawning in newly accessible habitat upstream of the former dam location (Weinheimer et al. 2018).

As explicitly described in Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-7, there is uncertainty in the response of fall-run Chinook salmon to the Proposed Project, as captured by the variance in predicted increases in abundance modeled by Hendrix (2011) and others. However, the preponderance of evidence considered by the Expert Panels and summarized in the EIR, and the observations of fall-run Chinook salmon recolonization following dam removal in other watersheds, support a prediction for increased fall-run Chinook salmon in the Klamath River under the Proposed Project.

AQF-9 Threshold for Impacts to Aquatic Species

Several commenters assert that the Draft EIR does not accurately assess the magnitude of impacts from the Proposed Project on coho salmon. They contend that substantial impacts are not accurately reflected in the threshold for a significant impact maintaining that the 50 percent reduction in the abundance of a year class is too high to use as a threshold, and that lesser impacts on coho salmon would still be substantial and should be considered a significant impact.

As discussed in Volume III Attachment 1 Section 3.3.3 *Aquatic Resources – Significance Criteria*, significance criteria thresholds used in the EIR are consistent with Appendix G of the CEQA Guidelines (California Code of Regulations title 14, section 15000 et seq.). Analysis of coho salmon and other focal species in the EIR considers any impact that substantially reduces the abundance of a year class to be a significant impact. As described in Section 3.3.2.1 Aquatic Species [coho salmon], Williams et al. (2006) described nine population units of coho salmon in the Klamath Basin to support recovery planning for the listed coho salmon SONCC ESU. Analysis of coho salmon in the EIR considers impacts and benefits for each of the nine population units in the Klamath Basin separately but makes a significance determination for all population units combined within the Klamath Basin to be consistent with the approach to assessing other aquatic species populations, and to be consistent with the NMFS 2014 Southern Oregon/Northern California Coast (SONCC) Recovery Plan, which assesses all of the coho salmon in the Klamath River Basin as part of the same ESU. The EIR engages in a multi-factored analysis – both numeric and qualitative – to evaluate the significance of potential impacts to

the species populations. This includes consideration of factors such as species life history, spatial distribution, population trends and variability, behavior, disease susceptibility and trends, and hatchery production for the species.

There is not a requirement under CEQA guidelines to establish a quantitative threshold for "substantial." In the EIR a numeric threshold of 50 percent was included as a number above which an aquatic species impact would necessarily be substantial.

Volume III Attachment 1 Section 3.3.3 *Aquatic Resources – Significance Criteria* has been revised to clarify that a reduction of less than 50 percent could also potentially be substantial, depending on a multifactored analysis. Please see below and refer to Volume III Attachment 1 Section 3.3.3 *Aquatic Resources – Significance Criteria* for the revisions.

"In the short term, effects of the Proposed Project would be significant if they:

- Substantially reduce the abundance~~(greater than 50 percent reduction)~~ of a year class for aquatic species, based on a comprehensive analysis that includes numeric analysis where available, qualitative analysis, and other relevant information. Any reduction of 50 percent or greater of a year class is necessarily a substantial reduction."

"In the long term; five years after removal of all dams, effects of the Proposed Project would be significant if they:

- Substantially reduce the abundance ~~(greater than 50 percent reduction)~~ of an adult population or year class for aquatic species, in any one generation, based on a comprehensive analysis that includes numeric analysis where available, qualitative analysis, and other relevant information. Any reduction of 50 percent or greater of a year class is necessarily a substantial reduction."

AQF-10 Potential Impacts to Fish of Sediment Release Due to Dam Removal

Several comments express concern regarding the volume of sediment that would be released under the Proposed Project, and the potential impacts of this release on fish in the Klamath River.

As discussed in Volume III Attachment 1 Section 3.3.5.1 *Aquatic Resources – Potential Impacts and Mitigation – Suspended Sediment* and Section 3.3.5.2 *Aquatic Resources – Potential Impacts and Mitigation – Bed Elevation and Grain Size Distribution*, there would be the following two major impacts on fish due to release of the stored fine reservoir sediment deposits: 1) short-term (dam removal year 1, dam removal year 2, and post-dam removal year 1) increase in suspended sediment concentrations (SSCs) in the Klamath River; and 2) short-term increase in the fine sediment content of the Klamath River bed material

primarily from directly below Iron Gate Dam to the Klamath River confluence with Cottonwood Creek, as well as backwater areas and eddies. The estimated concentrations of suspended sediment in the Middle and Lower Klamath River downstream from the Hydroelectric Reach due to dam removal are discussed in Volume III Attachment 1 Section 3.2.5.2 *Water Quality – Potential Impacts and Mitigation –Suspended Sediment* Potential Impact 3.2-3. The elevated short-term SSCs resulting from dam removal are expected to be significantly above background levels downstream of the dams only for several weeks to months during and following reservoir drawdown.

There are three reasons why substantially elevated SSCs in the Klamath River are anticipated to be limited to this period. First, the majority of the erodible sediments are expected to erode during the reservoir drawdown period. Second, the KRRC is proposing a comprehensive revegetation plan for the reservoir footprint areas anticipated to stabilize the remaining sediment deposits with a goal of 90 percent ground cover within five years. Test plot evaluations conducted since publication of the Draft EIR indicate that this goal is achievable (KRRC 2019c). Finally, physical testing of reservoir sediments indicates that reservoir sediments become less erodible once dried (USBR 2012d). Drying of sediments is expected to occur within several months of sediment exposure depending on precipitation, at which point sediment resistance to erosion increases dramatically (see also Volume I Potential Impact 3.11-3).

Potential impacts on fish due to increases in SSCs in the Klamath River are expected to be greatest during the first year following dam removal, as detailed in Volume III Attachment 1 Section 3.3.5.1 *Aquatic Resources – Potential Impacts and Mitigation – Suspended Sediment* and Volume II Appendix E. Appendix E describes a modeling analysis of the potential impacts of suspended sediment on focal fish species under existing conditions, the Proposed Project, and the No Project Alternative. USBR used available data to characterize SSCs under existing conditions as information to model potential impacts. The type of model is an SRH-1D 2.4 sediment transport model. Using this model, USBR considered multiple drawdown scenarios for the Lower Klamath Project reservoirs (USBR 2012c). Application of the SRH-1D 2.4 to the analysis of SSCs during and following reservoir drawdown is considered “conservative,” because the model uses SSCs averaged laterally across the river channel (i.e., from river bank to river bank), whereas in actuality there are likely to be portions of the channel that exhibit lower concentrations of SSCs (e.g., along channel margins) that would potentially provide refuge for fish during periods of elevated SSCs. The approach therefore assumes a less-likely, greater-fishery-impact scenario, in light of the model limitations. Please see Master Response GEO-1 for further discussion of model selection including implications of applying a more precise two-dimensional model to assess the effects of dam removal on sediment transport and deposition downstream of Iron Gate Dam. Use of a more simplified model with conservative assumptions provides sufficient information regarding the potential extent of fisheries impacts.

Regarding the potential for impacts due to an increase in the amount of fine sediment present in the riverbed during and following dam removal, the likely physical impacts are described in Volume III Attachment 1 Section 3.3.5.2 *Aquatic Resources – Potential Impacts and Mitigation – Bed Elevation and Grain Size Distribution*. Volume II Appendix F addresses effects to fish as the result of anticipated bed material changes resulting from dam removal.

Overall, the EIR describes potential deleterious effects from fine and course sediment changes during the first year after dam removal, but the long-term benefits to fish would outweigh the short-term impairments from the Proposed Project.

For additional information regarding fine sediment erosion, transport, and deposition under the Proposed Project, please refer to Master Response GEO-1.

AQF-11 Coho Native Status in the Klamath River

Several comments have asserted that coho salmon are not native to the Klamath River, with some pointing to evidence that there have been stocking efforts in the past as an indication that the species did not occur prior to the stocking.

Coho salmon within the Klamath Basin are included within the Southern Oregon/Northern California Coast (SONCC) coho salmon ESU (NMFS 1997a); an inclusion that is predicated on coho salmon being native to the Klamath Basin. In addition, coho salmon in the Klamath Basin have been listed by the California Fish and Game Commission as threatened under the California Endangered Species Act (CESA) (CDFG 2002a), which is also predicated on coho salmon being native to the Klamath Basin.

Historical distributions of anadromous fish in the Klamath River are described in Volume III Attachment 1 Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species – Anadromous Fish Species*. Credible scientific information describes the native North American range of coho salmon as extending from Alaskan coastal waters to the central California coast (Evermann and Clark 1931, Shapovalov and Taft 1954, Fry 1973, Moyle 1976, Sandercock 1991). This description is widely accepted by fishery biologists and ichthyologists. Brown and Moyle (1991) found records of the historic occurrence of coho salmon in 52 streams from the Smith River near the Oregon border to the Big Sur River on the central Coast. The largest concentration of wild coho occurs in the Eel River watershed (Brown and Moyle 1991), located just south of the Klamath Basin. The National Research Council (NRC) (2004a; 2008) lists coho salmon as a native species which occurred throughout the Klamath River and its tributaries at least up to the Oregon border. Hamilton et al. (2005) reports coho salmon in the Klamath were historically distributed upstream at least to the vicinity of Spencer Creek.

The fact that the Klamath River and tributaries: (1) are contiguous with documented historical coho rivers and streams both north and south of the Klamath River; (2) contain no natural barriers that would prevent their migration into the upper reaches and tributaries such as the Scott and Shasta rivers; (3) have physical attributes that would have produced suitable coho habitat in the past (e.g., gradient, morphology, and, in some cases like the Shasta River, spring sources that provide perennial flow); and (4) still contain suitable coho salmon habitat, is additional evidence that native coho salmon inhabited the Klamath River and its tributaries prior to any stocking.

Additionally, please note that the CEQA requires the Lead Agency to respond to comments on significant environmental issues related to the Public Draft EIR (CEQA Guidelines section 15088(a)). Although CEQA does not compel any further response to this type of comment, the above master response is provided to demonstrate the State Water Board's acknowledgement that there is continued concern regarding this issue despite the lack of evidence to support it.

AQF-12 KHSA Expert Panel Reports

Several comments assert that the Expert Panel Reports developed for the Klamath Hydroelectric Settlement Agreement (KHSA) highlight uncertainty in the outcome of the Proposed Project and the uncertainty is not acknowledged in the Lower Klamath Project EIR analyses.

The original KHSA terms sought legislation to grant the U.S. Secretary of the Interior the authority to make a "Secretarial Determination" regarding whether removing the J.C. Boyle, Copco No. 2, Copco No. 1, and Iron Gate dam complexes was in the public interest and would advance salmon restoration. The Expert Panel Reports were developed for the Secretarial Determination process. These reports, while acknowledging that there is a degree of uncertainty in their findings and identifying several challenges to restoration of fishery resources in the Klamath Basin, conclude an increased probability of successfully restoring Chinook, coho, and steelhead runs with dam removal. The Expert Panel Reports is one of many reference materials used in development of the EIR.

The U.S. Fish and Wildlife Service (USFWS) convened the Expert Panels to review, evaluate, synthesize, and provide scientific assessments regarding the likely trajectories of fish populations with and without implementation of dam removal and other restoration actions. The Expert Panels provide valuable independent reviews in addition to the various studies, reports, and scientific information considered in the science review process for the KHSA 2012 EIS/EIR and the Secretarial Determination Report. Further, having the Expert Panel reports as an additional set of analyses for consideration with respect to the Lower Klamath Project provides increased confidence in the Lower Klamath Project EIR findings regarding fish and fisheries. Please see Volume III Attachment 1 Section 3.3.6 *Aquatic Resources – References* for a list of all references used in developing Section 3.3 *Aquatic Resources*.

AQF-13 Ocean Conditions

Several comments noted that ocean conditions can have detrimental effects to anadromous salmonid populations in the Klamath River and that restoration of anadromous salmonid populations needs to consider ocean conditions.

Ocean conditions do play an important role in anadromous salmonid survival and productivity, as do several other factors, such as the condition of out-migrating juvenile salmonids (smolts) and freshwater habitat. Lawson (1993) used a conceptual model of declining freshwater habitat quality and cyclic ocean conditions to show that freshwater habitat is most critical during periods of depressed ocean survival and that improvements in ocean conditions can mask declines in freshwater habitat. Naturally functioning watersheds (freshwater environment) are important for wild salmon populations to persist.

Variable ocean conditions form part of the existing condition, which the Proposed Project is not anticipated to change. The Lower Klamath Project EIR considers ocean conditions while focusing on the effects of the Proposed Project on freshwater habitat conditions. The EIR addresses the influence of ocean conditions on anadromous salmonids in Volume III Attachment 1 Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species – Anadromous Salmonids*. In addition, the influence of ocean conditions is included in the analysis of potential impacts on focal species in Volume III Attachment 1 Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts*. Most notably, Potential Impact 3.3-7 includes the results of a population dynamics model (Hendrix 2011) that explicitly incorporated variability in ocean conditions when predicting the effects of dam removal consistent with the Proposed Project on fall-run Chinook salmon abundance.

2.2.6 Phytoplankton and Periphyton Master Responses

PAP-1 Influence of Upstream Sources of Algae and Associated Algal Toxin

Several commenters assert that toxic algae and associated algal toxins (e.g., microcystin) from upstream sources, including Upper Klamath Lake and Keno Reservoir, are not appropriately addressed in the EIR. Commenters express concern that toxic algae and associated toxins could be transported through the Hydroelectric Reach and downstream into the Middle and Lower Klamath River if the dams were to be removed. The commenters also assert that the Lower Klamath Project dams sequester or hold back the toxic algae, preventing its transport to the river downstream of the Lower Klamath Project dams.

Please refer to Potential Impact 3.2-6 for analysis of the potential for downstream transport of algal-derived (organic) suspended material due to the lack of interception and retention by the Lower Klamath Project dams. During the phytoplankton growth season (May through October), algal-derived (organic) suspended material is estimated using measurements of “Total Suspended Solids” (TSS) in the EIR since this is the primary component of TSS during this

time of year. Under this approach, TSS includes all phytoplankton[5] as well as toxic blue-green algae. Accordingly, the analysis of TSS in the EIR evaluates the seasonal (May through October) transport of phytoplankton, including toxic algae, from upstream of the Lower Klamath Project reservoirs into the Hydroelectric Reach and the Middle and Lower Klamath River. As discussed in Potential Impact 3.2-6, the majority of the interception and retention of TSS that originates in Upper Klamath Lake during the late spring through early fall occurs in the Keno Impoundment/Lake Ewauna, which is upstream of the Hydroelectric Reach and will not be affected by the Proposed Project.

In addition to TSS measurements showing a downstream decrease in transport of phytoplankton, Appendix C, Section C.6.2.1 *Iron Gate Dam to Salmon River*, Figure C-54, shows microcystin concentrations measured between Keno Dam (i.e., RM 233 in Figure C-54) and the upstream end of Copco No. 1 Reservoir (i.e., RM 206.4 in Figure C-54) typically decrease with distance downstream in the Klamath River and microcystin concentrations in the Klamath River between Keno Dam and the upstream end of Copco No. 1 Reservoir are generally far less than the microcystin concentrations measured in the Klamath River downstream of Iron Gate Dam (i.e., RM 189.7 in Figure C-54). The consistently low microcystin levels above Copco No. 1 Reservoir along with genetic analyses of blue-green algae in Copco No. 1 and Iron Gate reservoirs indicate that microcystin measured in Copco No. 1 and Iron Gate reservoirs and downstream of Iron Gate Dam is being primarily produced by local *Microcystis aeruginosa* populations in Copco No. 1 and Iron Gate reservoirs. Section 3.2.5.6 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* and Appendix C, Section C.6 *Algal Toxins and Chlorophyll-a* provide additional details on the genetic and toxins analyses of *Microcystis aeruginosa* in the Klamath River and the Lower Klamath Project reservoirs. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality* and the final Appendix C *Water Quality Supporting Technical Information*.

The KHSA Interim Measure 15 (IM 15) microcystin data collected at multiple locations in the Klamath River and the Lower Klamath Project reservoirs from 2005 to 2015 are presented throughout Section 3.2.5.6 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* and Appendix C, Section C.6 *Algal Toxins and Chlorophyll-a* and portions of Section 3.4.2 *Phytoplankton and Periphyton – Environmental Setting*, with Figure C-54 specifically showing the overall range of microcystin concentrations at individual monitoring locations by year from 2012 to 2015. To provide additional context, Figure PAP-1 below presents a time-series plot of the IM 15 microcystin data measured in the Klamath River between Keno Dam and the upstream end of Copco No. 1

[5] Defined in the EIR as aquatic microscopic organisms, including algae, bacteria, protists, and other single-celled plants, that obtain energy through photosynthesis and float in the water column of still or slowly flowing waters such as lakes or reservoirs.

Reservoir and downstream of Iron Gate Dam from 2008 through 2017, including all the data shown in Figure C-54 of the EIR as well as IM 15 data from Klamath River water quality sampling annual reports published after the issuance of the Notice of Preparation, which was issued on December 22, 2016. Figure PAP-1 further highlights how microcystin concentrations in the Klamath River between Keno Dam and the upstream end of Copco No. 1 Reservoir are usually far less than microcystin concentrations measured at the Klamath River monitoring site downstream of Iron Gate Dam. Public health microcystin monitoring data from within the Lower Klamath Project reservoirs were not plotted in Figure C-54, so these data also are not plotted in Figure PAP-1.

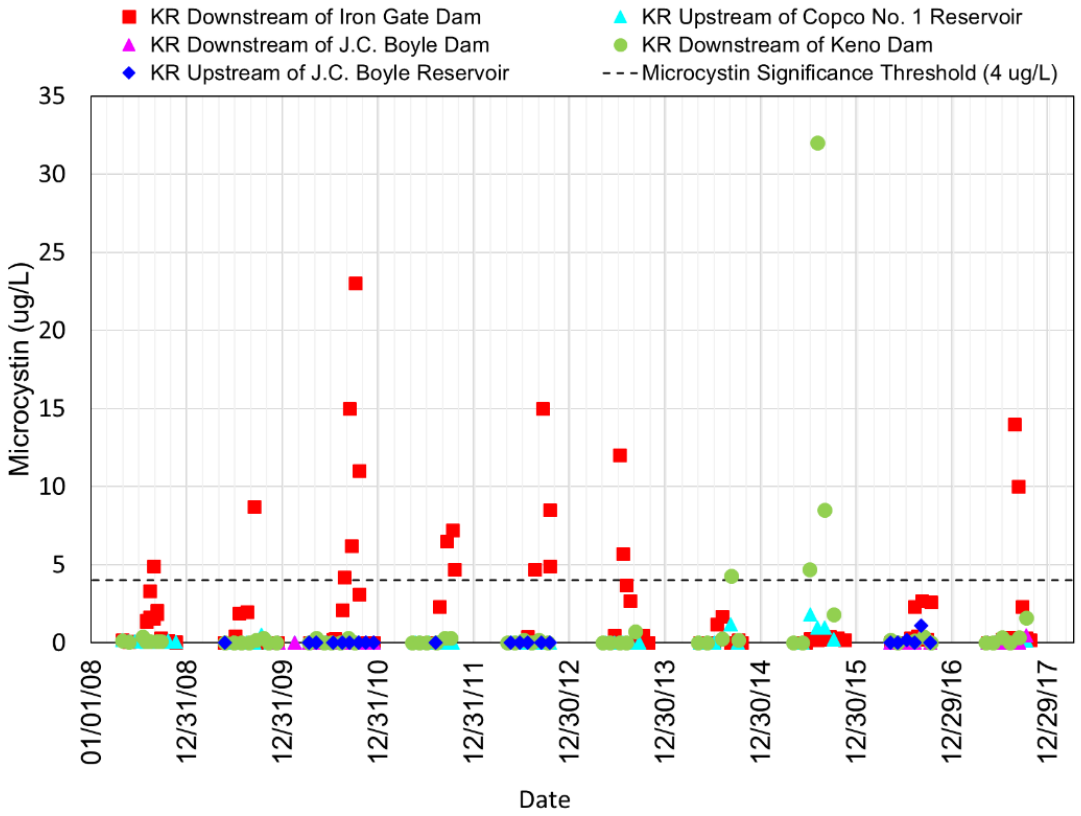

Figure PAP-1. Microcystin concentrations at monitoring sites in the Klamath River between Keno Dam and the upstream end of Copco No. 1 Reservoir along with downstream of Iron Gate Dam from 2008 through 2017. Source: PacifiCorp 2008b, 2009, 2010, 2011, 2012, 2013, 2014c, 2015b, 2016b, 2017b.

Data presented in Figure PAP-1 indicate that microcystin concentrations measured just downstream of Keno Dam exceeded the microcystin threshold of significance (4 ug/L) during two of the ten years plotted (20 percent), while microcystin concentrations measured at Klamath River monitoring sites from upstream of J.C. Boyle Reservoir to upstream of Copco No. 1 Reservoir did not exceed the microcystin threshold of significance in all 10 years of data. The decreases in microcystin concentrations in the Klamath River moving from Keno

Dam to upstream of Copco No. 1 Reservoir are likely due to degradation of the microcystin chemical in the free-flowing Klamath River reaches downstream of Keno Dam. In contrast, microcystin concentrations at the Klamath River monitoring site downstream of Iron Gate Dam exceeded the microcystin threshold of significance once or more in seven of the ten years (70 percent), supporting the conclusion that microcystin is being produced in Copco No. 1 and Iron Gate reservoirs.

The magnitude of phytoplankton and associated algal toxins transported into the Hydroelectric Reach from upstream sources would not be affected by dam removal since the Proposed Project would not alter conditions in the Klamath River upstream of J.C. Boyle Reservoir. The EIR analysis indicates that, absent any change in conditions in the Upper Klamath Basin, the same magnitude of phytoplankton (in the EIR this is typically referred to as algal-derived [organic] suspended material, TSS during the months of May through October, or biovolume) and associated algal-derived (organic) suspended material, nutrients, chlorophyll-*a*, and algal toxins measured between Keno Dam and J.C. Boyle Reservoir under existing conditions would be transported into the Hydroelectric Reach if the Lower Klamath Project dams were removed. Volume I Section 3.4.2.3 *Hydroelectric Reach – Phytoplankton* (pages 3-405 to 3-413) summarizes the existing phytoplankton conditions in the Klamath River between Keno Dam and J.C. Boyle Reservoir, including existing conditions for the toxin-producing blue-green algae *Microcystis aeruginosa*. Transport of the particular type of phytoplankton that produces the toxin microcystin (i.e., *Microcystis aeruginosa*) would continue to be limited under the Proposed Project, since this type of phytoplankton is infrequently detected between Keno Dam and J.C. Boyle Reservoir under existing conditions. Note that there were no measured detections of *Microcystis aeruginosa* in the Klamath River downstream of Keno Dam (approximately RM 238.4) or upstream of J.C. Boyle Reservoir (approximately RM 233.4) during 2002 to 2004, as shown in Figure 3.4-12 (page 3-409) and further documented in Kann (2006), cited in Volume I Section 3.4.2.3 *Hydroelectric Reach – Phytoplankton* (pages 3-405 to 3-413).

As discussed in Volume I Section 3.4.2.1 *Phytoplankton* (pages 3-392 to 3-403) and Volume I Section 3.4.2.3 *Hydroelectric Reach – Phytoplankton* (pages 3-405 to 3-413), the majority of blue-green algae cells being transported into the Hydroelectric Reach under existing conditions are the nitrogen-fixing blue-green algae *Aphanizomenon flos-aquae* and *Anabaena flos-aquae (Dolichospermum flos-aquae)*. *Aphanizomenon flos-aquae* has not been documented as a microcystin producing algae, and it is widely assumed that *Anabaena flos-aquae* is not responsible for the detected concentrations of microcystin in the phytoplankton and periphyton Area of Analysis because the measured amount (i.e., biovolume) of *Anabaena flos-aquae* is typically much less than that of *Microcystis aeruginosa* under existing conditions. Thus, similar to existing conditions, transport of these two types of blue-green algae into the Hydroelectric

Reach under the Proposed Project would not likely be the dominant source of microcystin to the Klamath River.

For those phytoplankton cells that do not settle out in the Keno Impoundment/Lake Ewauna, travel through the turbulent free-flowing reaches between Keno Dam and the upstream end of J.C. Boyle Reservoir under the Proposed Project would mechanically break apart colonies and cells such that they are no longer viable as intact blooms. As discussed in Potential Impact 3.2-6, mechanical breakdown of phytoplankton cells would continue in the turbulent reaches between J.C. Boyle and Copco No. 1 reservoirs, similar to existing conditions. The EIR analysis conservatively assumes that there would be no mechanical breakdown of phytoplankton cells in the new, free-flowing reaches of the Klamath River that replace J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate reservoirs, which results in a slight relative long-term increase in algal-derived (organic) suspended materials under the Proposed Project (Potential Impact 3.2-6). Long-term increases in algal-derived (organic) suspended material under the Proposed Project are slight relative to existing conditions since the large, episodic increases in phytoplankton cells during in-reservoir blue-green algae blooms under existing conditions would be eliminated by dam removal and the anticipated increases of algal-derived (organic) suspended material would be well below the algal-derived (organic) suspended material produced in Copco No. 1 and Iron Gate reservoirs under existing conditions.

Combining information presented in Potential Impact 3.2-6 and Volume I Section 3.4.2.3 *Hydroelectric Reach – Phytoplankton* (pages 3-405 to 3-413), there could potentially be a small increase in algal-derived (organic) suspended materials moving into the Middle and Lower Klamath River primarily due to transport of *Aphanizomenon flos-aquae* and *Anabaena flos-aquae (Dolichospermum flos-aquae)* cells that do not settle out in the Keno Impoundment/Lake Ewauna, but the elimination of in-reservoir blue-green algae blooms that occur under existing conditions would decrease the biovolume and transport of *Microcystis aeruginosa* cells and associated microcystin toxin into the Middle and Lower Klamath River. Overall, the potential slight increase in the transport of *Aphanizomenon flos-aquae* and *Anabaena flos-aquae (Dolichospermum flos-aquae)* cells along with a decrease in transport of *Microcystis aeruginosa* cells and associated microcystin toxin would have a less-than-significant impact on toxic algae concentrations in the Klamath River downstream of the Hydroelectric Reach. Potential Impact 3.2-12 also provides an analysis of the changes in algal toxins that would occur due to dam removal under the Proposed Project. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*, including Potential Impacts 3.2-6 and 3.2-12.

Overall, the existing data indicate that the magnitude of algal toxins that would be transported into the California portion of the Hydroelectric Reach under the Proposed Project would be less-than-significant (i.e., less than the significance threshold of 4 ug/L). The elimination of the slow-moving reservoir environment

that currently supports seasonal growth of toxin-producing nuisance blue-green algae and periodically high concentrations of algal toxins (i.e., greater than 4 ug/L microcystin) would result in an overall decrease in the frequency of high algal toxin concentrations being transported into the Middle and Lower Klamath River downstream of Iron Gate Dam and this would be a beneficial effect of the Proposed Project compared to existing conditions.

Lastly, please also refer to Volume I Potential Impact 3.4-2 (pages 3-428 to 3-433) for further analysis of the alterations in the spatial extent, temporal duration, transport, or concentration of nuisance and/or noxious phytoplankton blooms and concentrations of algal toxins due to dam removal and elimination of reservoir habitat.

In summary, transport of phytoplankton, including blue-green algae, and associated algal toxins into the Hydroelectric Reach from upstream under the Proposed Project would be similar to existing conditions but, measurements of blue-green algae species between Keno Dam and J.C. Boyle Reservoir indicate transport of toxigenic *Microcystis aeruginosa* and associated algal toxin (i.e., microcystin) into the Hydroelectric Reach would be limited and unlikely to exceeded the microcystin threshold of significance (4 ug/L). Seasonal algal blooms and elevated microcystin concentrations in the Lower Klamath Project reservoirs along with *Microcystis aeruginosa* and microcystin concentrations measured downstream of Iron Gate Dam are primarily due to *Microcystis aeruginosa* growth within the slow-moving, calm Copco No. 1 and Iron Gate reservoirs rather than transport from upstream of the Hydroelectric Reach. While algae would continue to enter and be transported through the Hydroelectric Reach from upstream (similar to existing conditions), dam removal under the Proposed Project would eliminate the slow-moving habitat in calm Copco No. 1 and Iron Gate reservoirs that supports seasonal algae blooms and so would decrease transport of *Microcystis aeruginosa* and microcystin concentrations downstream of Iron Gate Dam. The conservative analysis used in the EIR assumes that there would be no breakdown of algae within the free-flowing Hydroelectric Reach under the Proposed Project, such that there would be potential for a slight relative long-term increase in algal-derived (organic) suspended material downstream of Iron Gate Dam because the reservoirs would no longer settle out algal-derived (organic) suspended material that is transported into the Hydroelectric Reach; however, such increases would be well below that produced by algae blooms in Copco No. 1 and Iron Gate reservoirs under existing conditions.

PAP-2 Phytoplankton and Periphyton Response to Nutrient Alterations

Several commenters assert that phytoplankton and periphyton growth downstream of the Lower Klamath Project dams would increase after dam removal due to increases in available nutrients, based on the belief that the dams would no longer trap nutrients originating from the Upper Klamath Basin.

Potential Impact 3.2-8 provides analysis of the alterations in nutrients in the Hydroelectric Reach, the Middle and Lower Klamath River, the Klamath River Estuary, and the Pacific Ocean Nearshore Environment that would occur under the Proposed Project due to the lack of interception and retention by the dams and the conversion of the reservoir areas to a free-flowing river. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*, including clarifications to Potential Impact 3.2-8. Analysis of the nutrient interception and retention within Copco No. 1 and Iron Gate reservoirs using the Klamath River TMDL model output from calendar year 2000 determined that the annual (i.e., January to December 2000) modeled total phosphorus (TP) retention rate was approximately 6 percent of the incoming TP for Iron Gate Reservoir and approximately 1 percent for Copco No. 1 Reservoir, while the modeled total nitrogen (TN) retention rate was approximately 18 percent of the incoming TN for Iron Gate Reservoir and 4 percent for Copco No. 1 Reservoir. While the Klamath TMDL model results indicated that there was an overall annual nutrient retention, the monthly modeling results showed seasonal releases of nutrients, especially during reservoir turnover in late fall/early winter, with Iron Gate Reservoir releasing approximately 2 to 40 percent of incoming TP during late summer/fall and approximately 4 percent of incoming TN during winter and Copco No. 1 Reservoir releasing approximately 2 to 26 percent of incoming TP during late summer/fall and into winter months and approximately 3 to 14 percent of incoming TN during winter months (North Coast Regional Board 2010, Appendix 3).

In addition to the Klamath River TMDL model analysis of nutrient retention in the reservoirs, mass-balance nutrient budgets of the two reservoirs using approximately biweekly nutrient data from May 2005 through December 2007 have been used to estimate the nutrient interception and retention within Copco No. 1 and Iron Gate reservoirs (Asarian et al. 2009). Please note that estimates of annual nutrient retention in the reservoirs cannot be directly compared between the Klamath River TMDL model analysis discussed above and in Potential Impact 3.2-8 and the mass-balance nutrient budget analysis by Asarian et al. (2009) since the two analyses use different time periods for their calculations. The Klamath River TMDL model analysis is based on an annual period from January to December, but the nutrient budget analysis is based on an annual period from May of one year through April of the next year. The Klamath River TMDL model calculates results at a monthly time scale, but the nutrient budget analysis calculates results at a bi-weekly or seasonal (e.g., May to September) time scale.

On an annual basis (i.e., May 2005 to May 2006 or May 2006 to May 2007), the mass-balance nutrient budget analysis estimated the TP retention rate was approximately 3 to 6 percent of the incoming TP for Iron Gate Reservoir and approximately 6 to 8 percent for Copco No. 1 Reservoir, while the TN retention rate was approximately 4 to 7 percent of the incoming TN for Iron Gate Reservoir and approximately 5 to 10 percent for Copco No. 1 Reservoir. Similar to the

Klamath River TMDL model results for 2000, these results indicate an overall annual nutrient retention from May 2005 to May 2007. However, the nutrient budget analysis also indicates that there were periods of both retention and release during summer through winter, through analysis of bi-weekly nutrient budget values. More specifically, Iron Gate Reservoir releases for individual bi-weekly periods ranged from approximately 2 to 35 percent of incoming TP during late summer/fall and approximately 5 to 35 percent of incoming TN during mid-summer through mid-winter. Copco No. 1 Reservoir releases for individual bi-weekly periods ranged from approximately 2 to 35 percent of incoming TP during mid-summer to mid-winter months and approximately 3 to 14 percent of incoming TN during winter months. Average nutrient releases over the entire summer to winter period were much less than these amounts, since there were also periods of retention (Asarian et al. 2009).

Overall, the lack of nutrient retention in Copco No. 1 and Iron Gate reservoirs and the associated net annual increase in nutrients downstream of Iron Gate Dam due to removal of those reservoirs would be expected to be approximately 12 to 13 percent for TN and approximately 9 to 13 percent for TP based on the nutrient budget analysis results from May 2005 to May 2007. Note that the net annual nutrient increase from removal of both reservoirs is not equal to the sum of the annual nutrient retention from individual reservoirs since the individual reservoir results are reported as a percent of the incoming nutrients for the individual reservoir. Since much of the nutrient retention in Copco No. 1 and Iron Gate reservoirs occurs during winter and spring, much of this nutrient increase after dam removal (39 to 78 percent of TN and 92 to 116 percent of TP[6]) would occur during winter and spring (i.e., December to May) when water temperature, light levels, and high flows in the river do not support phytoplankton and periphyton growth (Asarian et al. 2009).

Further, as analyzed in Volume III Attachment 1 Potential Impact 3.2-8 and Volume I Potential Impact 3.4-2 (pages 3-428 to 3-433), Potential Impact 3.4-4 (pages 3-435 to 3-437), and Potential Impact 3.4-5 (pages 3-437 to 3-440), anticipated nutrient increases under the Proposed Project would not be expected to result in significant increases in overall algal biomass beyond levels experienced under existing conditions, so these additional nutrients would not be anticipated to result in exceedances of the California North Coast Regional Water

[6] Annual TP retention in Copco No. 1 and Iron Gate reservoirs was calculated as the sum of the TP retention from May of one year to May of the next year. Annual TP retention in Copco No. 1 and Iron Gate reservoirs during the one year period from May to May was less than December to May TP retention because there was a net release of TP downstream of Iron Gate Dam between May and December in that year. As such, the increase in TP between December and May downstream of Iron Gate Dam due to dam removal would potentially exceed the annual increase in TP, and the percentage of TP increase between December and May could exceed 100 percent.

Quality Control Board's Water Quality Control Plan for the North Coast Region (Basin Plan) water quality objectives for biostimulatory substances in the Hydroelectric Reach, the Middle and Lower Klamath River, the Klamath River Estuary, and the Pacific Ocean Nearshore Environment. Please also refer to Volume III Attachment 1 Potential Impact 3.4-2 and Potential Impact 3.4-4 for minor revisions to these analyses that do not alter the significance determinations. Nutrient increases under the Proposed Project would only result in an exceedance of the Basin Plan biostimulatory substances water quality objective if those increases promote additional growth of algal biomass to the extent that such additional growth causes nuisance or adversely affect beneficial uses. Overall, the increase in nutrient concentrations under the Proposed Project would not result in significant biostimulatory impacts since these nutrient increases are not expected to result in an overall increase in algae biomass that exceeds existing conditions.

Phytoplankton would be limited in their ability to use increased nutrient levels for growth because elimination of the existing calm reservoir habitat under the Proposed Project would constrain habitat conditions that support large phytoplankton blooms in summer and fall, as discussed in Volume III Attachment 1 Potential Impact 3.2-8 and Volume I Potential Impact 3.4-2 (pages 3-428 to 3-433). Relatively high water velocity and constant mixing in the Klamath River does not typically support high levels of phytoplankton growth or reproduction under current conditions (Otten et al. 2015; Genzoli and Kann 2017). There are slow-moving habitats along the river edges that may be suitable for phytoplankton growth, but an increase in nutrients under the Proposed Project would not be expected to increase the overall biomass of nuisance and/or noxious blue-green algae compared to existing conditions. This is because available slow-moving river margin habitats suitable for phytoplankton growth are already typically occupied and periodically experience high concentrations of phytoplankton cells and algal toxins under existing conditions (Kann et al. 2010a; Genzoli and Kann 2017). While phytoplankton cells and algal toxins are measured in calm, slow-moving river margin habitats under existing conditions, growth and reproduction of phytoplankton in these habitats has not been documented. Phytoplankton cells and algal toxins in these habitats are generally attributed to entrapment and accumulation of cells and toxins transported downstream from the reservoirs rather than growth and/or reproduction within these habitats (Falconer et al. 1999; Kann et al. 2010a; State Water Board et al. 2010, updated 2016; Genzoli and Kann 2016, 2017). Longitudinal decreases in the measured *Microcystis aeruginosa* cell densities and microcystin downstream of Iron Gate Dam in both slow-moving shoreline and open channel habitats further suggest *Microcystis aeruginosa* cells and microcystin are being transported downstream into these shoreline habitats and phytoplankton growth is limited in these slow-moving shoreline habitats (Genzoli and Kann 2017). The removal of slow-moving reservoir habitats also would eliminate the primary source of *Microcystis aeruginosa* potentially transported into these river margin

habitats, limiting the available *Microcystis aeruginosa* cells to uptake the additional nutrients.

Additionally, TN:TP ratios and a comparison of nutrient data measured at Klamath River monitoring sites from 2002 to 2017 downstream of Iron Gate Dam against phytoplankton half-saturation constants[7] for inorganic nitrogen and phosphorus suggest that nutrient availability is not the limiting factor that controls biomass from Iron Gate Dam (RM193.1) to approximately Seiad Valley (RM 132.7) under existing conditions. While nutrient concentrations vary widely across seasons (i.e., more than an order of magnitude), the minimum nutrient concentrations downstream of Iron Gate Dam were consistently greater than the phytoplankton half-saturation constants for inorganic nitrogen and phosphorus. The minimum inorganic phosphorus (i.e., orthophosphate) concentration (i.e., 0.019 mg/L) was approximately 6 times greater the inorganic phosphorus half-saturation constant (i.e., 0.003 mg/L) downstream of Iron Gate Dam, while the minimum TP concentration (i.e., 0.023 mg/L) was approximately 8 times greater than the inorganic phosphorus half-saturation constant. The minimum total inorganic nitrogen (i.e., ammonia/ammonium and nitrate+nitrite) concentration (i.e., 0.018 mg/L) was approximately 1.3 times greater than the inorganic nitrogen half-saturation constant (i.e., 0.014 mg/L) downstream of Iron Gate Dam, while the minimum TN concentration (i.e., 0.25 mg/L) was approximately 18 times greater than the inorganic nitrogen half-saturation constant. Furthermore, typical nutrient concentrations downstream of Iron Gate Dam are generally 3 or more times greater than the minimum nutrient concentrations. Since the measured nutrient concentrations under existing conditions are greater than the associated half-saturation constant from Iron Gate Dam to approximately Seiad Valley, there are currently more than sufficient nutrients to meet algal growth needs in this reach and additional nutrients under the Proposed Project would not correspond to an increase in algal biomass or an exceedance of the Basin Plan biostimulatory substances water quality objective.

Downstream of Seiad Valley, IM 15 data from 2009 to 2017 at Klamath River at Orleans (RM 58.9) and Turwar (RM 5.6) indicate that there are sufficient orthophosphate and total phosphorus to meet phytoplankton growth needs under existing conditions, but measured nutrient concentrations indicate inorganic nitrogen would likely limit phytoplankton growth. The total inorganic nitrogen in the Klamath River at Orleans and Turwar from 2009 to 2017 frequently was less than the inorganic nitrogen half-saturation constant during summer to early fall months. The abundance of nitrogen-fixing periphyton species in the Klamath River increases downstream of Seiad Valley and they become dominant, also

[7] The concentration of nutrient(s) at which the rate of uptake of those nutrients by phytoplankton (for growth) is one-half the maximum rate. Half-saturation constants for inorganic nitrogen and phosphorus also represent the highest concentration at which algae growth is directly proportional to nutrient concentrations (Cole and Wells 2015).

suggesting algal growth, including phytoplankton, becomes nitrogen-limited in the Klamath River downstream of Seiad Valley under existing conditions. While inorganic nitrogen is likely limiting growth of phytoplankton species that cannot fix nitrogen downstream of Seiad Valley, the growth of nitrogen-fixing phytoplankton species would be less limited by low inorganic nitrogen concentrations. While increases in nitrogen downstream of Seiad Valley under the Proposed Project would potentially result in some additional phytoplankton growth, the limited suitable habitat in the Klamath River downstream of Seiad Valley and the existing occupation of this limited suitable habitat would constrain increases in phytoplankton biomass under the Proposed Project compared to existing conditions. As such, nutrient increases under the Proposed Project still would not be anticipated to increase the overall phytoplankton biomass in the Klamath River or to result in an exceedance of the Basin Plan biostimulatory substances water quality objective due to the elimination of suitable reservoir habitat, the reductions in transport of *Microcystis aeruginosa* cells from reservoir habitats, and the presence of phytoplankton biomass in the remaining limited suitable habitat in the Klamath River, as discussed above.

In summary, some phytoplankton growth, including blue-green algae, may still occur after dam removal in the calm, slow-moving habitats along the margins of the Middle and Lower Klamath River, especially during low-flow periods, but nutrient increases under the Proposed Project are not expected to result in an overall increase algae biomass that exceeds existing conditions since a) dam removal would eliminate existing reservoir habitat that supports algal growth; b) the available suitable habitats in the Klamath River are already occupied and periodically experience high concentrations of phytoplankton cell and algal toxins concentrations under existing conditions; c) dam removal would reduce transport of *Microcystis aeruginosa* cells that could use the additional nutrients for growth into the available suitable habitats; and d) under existing conditions sufficient nutrients are already available to meet algal growth needs from Iron Gate Dam to Seiad Valley. Overall, the *Microcystis aeruginosa* and microcystin levels in Middle and Lower Klamath River under existing conditions are expected to decrease after dam removal because the decrease from reduced transport of *Microcystis aeruginosa* and microcystin into the Middle and Lower Klamath River under the Proposed Project is anticipated to be greater than potential growth within slow-moving habitats in the Middle and Lower Klamath River even with potential nutrient increases.

Lastly, please refer to Volume III Attachment 1 Potential Impact 3.2-8 and Volume I Potential Impact 3.4-4 (pages 3-435 to 3-437) and Potential Impact 3.4-5 (pages 3-437 to 3-440) for the analysis of the influence of anticipated nutrient increases under the Proposed Project on periphyton biomass in the Hydroelectric Reach, the Middle and Lower Klamath River, the Klamath River Estuary, and the Pacific Ocean Nearshore Environment. Please also refer to Volume III Attachment 1 Potential Impact 3.4-4 for minor revisions to these analyses that do not alter the significance determinations. Nutrient concentrations are high

enough (i.e., greater than the half-saturation constants) that there are sufficient nutrients for periphyton growth from the upstream end of the Hydroelectric Reach (i.e., J.C. Boyle Reservoir) to Seiad Valley (RM 132.7) under existing conditions and nutrient increases downstream of Iron Gate Dam under the Proposed Project would not have a biostimulatory effect on periphyton growth. Potential increases in periphyton abundance upstream of Iron Gate Dam in the Hydroelectric Reach would be due to habitat increases (i.e., conversion of reservoir into river habitat) rather than nutrient increases. This additional periphyton growth would uptake some nutrients and likely decrease the magnitude of the upstream nutrients being transported through the Hydroelectric Reach into the Middle Klamath River, but the Yurok Tribe analysis (Asarian et al. 2010) still estimates a potential nutrient increase in the Middle and Lower Klamath River under dam removal even with this uptake by periphyton. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*, including Potential Impact 3.2-8.

In the reaches where sufficient nitrogen is available to meet periphyton growth (i.e., upstream of Seiad Valley), the abundance of nitrogen-fixing species is low since nitrogen-fixing species primarily have a competitive advantage over other periphyton species when nitrogen concentrations are low. Downstream of Seiad Valley, the abundance of nitrogen-fixing species in the Klamath River increases and they become dominant, suggesting periphyton growth becomes nitrogen-limited in the Klamath River downstream of Seiad Valley under existing conditions. As such, increases in TN due to dam removal may alter the composition of the periphyton community (Asarian et al. 2010), but the increase in TN would likely just result in a change in the species of periphyton growing in the Klamath River and there is no anticipated overall increase in the periphyton abundance or biomass. Additionally, potential increases in TP due to dam removal under the Proposed Project are not expected to increase periphyton abundance or biomass because TP concentrations in the Middle and Lower Klamath River and the Klamath River Estuary suggest there is sufficient phosphorus to meet algal growth needs under existing conditions and additional phosphorus would not have a biostimulatory effect.

2.2.7 Terrestrial Master Responses

TER-1 Wildlife Habitat Effect of Removing Reservoirs

Several commenters indicate that the Iron Gate and Copco No. 1 reservoirs provide habitat for wildlife and removing the dams would destroy wildlife habitat. Commenters have noted, for example, that the area currently supports nesting bald eagles and pond turtles, and that the reservoir system has been long-established and supports both aquatic and terrestrial wildlife that sustain themselves on the reservoir systems.

Information on wildlife species at the Lower Klamath Project reservoirs is summarized in Volume I Section 3.5.2.4 *Terrestrial Resources – Environmental Setting – Non-special-status Wildlife* (pages 3-474 to 3-477) and Section 3.5.2.5

Terrestrial Resources – Environmental Setting – Special-status Species – Special Status Wildlife (page 3-478; see also Table 3.5-5, pages 3-501 to 3-513). As described therein, western pond turtles have been documented at Iron Gate Reservoir and Copco No. 1 Reservoir. The reservoirs and adjacent habitats also support migratory bird species (e.g., American white pelican, Barrow's goldeneye, common loon, black tern, black swift, Vaux's swift, olive-sided flycatcher, willow flycatcher, yellow warbler, and yellow-breasted chat) and year-round bird species (bald eagle, greater sandhill crane). The reservoirs and riparian areas provide foraging habitat for these species, by providing habitats that support fish, invertebrates, and reptiles for these birds to eat. Migratory birds use these reservoirs seasonally during their migrations and/or for overwintering, by supporting nesting, foraging, and/or loafing (resting on the water) habitat (see Volume I Section 3.5.5.3 *Terrestrial Resources – Potential Impacts and Mitigation – Special-status and Rare Natural Communities* Potential Impact 3.5-21 [pages 3-562 to 3-563]). Surveys conducted by KRRC in 2017 and 2018 documented several osprey nests on platforms located on top of electrical poles in areas surrounding Iron Gate Reservoir, Copco No. 1 Reservoir, Copco No. 2 Reservoir, and along the Klamath River (CDM Smith 2018c, AECOM and CDM Smith 2019), and it is likely that osprey use the reservoirs for foraging on fish. The reservoirs also provide foraging habitat for bat species (e.g., Yuma myotis) that primarily prey on aquatic emergent insects (see Potential Impact 3.5-21). Project structures have been documented to support habitat for Yuma myotis (AECOM and CDM Smith 2019), and surrounding habitats, including project structures, may also support roosting for other special-status bat species (Western mastiff bat, Townsends's western big-eared bat, spotted bat, pallid bat, fringed myotis, and long-eared myotis) that may forage on terrestrial insects in more upland habitats.

The species discussed above, which include special-status species, are not exclusive to the Lower Klamath Project reservoirs, but rather they also have been documented in adjacent areas. For example, all of the bird species listed above have been either documented in habitats along the Klamath River upstream of Copco No. 1 Reservoir and downstream of Iron Gate Dam (see Volume I Section 3.5.2.5 *Terrestrial Resources – Environmental Setting – Special-status Species – Special Status Wildlife* Table 3.5-5), at Lower Klamath National Wildlife and Tule Lake National wildlife refuges, or at other nearby creeks, lakes, and reservoirs including Emigrant Creek, Emigrant Lake, Howard Prairie Lake City Park, and Hyatt Reservoir north of Iron Gate Reservoir (eBird 2019). Volume I Section 3.5.5.3 *Terrestrial Resources – Potential Impacts and Mitigation – Special-status and Rare Natural Communities* Potential Impact 3.5-21 (pages 3-562 to 3-563) acknowledges that a loss of aquatic reservoir habitat would result in a loss of nesting, foraging, and loafing opportunities for fish-eating birds (e.g., bald eagle, osprey, and common merganser) and birds that consume aquatic vegetation and invertebrates (e.g., mallards). However, as discussed in Potential Impact 3.5-21, these impacts would be less than significant as these birds would continue to use the river or other aquatic habitat outside of the Proposed Project Primary Area of

Analysis for foraging once the reservoirs are removed. Aquatic insect foraging habitat for swifts and bats (Yuma myotis) would be reduced, as discussed in Volume I Section 3.5.5.3 *Terrestrial Resources – Potential Impacts and Mitigation – Special-status and Rare Natural Communities* Potential Impact 3.5-17 (pages 3-559 to 3-560). However, once benthic macroinvertebrate populations reestablish after drawdown, swifts and bats would be able to forage over riverine habitat. Please also refer to Volume I Section 3.5.5.3 *Terrestrial Resources – Potential Impacts and Mitigation – Special-status and Rare Natural Communities* Potential Impact 3.5-25 (pages 3-572 to 3-573), which analyzes the effects on wildlife that forage on fish (e.g., bald eagle, Barrow's goldeneye, common loon, and western pond turtle) from increased habitat for salmonids and changes in hatchery production.

Volume I Section 3.5.5.3 *Terrestrial Resources – Potential Impacts and Mitigation – Special-status and Rare Natural Communities* Potential Impact 3.5-22 (pages 3-563 to 3-570) presents the analysis of potential short- and long-term impacts on western pond turtle from loss of aquatic reservoir habitat; based on this analysis, impacts would be less than significant with mitigation. Impacts on other wildlife species as a result of removal of reservoir habitat are discussed in Volume I Section 3.5.5.3 *Terrestrial Resources – Potential Impacts and Mitigation – Special-status and Rare Natural Communities* Potential Impact 3.5-12 (pages 3-540 to 3-543), Potential Impact 3.5-13 *(*pages 3-543 to 3-547), Potential Impact 3.5-23 (page 3-570), Potential Impact 3.5-25 (pages 3-572 to 3-573), Potential Impact 3.5-29 (pages 3-575 to 3-576), and Potential Impact 3.5-30 (page 3-576). No special-status terrestrial invertebrates or amphibians would be affected by the removal of the reservoirs, as it is unlikely that reservoir habitat supports these species.

Please see Master Response AQF-1 for a discussion of how removal of the Lower Klamath Project reservoirs would affect Lost River and Shortnose sucker populations.

Consistent with CEQA Guidelines section 15088.5 (b), the EIR analysis characterizing potential short-term and long-term impacts on native special-status terrestrial species due to the loss of reservoir habitat has been clarified to include information regarding species' use of reservoirs and rivers within the Primary Area of Analysis, as well as in nearby wildlife refuges, creeks, lakes, and reservoirs outside of the Primary Area of Analysis. Please refer to Volume III Section 3.5 *Terrestrial Resources* for the associated revisions.

2.2.8 Flood Hydrology Master Responses

FLD-1 Downstream Flood Hydrology

Numerous commenters expressed concern regarding the potential for the Proposed Project to result in increased flooding and associated damage. This response summarizes key points from the EIR concerning the potential impacts

related to the Proposed Project's changes to downstream flood hydrology, as well as the Proposed Project's proposal to reduce or avoid such impacts.

As discussed in Volume I Section 3.6.5.2 *Flood Hydrology – Potential Impacts and Mitigation – River Floodplain* (pages 3-630 to 3-635), J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate dams are not designed or currently operated as flood control facilities, although they do result in incidental and limited flood protection during certain flood events. Specifically, Volume I Table 3.6-12 (page 3-631) presents peak flood flows for the mainstem Klamath River and indicates that the 100-year flood is attenuated less than seven percent by Iron Gate and Copco No. 1 reservoirs under existing conditions, with J.C. Boyle and Copco No. 2 reservoirs providing negligible flood attenuation due to their substantially smaller volume and, in the case of J.C. Boyle, long distance upstream (USBR 2012a). Under the Proposed Project, there would be a minor increase in the 100-year floodplain elevations in the reach from Iron Gate Dam (river mile [RM] 193) to Humbug Creek (RM 174) following dam removal, with two additional legal habitable structures identified in the anticipated floodplain that are currently not within the existing floodplain. Additionally, peak flood flows downstream of Iron Gate dam would occur about 10 hours sooner if the dams were removed.

To address the minor increase in floodplain inundation below Iron Gate Dam, the KRRC proposes implementation of the Downstream Flood Control Project Component (Volume I Potential Impact 3.6-3 [pages 3-630 to 3-633]). This component of the Proposed Project includes working with landowners to move or elevate the 36 habitable structures (34 existing structures and 2 additional structures) located in the altered 100-year floodplain between Iron Gate Dam and Humbug Creek prior to dam removal, where feasible. This would reduce the risks of exposing people and/or structures to damage, loss, injury, or death due to flooding following dam removal.

As described in Volume I Potential Impact 3.6-3 (pages 3-630 to 3-633), final determination of the extent of the future 100-year floodplain following dam removal would be made by the Federal Emergency Management Agency (FEMA) and the KRRC is planning to coordinate with Siskiyou County and FEMA to initiate the map revision process (Appendix B: *Definite Plan*). Although the Downstream Flood Control Project Component would likely reduce potential flood hydrology-related impacts to less than significant, the State Water Board cannot ensure its implementation. Additionally, there may be new or increased potential for flood damage and/or loss of structures that are not feasible to move or elevate. Therefore, the State Water Board has concluded that impacts associated with exposing structures to a substantial risk of damage due to flooding are significant and unavoidable.

The Emergency Response Plan would ensure that potential effects related to exposing people and/or structures to a substantial risk of flooding related to flood forecasting would result in no significant impact. See Volume I Potential Impact

3.6-3 (page 3-632 to 3-633) for further discussion of the Emergency Response Plan.

2.2.9 Groundwater Master Responses

GRW-1 Effects on Groundwater Wells

Multiple comments expressed concern regarding the potential impact of removing Lower Klamath Project reservoirs on groundwater availability and quality, including the potential impact on residential or other private wells near the reservoirs.

Volume I Section 3.7 *Groundwater – Potential Impacts and Mitigation* Potential Impact 3.7-1 (pages 3-663 to 3-665) discusses the potential impacts of the Proposed Project on groundwater resources in the vicinity of the Lower Klamath Project reservoirs. As described in Volume I Section 3.7 *Groundwater* (starting on page 3-639), there is uncertainty regarding the extent to which wells may be impacted and the number of potentially impacted wells. However, available well record data (Section 3.7.2.2 *Groundwater – Environmental Setting – Local Groundwater Conditions* [pages 3-644 to 3-661] and Volume II Appendix L) indicate that some wells could be significantly impacted by dam removal unless measures are undertaken to protect groundwater supplies. Well records evaluated in the Groundwater analysis were obtained from the California Department of Water Resources and Oregon Water Resources Department (OWRD) databases. The records reviewed include sufficient detail to accurately locate the wells relative to the Lower Klamath Project reservoirs. These records include 25 wells near Iron Gate Reservoir and 22 near Copco No. 1 and Copco No. 2 reservoirs.

The Proposed Project includes implementation of the Groundwater Well Management Plan to offset potential adverse impacts. The Groundwater Well Management Plan requires monitoring to detect groundwater well impacts and identification of short and long-term measures to address such impacts as encountered. Under the Groundwater Well Management Plan, if groundwater levels in existing wells adjacent to the Lower Klamath Project reservoirs are found to be substantially depleted as a result of Project implementation, such that production rates drop to levels that do not support designated domestic or irrigation uses, the KRRC would undertake measures to return the production rates of the affected domestic or irrigation groundwater supply wells to conditions existing prior to dam removal. Additionally, short-term measures would include actions providing temporary water supplies until long-term measures such as pump motor replacement, well deepening, or full well replacement are identified and implemented.

Volume I Section 2.7.8.8 *Proposed Project – Proposed Project – Other Project Components – Groundwater Well Management* (page 2-99) and Volume II Appendix B: *Definite Plan* provide additional detail regarding the Groundwater

Well Management Plan. Further, the State Water Board has issued a draft water quality certification that sets forth monitoring and reporting requirements for groundwater wells surrounding the Lower Klamath Project reservoirs, including reporting that summarizes actions that KRRC has or will implement to address any impacts to groundwater supply associated with implementation of the Proposed Project.

GRW-2 Wells Missing from Groundwater Analysis

Some comments expressed concern that the EIR's groundwater analysis did not include the locations of all groundwater wells located within the groundwater Area of Analysis (Volume I Figure 3.7-1, page 3-640), and requested that additional information for missing wells be provided. Existing groundwater conditions in the Lower Klamath Project vicinity are presented in Volume I Section 3.7.2.2 *Groundwater – Environmental Setting – Local Groundwater Conditions* (starting on page 3-644) and the analysis of potential impacts of the Proposed Project on groundwater resources is presented in Volume I Potential Impacts 3.7-1 and 3.7-2 (starting on page 3-663 and 3-665, respectively). The section relies on information from the California Department of Water Resources well logs but notes that the available data on the location of existing wells is limited. In light of this limitation (and of limits on information regarding well-specific conditions other than location and water source that influence whether reservoir removal will impact a particular well), the EIR provides general information on potential impacts and measures to address groundwater wells within the groundwater Area of Analysis (Volume I Figure 3.7-1; page 3-640). Analysis provided in the EIR applies to both known and unknown wells within the Area of Analysis.

The analysis presented in the Lower Klamath Project EIR, as well as in previous studies conducted by USBR (2012a), conclude that while the direction of regional groundwater flow is toward the Lower Klamath Project reservoirs, local groundwater levels (i.e., locations immediately adjacent to the reservoirs) exhibit site-specific variability, with the majority of wells exhibiting water levels above those of the reservoirs such that groundwater would flow toward the reservoir, rather than away from the reservoir. A subset of groundwater wells located immediately adjacent to Copco No. 1 Reservoir exhibit water levels below those of the reservoir, such that groundwater would potentially flow from this reservoir toward these wells. In light of the potential for connectivity between groundwater and Copco No. 1 Reservoir for a subset of existing wells, and because well data are not readily available for every existing groundwater well in the vicinity of the Lower Klamath Project reservoirs, it is possible that removal of the reservoirs would cause a substantial decrease of groundwater levels and a corresponding decrease in production rates in existing wells to a degree that interferes with existing or planned uses. The inclusion of any other existing groundwater wells surrounding the Lower Klamath Project reservoirs in the groundwater analysis presented in the EIR, or in the analysis conducted by USBR (2012a), would not change the potential for the aforementioned impact.

Please also refer to Master Response GRW-1 for a discussion of the KRRC's Groundwater Well Management Plan, which would offset potential adverse impacts of Lower Klamath Project dam and reservoir removal on local groundwater supplies.

2.2.10 Water Supply/Water Rights Master Responses

WSWR-1 Potential Effects on Agricultural Water Supply for California Water Users in the USBR Klamath Irrigation Project

Some comments express concern that the Proposed Project will limit agricultural water supplies for farms upstream of the Hydroelectric Reach. Some comments refer specifically to operational coordination between the United States Bureau of Reclamation's (USBR) Klamath Project for irrigation and the Klamath Hydroelectric Project for hydropower production. Concerns specifically related to water supply on Klamath River tributaries are addressed in Master Response WSWR-2. Concerns specifically related to water supply within the Hydroelectric Reach and downstream of Iron Gate Dam are addressed in Master Response WSWR-3.

Volume I Section 3.8.2.1 *Upper Klamath Basin* (page 3-670 to 3-671) and Section 3.8.5 *Potential Impact 3.8-2* (pages 3-679 to 3-680) describe the role of the Lower Klamath Project in water diversions upstream of the Hydroelectric Reach, and potential impacts of the Proposed Project on those agricultural water supplies. As described more fully in the EIR, Upper Klamath Lake is the primary water supply for agricultural irrigation use in the Klamath River Basin. Approximately 98 percent of the available active surface water storage for irrigation uses along the Klamath River occurs in Upper Klamath Lake, which is regulated by Link River Dam. Keno Dam regulates water levels of the Klamath River upstream of the dam. The facility does not generate hydropower. PacifiCorp operates Keno Dam under an agreement with USBR to maintain stable water levels in Keno Impoundment/Lake Ewauna for irrigation uses. The Lower Klamath Project facilities have non-consumptive hydropower water rights (please also refer to Master Response WSWR-3), rather than water rights for the provision of irrigation supplies. Neither Link River Dam nor Keno Dam is being considered for removal under the Proposed Project.

As described in Volume I Section 3.8.5 *Potential Impacts* 3.8-1 and 3.8-2 (pages 3-676 to 3-680), during the extreme drought of 2014 to 2016, PacifiCorp coordinated late-2014 releases from Iron Gate and Copco No. 1 dams which resulted in a small degree of flexibility for managing irrigation water in the Upper Basin by allowing USBR to postpone releasing water for irrigation purposes at Keno Dam. A comparable water borrowing agreement between PacifiCorp and USBR for approximately 20,000 acre-feet also occurred in 2018. It is unclear if further water borrowing would occur in the future due to the multiple constraints detailed by USBR and discussed in Volume I Potential Impact 3.8-2 (pages 3-

679 to 3-680). The EIR's assessment of the unlikelihood of future water borrowing is further bolstered by USBR's elimination of this alternative from further consideration as part of its environmental assessment of the Klamath Irrigation Project operations (USBR 2019). Removal of the Lower Klamath Project dams would not affect USBR's central role in providing water to irrigators in the Upper Klamath Basin while also providing flows to the Klamath River as required by the current biological opinion.

WSWR-2 Water Availability on Klamath River Tributaries

Some comments raise concerns that removal of the Lower Klamath Project reservoirs would reduce the water supply available for environmental purposes in the mainstem Klamath River, and as a result, water diverters in tributaries to the Klamath River would be curtailed in order to increase mainstem surface water flows.

As described in Volume I Section 3.8.1 *Water Supply/Water Rights – Area of Analysis* (pages 3-667 to 3-669), there would be no water supply impact to tributaries to the mainstem Klamath River from implementation of the Proposed Project. Agricultural diversions within the Mid and Lower Klamath basins occur in tributaries including the Shasta, Scott, Salmon, and Trinity rivers. However, because the USBR maintains its biological opinion obligations for the mainstem Klamath River regardless of the existence of the Lower Klamath Project, dam removal would not alter the amount of water available for environmental purposes, or the source of that water.

WSWR-3 Downstream Water Rights, Lower Klamath Project Water Rights, and Hatchery Water Diversions

Some comments express concern that removal of the Lower Klamath Project facilities would adversely impact water supplies and/or water rights for beneficial uses including hydropower production, agriculture, hatcheries, and other downstream water diversions.

Please refer to Volume I Potential Impact 3.8-1 (pages 3-676 to 3-679) and Volume II Appendix M. The Lower Klamath Project reservoirs contain approximately two percent of the active surface water storage in the Klamath River watershed. The dams are operated for short-term water storage to be released for hydropower operations. As hydropower operations would cease at the Lower Klamath Project dams under the Proposed Project, use of these hydroelectric power-generation rights would cease. As described in Volume I Potential Impact 3.8-1 (pages 3-677 to 3-679) this cessation of diversion is not anticipated to have a significant impact on other domestic and agricultural diversions in the Klamath River downstream of the Hydroelectric Reach. With respect to the loss of hydropower generation associated with the Lower Klamath Project, this topic pertains to a portion of the Draft EIR that was recirculated on

December 21, 2019. Please refer to the recirculated document (*Greenhouse Gas Emissions and Energy*).

Under the Proposed Project, diversions for Iron Gate Hatchery operations would decrease, and the point of diversion would change from Iron Gate Reservoir to Bogus Creek (Volume I Section 2.7.6.1 *Iron Gate Hatchery* [pages 2-77 to 2-80]). As identified in the EIR, there are no water diversions between the hatchery diversion location and the point of return for the water. The existing water flows that the California Department of Fish and Wildlife (CDFW) diverts into the Fall Creek Hatchery would increase under the Proposed Project as the hatchery is returned to operation for eight years following dam removal. Please refer to Volume I Potential Impact 3.8-1 (pages 3-676 to 3-679) and Master Responses WSWR-5 and WSWR-6 below for further discussion of the City of Yreka and hatchery water rights. Neither of these changes are anticipated to impact other water rights holders because there are no intervening diverters associated with the hatchery points of diversion and hatchery use is non-consumptive. Additionally, after eight years hatchery operations are planned to cease. Please refer to Master Response WSWR-1 for a discussion of potential effects on agricultural and downstream water supply.

WSWR-4 Potential Sediment Impacts on Water Diversions Downstream of the Lower Klamath Project

Some comments express general concern about potential impacts to diversion works downstream of the Lower Klamath Project that may result from increased sedimentation that is expected to occur during and following dam removal activities. Some of these comments have included concern that impacts to individual diversions were not evaluated with greater particularity. As described in Master Responses WSWR-1 and WSWR-3, the Proposed Project was not found to have a significant impact on water supplies or water rights. However, the EIR does evaluate and require mitigation for potential impacts related to sediment release and deposition.

Volume I Potential Impact 3.8-3 (page 3-680 to 3-682) evaluates the potential impact from releases of stored reservoir sediments during Proposed Project implementation to Klamath River water intake pumps downstream of Iron Gate Dam. USBR (2012a) conducted detailed hydraulic, hydrologic, and sediment transport modeling to determine the potential for sediment-related impacts due to removal of the Lower Klamath Project dams. This model does not address localized sediment deposition and erosion at a site-scale, which could affect existing diversion facilities.

No comments were received identifying individual diversion infrastructure that could be impacted due to sediment releases and deposition under the Proposed Project. The findings of Volume I Potential Impact 3.8-3 (pages 3-680 to 3-682) already discloses that sediment releases during reservoir drawdown could significantly affect the functionality of downstream diversion facilities. To address

this potential impact, Mitigation Measure WSWR-1 (Volume I, page 3-681 to 3-682) requires individualized mitigation to address any impacts, with the option for diverters to engage in pre-project evaluations. With mitigation, the impact would be less than significant.

WSWR-5 City of Yreka Water Supply/Water Rights

Some comments express concern about potential impacts to the City of Yreka's water supply, which is diverted from Fall Creek (see also Volume I Section 2.7.7 *City of Yreka Water Supply Pipeline Relocation* [pages 2-84 to 2-86]). Specific concerns include potential impacts from the pipeline alignment, instream bypass flow requirements in Fall Creek, PacifiCorp diversions from Spring Creek to Fall Creek, and the City's diversion intake structures on Fall Creek. Please refer to Master Responses WSWR-6 and WSWR-7 for a discussion of water availability and water rights in the Fall Creek watershed.

As described in Volume I Potential Impact 3.8-4 (pages 3-682 to 3-683), the existing water supply pipeline for the City of Yreka passes under Iron Gate Reservoir and would have to be relocated prior to reservoir drawdown to prevent potential damage. Three alternatives have been developed for proposed modifications to the pipeline, and the KRRC would determine the preferred alternative in consultation with the City of Yreka. During connection of a new pipeline, the KRRC anticipates that the existing pipeline would be disconnected for less than 12 hours during the winter season. The available water in the City of Yreka's storage facilities is able to supply the City of Yreka for up to 60 hours during the winter (see also Volume II Appendix B: *Definite Plan*).

In light of the lack of the specific construction detail necessary to fully support the KRRC's outage estimate, the EIR includes Mitigation Measure WSWR-2. Mitigation Measure WSWR-2 requires both coordination on the planned outage with City of Yreka and a separate approval for any outage longer than 12 hours and requires that the outage will not impair the City of Yreka's ability to supply water.

The 15 cubic feet per second (cfs) instream bypass flow requirement associated with the City of Yreka's water right is derived from provisions of the agreement between the City of Yreka and CDFW executed in 1967 and filed with the State Water Board. The condition was included in the amended permit for diversion and use granted by the State Water Board in 2012. There is no evidence that CDFW's 15 cfs bypass flow requirement is not suitable for potential future use of Fall Creek by salmonids, regardless of the entity that owns and operates Fall Creek hatchery, and no amendment to that obligation is part of the Proposed Project. CDFW has given no indication in its comments on the Draft EIR that a higher flow would be necessary in Fall Creek with access by anadromous fish or with hatchery operation. Additionally, under California water rights law, diversions under junior water rights must cease if demand under all senior water rights has not been met; exercise of a junior right cannot harm the senior right.

Concerns related to future increases of bypass flow requirements are speculative and not analyzed in this EIR.

With respect to concerns regarding potential impacts to the City of Yreka's water supply diversion intake structures, the Definite Plan (Volume II Appendix B: *Definite Plan*) indicates that the existing flat panel fish screens for the water supply intakes at Dams A and B may not meet current regulatory agency screen criteria for anadromous fish and may require updates (see also Volume I Section 2.7.7 *City of Yreka Water Supply Pipeline Relocation* [pages 2-84 to 2-86]). Since issuance of the Draft EIR, the KRRC has proposed to include a permanent fish passage barrier at the Fall Creek Hatchery, located approximately 200 to 300 feet downstream of both Dams A and B (KRRC 2019a), such that there would be no need for updates to the City of Yreka's Dam A or B existing diversion intake structures and there would be no impacts.

WSWR-6 Fall Creek Hatchery Water Rights

Some comments express concern that increased water diversions from Fall Creek associated with re-opening the Fall Creek hatchery could preclude the City of Yreka from diverting their full water right.

Water diversions from Fall Creek associated with operation of the Fall Creek Hatchery would not impact the City of Yreka's water right, including its bypass flow requirement. CDFW's non-consumptive water right diverts water primarily downstream from the City of Yreka's diversion point with an optional 0.33 cubic feet per second (cfs) diversion above the City of Yreka's Dam B on Fall Creek. After passing through the hatchery, all diverted water (less evaporative losses) would be returned to Fall Creek upstream of the City of Yreka's bypass flow compliance point (i.e., location of USGS Gage No. 11512000 approximately 1,000 feet upstream of Daggett Road). Please refer to Volume I Section 2.7.6.2 *Fall Creek Hatchery* (pages 2-81 to 2-84) for further discussion. See also Master Response WSWR-5.

Since issuance of the Draft EIR, the KRRC has proposed to use 0.33 cfs from the optional diversion point located upstream of the City of Yreka's Dam B on Fall Creek. The KRRC proposes to use water from the optional diversion for egg incubation at Fall Creek Hatchery and proposes that this diversion would be part of the 10 cfs maximum diversion for operation of the hatchery. This diversion would also be non-consumptive. As noted above, all diverted water (less evaporative losses) would be returned to Fall Creek upstream of the bypass flow compliance point for the City of Yreka's water supply. Further, although the 0.33 cfs would be diverted upstream of the City of Yreka's Dam B, the amount of this diversion is relatively small compared with historical Fall Creek flows and historical City of Yreka diversions (Volume I Figure 2.7-16 [page 2-84]) and therefore the 0.33 cfs diversion would not preclude the City of Yreka from diverting their full water right.

WSWR-7 PacifiCorp Water Rights in Fall Creek and Spring Creek

Some comments express concern that reductions to PacifiCorp's water rights in Fall and Spring creeks could preclude the City of Yreka from diverting their full water right.

PacifiCorp's water diversions on Spring and Fall creeks and hydropower generation at the Fall Creek powerhouse are part of the Klamath Hydroelectric Project (KHP) and are not part of the Proposed Project. PacifiCorp's ownership and operation of the portions of the KHP that are not part of the four dams and the associated facilities proposed for removal (i.e., the Lower Klamath Project), or part of Parcel B lands, are not being changed under the Proposed Project. Whether the Federal Energy Regulatory Commission (FERC) would alter PacifiCorp's Spring Creek diversion in the future, as related to the KHP, is speculative and is not analyzed in this EIR. The State Water Board anticipates that any such change would be the subject of a future proceeding under FERC, which would include the opportunity for public and State Water Board input on decisions to continue or to change current operations.

2.2.11 Greenhouse Gas Emissions and Energy Master Responses

ENR-1 Rate Increases

Several comments state the belief that removal of the Lower Klamath Project facilities would result in power rate increases for PacifiCorp customers. Please note that under CEQA, potential effects from implementing a project that are solely social or economic in nature, such as reductions in property values, loss of property tax revenues, and increases in energy costs, do not constitute an effect (i.e., an impact) to the physical environment (see also Volume I Section 5.4 *Social and Economic Factors Under CEQA*).

Although under CEQA no further response is required, the following information is provided as context for power rates. The excerpt below is taken from the U.S. Bureau of Reclamation's (USBR's) response to public comments on this topic, as presented in Volume III of the 2012 KHSA EIS/EIR. This State Water Board is not aware of any limits to the applicability of the below analysis and conclusions regarding costs since its publication.

"Rates for PacifiCorp customers in the Klamath Basin are anticipated to rise even if the dams are retained. Any rate increase would be used to fund a portion of [dam removal], if approved, or the cost of relicensing, if not approved. Federal funds and California bond funds would be used to pay for the remainder of the costs associated with the Proposed [Project]. Rate increases for utility customers are controlled by public utility commissions to prevent price gouging and sudden harmful increases in power costs. Both the Oregon Public Utilities Commission (PUC) and the California PUC (CPUC) have determined that the cost to PacifiCorp customers would be less under a decommissioning scenario than a relicensing scenario."

According to the Oregon PUC hearings on the cost increases associated with the KHSA [Klamath Hydroelectric Settlement Agreement], PacifiCorp claimed that relicensing would cost their customers in excess of $400 million in capital costs and $60 million in operations and maintenance costs over a 40-year license term (Oregon PUC Order No. 10-364 can be found at https://apps.puc.state.or.us/orders/2010ords/10-364.pdf). In contrast, the cost of decommissioning the Lower Klamath Project has been capped at $450 million under the KHSA, and customer contributions have been capped at $200 million with up to $184 million coming from Oregon customers and up to $16 million from California customers. In California, the annual collection from PacifiCorp may not exceed two percent of their annual revenue, and it must be collected as a specified amount per kilowatt-hour billed to customers. The State of California is providing the remaining $250 million through Proposition 1 bond funding (Amended KHSA 2016 can be found at http://www.klamathrenewal.org/wp-content/uploads/2017/04/2016.12.31-Executed-and-Amended-Final-KHSA.pdf).

The CPUC also determined that the KHSA would provide more certainty to PacifiCorp customers in terms of cost than a relicensing scenario, as the KHSA mandates specific cost caps to PacifiCorp's customers. Without the KHSA, the CPUC finds that PacifiCorp's ratepayers would be subject to "an uncertain amount of cost in addressing what to do with PacifiCorp's Klamath assets" (CPUC Final Decision to Authorize a Surcharge to Recover the Costs of Removing the Klamath Assets can be found at http://docs.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/134812-03.htm).

2.2.12 Geology, Soils, and Mineral Resources Master Responses

GEO-1 Fine Sediment Modeling and Analysis

Several comments were submitted regarding the EIR's overall approach to sediment modeling and analysis for the Proposed Project and alternatives, the downstream extent of potential fine sediment impacts during and following dam removal, and the analysis approach for addressing spatially discrete fine sediment impacts. These topic areas are discussed below.

1D and 2D Sediment Models

Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 (pages 3-765 to 3-775), which is partially modified in Volume III Attachment 1, describes the results of sediment modeling for the Proposed Project undertaken by USBR (2012a). While not cited in Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 (pages 3-765 to 3-775), results of sediment modeling conducted by Stillwater Sciences (2008) are cited in USBR (2012a) and used towards analyzing how the rate of reservoir drawdown would affect the amount of erosion of the reservoir sediment deposits.

Stillwater Sciences (2008) originally used the peer-reviewed Dam Removal Express Assessment Model (DREAM-1) (Cui et al. 2006a,b) to identify preferred reservoir drawdown options for minimizing suspended sediment impacts to the Klamath River, especially biological resources, downstream of Iron Gate Dam. USBR (2012a) subsequently applied the one-dimensional (1D) Version (2.4) of the Sedimentation and River Hydraulics sediment transport model (SRH-1D), developed by Huang and Greimann (2010), to examine surface hydrology, groundwater hydrology, hydraulics, geomorphology, and sediment transport within the Klamath River Basin under the No Project Alternative (dams remain in place) and the Proposed Project (dam removal). Fine and coarse sediment were both modeled by USBR (2012a), including 48 two-year simulations (1961-2008) focused on suspended sediment, as well as three fifty-year simulations considering long-term evolution of the riverbed, with drawdown (3 ft/day maximum) modeled for dry, median, and wet water year types.

Information on the data and model parameters input to the SRH-1D model is included in USBR (2012a, pages 9-4 to 9-5). The sediment load inputs to the SRH-1D model are also described in USBR (2012a, pages 5-4 to 5-11), with additional information on tributary sediment loads provided in Stillwater Sciences (2010). In addition to the SRH-1D model, USBR (2012a, pages 9-56 to 9-85) also applied a two-dimensional (2D) model (SRH-2D v3) for Copco No. 1 Reservoir, which verified the erosional patterns predicted by the SRH-1D model for Copco No. 1 Reservoir.

The main difference between 1D and 2D sediment models is that 1D models consider flow velocity (i.e., the speed that water travels in the river channel) and water surface elevation (i.e., water level) as average values that remain constant across the width and depth of the river channel, whereas 2D models allow flow velocity and water surface elevation (also expressed as average values) to vary across the width of the river channel using a spatially distributed grid or mesh of input data. At an even finer scale, 3D models apply a mesh of input data across the width, depth, and upstream to downstream dimension of the river channel. 1D sediment models are technically sound for assessing sediment erosion, transport, and deposition, and associated channel change, in the upstream to downstream direction (i.e., the "longitudinal" dimension). For the purposes of Volume I Section 3.11 *Geology, Soils, and Mineral Resources*, the SRH-1D sediment model results were used to assess whether the Proposed Project would result in substantial deposition[8] of sediment in the Klamath River channel or Klamath River Estuary due to erosion of reservoir sediment deposits, and

[8] To affect the significance determinations for reaches downstream of Cottonwood Creek, a 2D model would have to find that there would be substantial deposition of sediment as defined in Volume III Attachment 1 Section 3.11.3 *Geology, Soils, and Mineral Resources – Significance Criteria*, where clarifying text has been added since the Draft EIR, or a risk to people and structures.

whether people and structures would be adversely affected (see Volume I Section 3.11.3 *Geology, Soils, and Mineral Resources – Significance Criteria* on page 3-759 and the modifications in Volume III Attachment 1). Although 2D sediment modeling would improve the understanding of sediment dynamics across the river channel (i.e., the "lateral" dimension), the results of such an undertaking would not change the EIR significance determinations presented in Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 (pages 3-765 to 3-775) because the EIR already discloses that there would be short-term substantial deposition of sediment in the Klamath River channel between Iron Gate Dam and Cottonwood Creek in the short term (i.e., a significant and unavoidable impact) and recognizes the potential for spatially discrete fine sediment deposition in slack-water areas farther downstream. Additionally, 2D model results are usually consistent with 1D results as seen with 2D and 1D models used for reach-scale analyses of erosion and sediment deposition in river systems (Stillwater Sciences 2008; and the SRH-2D v3 model in USBR 2012a). The finer-scaled pattern of sedimentation across the river width (i.e., in slack water areas) downstream of Cottonwood Creek that could be predicted by a higher resolution 2D model would not affect the key findings of the EIR analysis or change the significance determinations.

The SRH-1D model simulations applied are considered appropriate for assessing the potential effects of dam removal in the context of CEQA. Furthermore, the advantage of 1D sediment modeling is that it is computationally less intensive and for assessing impacts from the Project, more efficient than 2D or 3D modeling. This allowed for SRH-1D models to be applied to the Klamath River from upstream of J.C. Boyle Dam (RM 229.8) to the Pacific Ocean using two-year simulations over a 48-year period (1961-2008), as well as using three separate 50-year simulations with reservoir drawdown modeled to occur in dry, median, and wet water year types (USBR 2012a). Modeling over this length of river and for this number of years would be impractical with 2D or 3D models, and modeling a fewer number of years would significantly reduce the probability that the hydrological conditions present during project implementation would be captured by any model predictions.

River Sediment Transport and Downstream Extent of Significant Short-term Sedimentation Impacts

The existing sediment deposits in J.C. Boyle, Iron Gate, and Copco No. 1 have a high water content (80 to 90 percent) and over 80 percent of the sediments are fine-grained (see Table 3.11-6 in Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 [page 3-766]), which means that they are highly erodible. Based on the above described, technically sound, SRH-1D model simulations, USBR (2012a) estimated that between 5.4 and 8.6 million yd^3 [1.2 to 2.3 million tons], or 36 to 57 percent of the total reservoir sediment volume, is expected to be eroded and transported downstream during the drawdown period (see Table 3.11-7 in

Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 [page 3-767 to 3-768]). Whether sediment eroded and transported would be within the lower, mid, or upper portion of this range is primarily related to whether drawdown occurs in a dry, normal, or wet water year, with more erosion and transport expected in a wet water year (see Figure 3.11-11 in Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 [page 3-768]).

In addition to modeling the amount of sediment that would be eroded and transported downstream, the SRH-1D model simulated reach-averaged erosion of, and deposition on, the channel bed (USBR, 2012, pages 9-34 to 9-37). Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 has been clarified to discuss reach-averaged sediment deposition or erosion and bed elevation change results of both SRH-1D simulations (i.e., the 48 2-year simulations and three 50-year simulations) (USBR 2012a). The clarifying edits do not change the conclusions or significance determinations in Potential Impact 3.11-5. Please refer to Volume III Attachment 1 Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 for the revisions.

The model simulations found that the reservoir sediment deposits would erode in the Hydroelectric Reach, with minimal deposition (see Figure 3.11-13 in Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 [page 3-771]). The model also found that most of the fine-grained sediment would be transported downstream to the Pacific Ocean during the drawdown process (USBR, 2012, page 9-33). In the downstream direction, flows in the Klamath River increase due to tributary inflows (see Table 3.6-9 in Volume I Section 3.6.2.2 *Flood Hydrology – Environmental Setting – Basin Hydrology* [pages 3-616 to 3-617]), such that for the same riverbed slope there is greater stream power to hold sediment suspended in the water (see Table 3.11-3 in Volume I Section 3.11.4.2 *Geology, Soils, and Mineral Resources – Impacts Analysis Approach – Suspended Sediment* [pages 3-749 to 3-750]). Therefore, as the fine sediment load moves downstream during reservoir drawdown and in the short term following dam removal, it is not likely to be deposited in any substantial way unless there is a decrease of riverbed slope great enough to counter the power of water flow, which does not occur in the 193 river miles between Iron Gate Dam and the Pacific Ocean. USBR (2012a) modeled sediment deposition results are supported by Stillwater Sciences (2008) model results, which used the peer-reviewed Dam Removal Express Assessment Model (DREAM-1) (Cui et al. 2006a,b), and returned no discernable sediment deposition downstream of Iron Gate Dam for any simulations.

Based on the SRH-1D model results, the downstream extent of substantial sediment deposition would be Cottonwood Creek. The Klamath River reaches where sediment deposition is most likely to occur within two years of dam

removal are Bogus Creek to Willow Creek and Willow Creek to Cottonwood Creek (RM 185.1), both of which have relatively low riverbed slope (approximately 0.2 to 0.4 percent within 5 miles of Iron Gate Dam) compared with upstream reaches, and are upstream of the first major tributary inflow–the Shasta River (RM 179.5) (see Figure 3.11-15 in Volume III Attachment 1 Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5). Between Bogus Creek and Cottonwood Creek most of the predicted sediment deposition would be sand or larger, with fine sediments remaining in suspension in the water column through these reaches. The SRH-1D model simulation found that the streambed level could be raised (i.e., the process of 'aggradation') by 0.8 to 1.7 feet between Iron Gate Dam and Cottonwood Creek if drawdown occurs in a normal water year due to primarily coarse sediment deposition, with less in dry and wet water year types (USBR 2012a, pages 9-36 to 9-37). In these reaches, the greatest deposition is expected in a normal water year type, because less sediment would be eroded from the upstream reservoirs in a dry water year, and more sediment would remain suspended in the water column through these reaches in a wet water year. The potential effects of this deposition between Bogus Creek and Cottonwood Creek on aquatic habitat are described in Volume I Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* and Master Response AQF-7. Regarding geomorphic hazards, the flow of water and sediment is expected to follow existing and historic channels, which are reasonably confined and have sufficient width-depth ratios to allow for the predicted sediment deposition to occur within the channel.

Farther downstream, between Cottonwood Creek and the Shasta River, there is more likely to be minor scour than sediment deposition, and downstream of the Shasta River there would insignificant deposition (less than 0.1 feet) within two years following dam removal (see Figure 3.11-15 in Volume III Attachment 1 Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5). Based on the SRH-1D model, downstream fluctuations of stream power (USBR 2012a, page 4-9) would not be substantial enough to result in suspended fine-grained load dropping out of the water column in reaches downstream of Cottonwood Creek. The estimated equivalent 10-year flood flow that would occur during reservoir drawdown would be large enough to spill onto lower elevation floodplains, with some spatially discrete sediment deposition expected in these locations. Although mitigation would be required to reduce the short-term impacts of elevated suspended sediment concentrations on coho salmon critical habitat and Chinook and coho essential fish habitat in the Klamath River between Cottonwood Creek and the Shasta River (see Potential Impacts 3.3-1 through 3.3-16 in Volume I Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts*), return of more natural sediment loads to the Klamath River, which has been historically sediment starved by dams and hydraulic mining, would be beneficial for aquatic species in the long term (see Volume III Attachment 1 Section 3.3.5.2 *Aquatic Resources – Potential Impacts and Mitigation – Bed Elevation and Grain Size*

Distribution and Master Responses AQF-7 and AQF-10). Further, any fine sediment deposition that does occur in the short term or long term would have positive benefits for riparian vegetation establishment and would expand habitat suitable for larval rearing of Pacific lamprey (see Volume III Attachment 1 Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Habitats* Potential Impact 3.3-11).

Short-term Spatially Discrete Sedimentation Impacts

As USBR (2012a) used a combined data reporting approach for the two-year model simulations, the report does not explicitly account for transient (i.e., temporary) sediment storage and erosion effects within the two-year period immediately following dam removal, or thereafter. Although most fine-grained sediment is expected to move downstream during drawdown (as described above) and Stillwater Sciences (2008) found that the amount of pool filling within the Klamath River bed would be small, there would be some spatially discrete sedimentation effects, such as deposition in slack water areas (e.g., pools, eddies, alcoves) (see Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 [pages 3-772 to 3-773], which is partially modified in Volume III Attachment 1). This prediction was considered in the analyses of geology, soils, and mineral resources, hydrology, water quality, and aquatic biological resources for the Proposed Project and the alternatives, and is described as such in the Draft EIR.

The likely persistence of any fine sediment that does deposit along the Klamath River would be dependent on the flow magnitude required for remobilization of surface sediments. Shea (2016) summarized available information on this subject, and found the following:

- The flow required to mobilize fine sediments deposited in surface layers (i.e., exceed the shear stress) on 20-30% of the riverbed downstream of Iron Gate Dam is 5,000 cfs to 8,000 cfs (adapted from Holmquist-Johnson and Milhous 2010).
- The flow required to initiate slight mobilization of the riverbed (i.e., for the Shield's parameter to reach or exceed the reference Shield's stress), which would correspond to a small, but measurable, sediment transport rate, with potential flushing of sand to a depth of gravels and cobbles with a D_{90} particle size (i.e., the particle size diameter at which 90 percent of the riverbed's sediment is comprised of particles with a diameter less than this value), downstream of Iron Gate Dam varies by reach and ranges from 5,800 cfs to 20,000 cfs (USBR 2012a).

Additionally, Ayres Associates (1999) provide geomorphologically specific information on the sediment motion associated with pools and riffles using a set of criteria related to grain shear stress, the specific weight of water, sediment size, and sediment density (termed "Shield's criteria') throughout the length of the Klamath River downstream of Iron Gate Dam, which are both considered here:

- Riffles comprise coarser sediment and conditions for sediment motion are frequently exceeded on parts of the riffle, even in low flows, because riffles are shallow with relatively high velocities and rough surfaces. Using Shield's criteria, the flow required for full mobility of the highest point on a riffle (i.e., riffle crests) at Little Bogus Creek (RM 187), which is upstream of Cottonwood Creek, is approximately 9,800 cfs, and this increases downstream to 147,000 cfs at Blue Creek (RM 16) using D_{50} (i.e., the particle size diameter at which 50 percent of the riverbed's sediment is comprised of particles with a diameter less than this value).
- Pools comprise finer sediment, and in the Klamath River the long-term capacity for storing fine sediment along the riverbed greatly exceeds the fine sediment supply. Using Shield's criteria, the flow required for sediment motion in pools at Little Bogus Creek is approximately 5,400 cfs, increasing downstream to 25,000 cfs at Blue Creek using D_{84} (i.e., 2 mm—the particle size diameter at which 84% of the riverbed's sediment is comprised of particles with a diameter less than this value). Using a smaller particle size (e.g., D_{50}) reduces the flow required for motion of fine sediment in pools.

In the reaches where significant sediment deposition is most likely to occur (Bogus Creek to Cottonwood Creek), the median estimate for initiation of mobilization of the existing bed substrate is a flow of approximately 10,250 cfs, which has a return period of approximately 4 years based on data from 1961-2008 (see Figure 3.11-6 in Volume III Attachment 1 Section 3.11.2.4 *Geology, Soils, and Mineral Resources – Impacts Analysis Approach – Sediment Load*) (USBR 2012a). As discussed in *Geology Soils and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 and USBR (2012a, pages 9-86 to 9-88), fining of the channel bed post dam removal is predicted to reduce the return period flow required to initiate mobilization of the channel bed to approximately 6,000 cfs from Bogus Creek to Cottonwood Creek. Therefore, controlled flushing flows in the order of 6,000 cfs (USBR 2018a; NMFS 2019; USFWS 2019a) may result in some bed mobilization from Bogus Creek to Cottonwood Creek. The amount of sediment deposition predicted by the SRH-1D model results between Bogus Creek and Cottonwood Creek, and the potential for these sediment deposits to remain in place for more than two years until a sufficiently large flow can mobilize them, led to the significant and unavoidable impact determination associated with Potential Impact 3.11-5 in Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* (page 3-765 to 3-775).

Downstream of Cottonwood Creek, the potential for impacts due to spatially discrete fine sediment deposition (i.e., deposition that occurs in slack water areas such as pools, eddies, and alcoves) would not be significant because the predicted sedimentation (described above) is sufficiently small and any sedimentation that does occur would be expected to mobilize during subsequent flood events. As described above, flows of 5,000 to 8,000 cfs could be sufficient to flush surface sediment downstream of Iron Gate Dam. Modeling by USBR

(2012a) produced reach-by-reach flow estimates, which were considered in preparing the EIR. Based on USBR (2012a), none of the reaches from Cottonwood Creek to Indian Creek have a median return period for initiation of sediment transport (i.e., surface flushing) greater than 4.5 years (see Figure 3.11-6 in Volume III Attachment 1 Section 3.11.2.4 *Geology, Soils, and Mineral Resources – Impacts Analysis Approach – Sediment Load*). No significant fining of the channel bed from Cottonwood Creek to Indian Creek is predicted that would alter the historic return period for sediment mobilization (USBR 2012a, pages 9-86 to 9-88). Under the USBR Klamath Irrigation Project 2019 BiOp (USBR 2018a; NMFS 2019; USFWS 2019a), flow releases of approximately 6,000 cfs would occur at Iron Gate Dam annually in spring, which would be expected to generate surface flushing in some reaches (i.e., reaches with the lowest shear stress) downstream of Iron Gate Dam. Although there are some differences between lower flows modeled by USBR (2012a) for the 1961−2011 period and lower flows that would occur with the 2019 BiOp (USBR 2018a; NMFS 2019; USFWS 2019a), the peak flows (>5,000 cfs) that would mobilize sediment are similar. Therefore, with the 2019 BiOp, the return periods modeled by USBR (2012a) for initiation of sediment transport continue to be relevant to this discussion and the EIR.

Should spatially discrete downwelling of sediment (i.e., downward movement of finer sediment into the matrix of larger particles on the riverbed) occur, the subsequent geomorphologically effective flow would redistribute (sort) the gravel and cobble layer on the riverbed, as well as widen the channel and remove aquatic vegetation. Shea (2016) estimates that this would occur with flows of approximately 15,000 cfs downstream of Iron Gate Dam, which have a return period probability of 10 years; although Ayres Associates (1999) suggest that geomorphic reworking of riffle crests may occur more frequently, and USBR 2012a (Figure 5-25 on page 5-8) indicate that slightly higher flows would be required for significant bed mobilization with return periods of 10.5 to 12.5 years. This is a cyclic geomorphic phenomenon, where sediment and vegetation build up until the next geomorphologically effective flow rejuvenates the reach, and the process repeats itself, maintaining approximate sediment equilibrium of free-flowing rivers at the time scale of decades. This process of sorting and redistributing sediment would reduce the impact of substantial short-term sediment deposition upstream of Cottonwood Creek in the long term. The Proposed Project would have the beneficial long-term (i.e., 50 years) effect of increasing sediment supply and transport and creating a more dynamic and mobile bed downstream of Iron Gate Dam. Farther downstream where no substantial short-term sediment deposition would occur, none of the reaches from Cottonwood Creek to Indian Creek have a median return period for significant (full bed) mobilization, which would sort the gravel and cobble layer, greater than 12 years (see Figure 5-25 in USBR 2012a, page 5-8). Downstream of Beaver Creek, significant bed mobilization would occur frequently, with the median estimate of every two to three years. Any potential small and spatially discrete fine-grained sediment deposition downstream of Cottonwood Creek is

expected to have the longest residence time between the Shasta River and Beaver Creek.

Minimization and Monitoring Requirements

The EIR determined that potential sediment deposition between Iron Gate Dam and Cottonwood Creek would be significant and unavoidable (Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 [pages 3-765 to 3-775]) because mitigation measures could not reduce deposition in the Klamath River channel between Bogus Creek and Cottonwood Creek to an amount that would not be substantial. The significance of potential sedimentation was, therefore, fully disclosed in the Draft EIR based on the best available science, and technically sound information, described above. This determination was made after accounting for Proposed Project measures to minimize ongoing sediment erosion and impacts. Mechanical methods for moving and stabilizing sediment have been avoided in the Proposed Project, in favor of softer measures to achieve the same objectives. Sediment jetting would be used to maximize sediment erosion during drawdown, thus minimizing potential future erosion of reservoir sediment deposits, and is described in Volume I Section 3.2.5.2 *Water Quality – Potential Impacts and Mitigation – Suspended Sediments* Potential Impact 3.2-3 (pages 3-84 to 3-106), which is revised and reprinted in Volume III Attachment 1. Additionally, during and after reservoir drawdown, hydroseeding would be used to stabilize sediments, with vegetation management for at least five-years following dam removal (see Volume II Appendix B: *Definite Plan*, pages 211-215).

The approach in the EIR does not affect monitoring that would be required under the Clean Water Act Section 401 certification for the Lower Klamath Project. The Definite Plan (see Volume II Appendix B: *Definite Plan – Appendix M*) includes a Water Quality Monitoring Plan to assess the Proposed Project's impacts to water quality, and this plan includes turbidity and suspended sediment concentration monitoring, along with adaptive management requirements. Please note that the State Water Board has authority to review and approve any final Water Quality Monitoring Plan through its water quality certification under the Clean Water Act, Section 401. The State Water Board released a Draft Water Quality Certification for public comment on June 07, 2018. The Draft Water Quality Certification sets forth water quality monitoring, adaptive management, and compliance requirements for any Water Quality Monitoring Plan to meet under Conditions 1 and 2. For informational purposes, note that the Draft Water Quality Certification requires quantification of the amount of sediment present in each Proposed Project reservoir footprint, the total amount of sediment exported from the Proposed Project reservoirs, and the amount of sediment that settles in the Klamath River between Iron Gate Dam and Cottonwood Creek following dam removal in the short term.

Conclusion

Although significant sediment deposition may occur between Iron Gate Dam and Cottonwood Creek, most eroded reservoir sediments are predicted to be transported to the Pacific Ocean as particles that remain suspended in the water during drawdown and in the short term following drawdown. The DREAM-1 model applied by Stillwater Sciences (2008) and the SRH-1D model applied by USBR (2012a) both indicate that fine sediment deposition in the Klamath River downstream of Cottonwood Creek would be minimal. Any spatially discrete fine sediment deposition (i.e., deposition that occurs in slack water areas such as pools, eddies, and alcoves) would also likely be transient (i.e., temporary), with remobilization occurring in near-term floods (i.e., for initiation of remobilization, 4.5-year probability or less).

The SRH-1D model, which is used as a basis for assessing downstream sediment impacts in the EIR, is technically sound and fit-for-purpose. The significance determinations in Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 would not change with application of a different sediment model or more spatially discrete geomorphic analysis, because the existing sediment models were sufficient to assess potential sediment-related impacts of the Proposed Project against criteria relevant to CEQA, and the reach-by-reach significance of potential sedimentation was fully disclosed in the Draft EIR. Therefore, additional analysis of fine sediment erosion, transport, and deposition, as suggested by some commenters, is not necessary for the purposes of the EIR, and would be an unreasonable use of time and resources.

GEO-2 Potential For Slope Instability

Several commenters expressed concern about the potential for drawdown to trigger slope instability at specific locations around the Copco No. 1 Reservoir rim. Some slope stability-related comments also assert that existing and proposed geologic investigations and analyses to better define slope stability along the reservoir rim are inadequate to define the impacts and associated mitigation, and that monitoring of large, potentially unstable areas within Copco No. 1 Reservoir included in Mitigation Measure GEO-1 should be extended to a five-year period following drawdown.

Please refer to Volume I Section 3.11.2.3 *Slope Instability and Mass Wasting* (pages 3-747 to 3-748) for a general description of existing slope instability around the reservoirs and Volume III Attachment 1 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-3 for a detailed analysis of specific areas along the Copco No. 1 Reservoir rim where slope instability may occur during reservoir drawdown. Potential Impact 3.11-3 also includes a description of measures that KRRC will implement to mitigate the potential impacts of slope instability during drawdown (see also Volume II Appendix B: *Definite Plan*). Mitigation Measure GEO-1 specifies that KRRC shall implement these measures to mitigate the potential impacts of slope instability

during reservoir drawdown; and specifies additional monitoring and inspection of unstable or potentially unstable areas throughout and following drawdown, as well as revegetation of affected areas.

For development of the Definite Plan (Volume II Appendix B of the EIR), the KRRC summarized existing geologic mapping, performed additional geologic mapping, conducted subsurface investigations with lab testing, and, using results of the testing, characterized and analyzed the stability of sediments in the reservoir rim and bed areas. Based on these analyses, KRRC identified certain areas that have the potential for slope instability as a result of proposed activities associated with dam removal. Where areas of potential instability occur above the current reservoir water surface, and where these instabilities could result in impacts to existing roads, private property, or structures during and following reservoir drawdown, KRRC would mitigate these impacts by implementing the below summarized actions, also specified in Mitigation Measure GEO-1.

Mitigation Measure GEO-1 specifies that KRRC will visually monitor potentially unstable areas along the Copco No. 1 Reservoir rim for the duration of reservoir drawdown and for two weeks following drawdown, or longer, if KRRC determines that a longer monitoring period is prudent. Depending on the location, monitoring may involve tribal monitors (see also Mitigation Measures TCR-1, TCR-2, and TCR-3 in Volume III Attachment 1). If slope failure related to Project activities is observed, an exclusion zone will be established around the unstable area and the KRRC will monitor the unstable area. Throughout drawdown activities, and once the areas are safe to inspect, the KRRC shall inspect any slope failures and implement slope stabilization measures, as appropriate. For any slope failure related to Project activities that occurs during drawdown or the year following drawdown and that adversely impacts a structure or public facility or impacts or has a material potential to impact water quality or volitional fish passage, KRRC will fund or implement the following actions:

1. By agreement with the property owner, repair or move affected structures and/or purchase affected property; or
2. Repair and/ or re-align affected road segments; or
3. Regrade and/or engineer structural slope improvements (e.g., retaining walls, buttresses, drilled shafts or other structural elements that could be installed to resist slope movement); and
4. Revegetate affected areas to the extent revegetation is feasible and appropriate.

As stated in Volume III Attachment 1 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-3, implementation of the aforementioned measures would reduce the potential impacts to a less than significant level. Although KRRC may be conducting additional analyses to better understand the site-specific potential for slope failure, the results of these analyses would be intended to provide more refined information regarding how best to implement Mitigation Measure GEO-1 to reduce potential impacts to the

less than significant or no impact level, and the results of these analyses would not change the determination of environmental impacts detailed in the EIR, nor would they change the actions stipulated in the mitigation measure.

With respect to comments asserting that monitoring under Mitigation Measure GEO-1 should be extended to a five-year period following drawdown, the following explanation is provided. When the water level in a reservoir is high, hydrostatic pressures (i.e., pressures exerted by the reservoir water at equilibrium at a given point, due to the force of gravity) help to stabilize the shoreline slope. A reduction in water level reduces the stabilizing external hydrostatic pressure and changes pore pressures (i.e., pressures in the small spaces between grains of sediment) inside the shoreline slope, which can lead to slope instability. Analyses by KRRC indicate the potential for slope instability in particular areas of the Copco No. 1 Reservoir rim during drawdown. The potential for slope instability in subsequent years following drawdown would be substantially lower, since groundwater related to reservoir inundation would have drained and pore pressures associated with that groundwater would have dissipated. Thus, any instabilities after the initial drawdown and draining of the reservoir slopes immediately following drawdown are anticipated to be unrelated to the Proposed Project. Consistent with the analysis described in Volume III Attachment 1 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-3, throughout and immediately following reservoir drawdown is the reasonable and appropriate period within which to monitor and inspect potential slope instability related to the Proposed Project as this period allows for sufficient time for the conditions that may result in instability to resolve.

2.2.13 Recreation Master Responses

REC-1 Flatwater Fishing and Boating

Some commenters have expressed concern that the removal of the Lower Klamath Project facilities would result in a loss of flatwater fishing and boating at the reservoirs, and some of these commenters view the Iron Gate and Copco No. 1 reservoirs as rare/unique flatwater habitat within California. Some commenters indicate that a lack of recent data in the Draft EIR to characterize recreational use of the Lower Klamath Project reservoirs for flatwater activities is problematic. Other commenters are concerned that the KRRC's proposed new recreational facilities and the existing facilities may not be sufficient to minimize Proposed Project's impacts to flatwater recreation.

Section 3.20 *Recreation* has been updated to include the most recent recreational use data that are available (2015−2019). Please refer to Volume III Attachment 1 for the final Section 3.20 *Recreation*.

Section 3.20.2.1 *Recreation –Regional Recreation – Reservoir- and Lake-based Regional Recreation,* Table 3.20-4, indicates that there are 12 other

lakes/reservoirs with similar facilities within 50 miles of the Lower Klamath Project reservoirs and another seven lakes/reservoirs within 100 miles, including California's Trinity Lake Unit, Whiskeytown Lake, Shasta Lake, and Willow Lake, such that the Lower Klamath Project reservoirs would not be rare or unique resources. Section 3.20.5 *Recreation – Potential Impacts and Mitigation* Potential Impact 3.20-2 discusses the impacts to flatwater fishing and boating. As discussed in Potential Impact 3.20-2, given that other regional facilities provide similar opportunities for reservoir-based recreation in an uncrowded setting, KRRC's proposal to retain and enhance most existing river access facilities, and Parcel B land transfer under the Proposed Project that would potentially allow for additional future river-based recreation opportunities, the Proposed Project would be highly unlikely to result in a loss of recreational facilities affecting a large area or substantial number of people.

Based on public comments on the Draft EIR, Section 3.20.3 *Recreation – Significance Criteria* has been revised to remove the requirement from the significance criteria for a recreational facility to be considered rare or unique before a change to or loss of a facility would be considered a significant impact. The particular revised criterion that would result in a significant impact to recreational resources is as follows: "Adverse changes to or loss of recreational facilities affecting a large area or substantial number of people." Please refer to Volume III Attachment 1 for the final Section 3.20 *Recreation*.

REC-2 Level of Detail in KRRC's Draft Recreation Plan

Some commenters have expressed concern regarding the analysis and/or significance determination for Potential Impact 3.20-4. Others request further details regarding any future site-specific review of the new recreation sites proposed in the KRRC's Draft Recreation Plan and details on the Proposed Project's mitigation measures that would help reduce potential impacts on recreation, consistent with CEQA Guidelines 15168(c).

The KRRC's Recreation Plan takes a programmatic approach to developing recreational facilities and mitigating any impacts attributable to these developments. Proposed new recreational facilities are being evaluated by KRRC, including consideration of public input on the potential types and locations of these facilities. A Final Recreation Plan would be submitted to FERC, and this plan would include any new recreation facilities that are proposed by the KRRC. The Final Recreation Plan would be subject to environmental review under NEPA, and mitigation measures would be determined by FERC. If implementation of the Final Recreation Plan (at FERC's direction) requires any further state or local approvals, then written checklists would be prepared pursuant to CEQA Guidelines sections 15162 and 15168(c) to ascertain whether further site-specific environmental review of individual reactional projects would be necessary. Such individual projects shall be subject to applicable best management practices and mitigation measures required by FERC, applicable mitigation measures in this EIR, such as Mitigation Measures WQ-1, TER-1,

TER-2, TER-3, TER-5, TCR-1, TCR-2, TCR-3, and HZ-1, and any other measures required by an agency with jurisdiction over those individual recreation projects. The potential environmental impacts of these new recreational facilities would be reviewed at a project level in subsequent evaluations prior to their implementation. Section 3.20.5 *Recreation – Potential Impacts and Mitigation* Potential Impact 3.20-4 has been removed in light of the discussion above. Please refer to Volume III Attachment 1 for the final Section 3.20 *Recreation*.

The EIR analyzes the potential environmental impacts of adding new recreational sites or expanding existing recreational sites for water quality (Potential Impact 3.2-4), aquatic resources (Potential Impact 3.3-21), terrestrial resources (Potential Impact 3.5-1, Potential Impact 3.5-7, Potential Impact 3.5-10), historical resources and tribal cultural resources (Potential Impact 3.12-1), and utilities (Potential Impact 3.18-1).

2.2.14 Hazards and Hazardous Materials Master Responses

HAZ-1 Identification and Disposal of Hazardous Materials due to Construction Activities

Numerous commenters expressed concern that hazardous materials associated with implementation of the Proposed Project, and their transport, use, disposal, accidental spill/release, handling, and/or emissions, have not yet been fully identified.

Please refer to a discussion of this topic in Volume I Section 3.21.2.1 *Hazards and Hazardous Materials – Environmental Setting – Transport/Releases of Hazardous Materials* (pages 3-1029 to 3-1031) and Volume I Section 3.21.2.3 *Hazards and Hazardous Materials – Environmental Setting – Contaminants/Contaminated Sites* (pages 3-1033 to 3-1035). Please also refer to Volume I Section 3.21.5 *Hazards and Hazardous Materials – Potential Impacts and Mitigation* Potential Impact 3.21-1, specifically pages 3-1042 to 3-1045, Potential Impact 3.21-2, specifically pages 3-1045 to 3-1046, and Potential Impact 3.21-4, specifically pages 3-1046 to 3-1047 for analysis of the potential impacts of the Proposed Project as related to the routine transport, use, disposal, accidental spill/release, handling, and/or emissions of hazardous materials. Pages 3-1043 to 3-1044 list federal and state regulations applicable to this project.

As discussed in Volume III Attachment 1 Section 3.21 *Hazards and Hazardous Materials*, after the Draft EIR was released for public comment, the State Water Board received a submittal from PacifiCorp (dated December 30, 2019) which included redacted versions of Phase I and Phase II Environmental Site Assessment (ESA) reports. As noted in the submittal, these reports included the following:

Phase I ESA documents

- Phase I ESA for the Lower Klamath Hydroelectric Project, Dated August 23, 2019
- Phase I ESA for the City of Yreka Diversion Dam, Dated July 10, 2019
- Phase I ESA for the Fall Creek Hatchery, Dated July 10, 2019

Phase II ESA documents

- J.C. Boyle Development, Hazardous Building Materials Survey (HBMS) Revision 1, Dated August 27, 2019
- Copco No. I Development, HBMS Revision 1, Dated August 22, 2019
- Copco No.2 Development, HBMS Revision 1, Dated August 22, 2019
- Iron Gate Development, HBMS Revision 1, Dated August 22, 2019
- Iron Gate Hatchery and Fall Creek Hatchery, HBMS Revision I, Dated August 22, 2019
- City of Yreka Diversion Dam, HBMS Revision 1, Dated August 27, 2019
- Iron Gate Hatchery Burn Pit, Phase II ESA, Dated September 13, 2019

These redacted reports confirm the findings in the Draft EIR, which disclosed the potential for certain types of hazardous materials (e.g., asbestos, heavy metals, polychlorinated biphenyls [PCBs] creosote-treated wood), at the various facilities as well as information in Appendix B: *Definite Plan – Appendix O-3 Hazardous Materials Management Plan*. Volume III Attachment 1 presents the final Section 3.21 *Hazards and Hazardous Materials*.

HAZ-2 Potential for Increased Wildfire Risk due to Loss of Lower Klamath Project Reservoirs

(A) Numerous comments expressed the generalized concern that the Lower Klamath Project reservoirs would no longer be available for fire response crews to use as a water source for firefighting if the dams were to be removed.

Please refer to a discussion of this topic in Volume I Section 3.17.2.1 *Public Services – Environmental Setting – Fire Protection* (pages 3-909 to 3-911) as well as Volume I Section 3.21.2.6 *Hazards and Hazardous Materials – Environmental Setting – Wildfires* (pages 3-1036 to 3-1040). Please also refer to Volume I Section 3.17.5 *Public Services – Potential Impacts and Mitigation* Potential Impact 3.17-2 (specifically pages 3-915 to 3-921), for an analysis of whether elimination of a long-term water source for wildfire services would substantially increase the response time for suppressing wildfires in the vicinity of the Lower Klamath Project, and Volume I Section 3.21.5 *Hazards and Hazardous Materials – Potential Impacts and Mitigation* Potential Impact 3.21-8 (specifically pages 3-1050 to 3-1053), for an analysis of whether dam removal construction-related activities and/or removal of the Lower Klamath Project reservoirs would

substantially increase the public's risk of loss, injury, or death associated with wildland fires.

KRRC's most recent application for water quality certification of the Proposed Project, as submitted to the State Water Board in December 2019 (KRRC 2019a), includes the following additional information about the Fire Management Plan:

- "KRRC intends to avoid a material net increase of fire risk as compared to baseline conditions in the Project area as defined in the Definite Plan."
- "KRRC is developing an updated Fire Management Plan that will include effective and feasible strategies and concepts to enhance both short-term and long-term fire prevention, detection, and suppression in the Klamath River Basin, and will submit the updated Fire Management Plan with FERC in support of the pending surrender application."
- "The updated Fire Management Plan is being developed in consultation with federal, California, Oregon, and local fire agencies. During construction, these measures include, but are not limited to meeting or exceeding federal, Oregon, and California requirements for fire prevention and suppression during construction activities, implementation of best management practices following National Fire Protection Association standards, and the designation of a safety officer on site that is responsible for overseeing fire responsibilities for construction operations 24 hours a day, seven days a week. The Fire Management Plan will also address long-term fire management to ensure that the Klamath River Basin's fire-fighting resources are not diminished due to the implementation of the Project, including the potential deployment of technology that will rapidly detect wildfire ignitions in the Basin allowing fire agencies to respond quickly to fire ignitions. KRRC is also consulting with fire agencies on identifying replacement water sources and access, including identification of aerial river access points."
- "In addition, KRRC has also contracted with Reax, a leading fire engineering firm that has assisted utilities throughout California (including PacifiCorp) to reduce operational fire risk. Reax will assist KRRC with the development of the updated Fire Management Plan to ensure that the measures set forth in the updated Fire Management Plan will effectively reduce short- and long-term fire risk as a result of the implementation of the Project".

Section 3.17.5 *Public Services – Potential Impacts and Mitigation* Potential Impact 3.17-2 and Section 3.21.5 *Hazards and Hazardous Materials - Potential Impacts and Mitigation* Potential Impact 3.21-8 have been revised to include the additional information presented above. Please refer to Volume III Attachment 1 Sections 3.17.5 *Public Services – Potential Impacts and Mitigation* Potential Impact 3.17-2 and Section 3.21.5 *Hazards and Hazardous Materials - Potential Impacts and Mitigation* Potential Impact 3.21-8 for these revisions.

(B) Numerous comments expressed concern that Recommended Measure PS-1 is not an enforceable mitigation measure, the KRRC's Fire Management Plan (FMP) is a draft plan that has not yet been reviewed by fire suppression agencies, and coordination with CALFIRE regarding their specific needs and abilities has not yet occurred.

In CALFIRE's comment letter on the Draft EIR dated February 25, 2019 (please refer to comment SA4-1), CALFIRE notes *"…It is fair to say the possible impacts of the dam removal on firefighting would depend on a variety of factors including: Location of fire, type of fire, fire behavior, firefighting resources assigned to the fire, time of year when the fire occurs, the water flow of the Klamath River on the day of the fire, etc…. Ultimately the impact of the dam removals will have to be evaluated on a case by case basis. CAL FIRE is used to fighting wildland fires in a large variety of circumstances and will adapt to whatever conditions we encounter at each fire. Also CAL FIRE understands that the …(KRRC) will be working with CAL FIRE on KRRC's Fire Management Plan to address the analyzed issues."*

In KRRC's comment letter on the Draft EIR, dated February 26, 2019 (please refer to comment ORG47-3), KRRC states *"As a condition of license surrender, KRRC will address any potential increased response time and associated wildland fire risk due to implementation of the Proposed Project."* KRRC's EIR comment letter further states *"KRRC continues to work with CAL FIRE to identify not only replacement sources of water, but ways in which KRRC can facilitate the reduction of overall emergency response times through communications and roadway improvements."* KRRC goes on to describe specific steps that they would take to implement replacement sources and reduce overall emergency response times under the Proposed Project.

As mentioned above, the KRRC included additional information about its ongoing coordination with CALFIRE in its recent application to the State Water Board for water quality certification for the Proposed Project (KRRC 2019a). This and other clarifying information has been incorporated into Volume III Attachment 1 Section 3.17.5 *Public Services – Potential Impacts and Mitigation* Potential Impact 3.17-2 and Section 3.21.5 *Hazards and Hazardous Materials – Potential Impacts and Mitigation* Potential Impact 3.21-8 for the revisions.

The State Water Board appreciates KRRC's commitment to addressing any potential for increased response time and associated wildland fire risks due to implementation of the Proposed Project as a condition of license surrender, and notes that the ongoing discussion and hiring of a contractor to reduce fire risk are steps that further increase the likelihood that fire risk will not increase, and may improve as a result of the mitigation measures. The State Water Board also appreciates the aforementioned comment letter from CALFIRE affirming the agency's ability to adapt to myriad fire risk situations and its intent to work with the KRRC on the Fire Management Plan. However, the EIR significance

determination related to this topic remains 'significant and unavoidable' since the terms of an updated Fire Management Plan and its incorporation of Recommended Measure PS-1 are not within the State Water Board authority, and the State Water Board therefore cannot ensure implementation of Recommended Measure PS-1. For additional discussion of preemption under the Federal Power Act, please refer to Master Response CEQ-2.

2.2.15 Master Responses for the Recirculated Portions of the Draft EIR

R-1 Comments Not Relating to Recirculated Portions of the Draft EIR

CEQA Guidelines section 15088.5 requires a lead agency to recirculate an Environmental Impact Report (EIR) when significant new information is added to the EIR, after public notice is given of the availability of the Draft EIR for public review but before certification of the Final EIR. If the revision is limited to a few chapters or portions of the EIR, the lead agency is only required to recirculate the chapters or portions that have been modified for public review. When the Draft EIR is revised only in part and the lead agency is recirculating only the revised chapters or portions of the EIR, the lead agency may request that reviewers limit their comments to the revised chapters or portions of the recirculated Draft EIR.

When a lead agency elects to partially recirculate an EIR, it can result in the lead agency receiving more than one set of comments from reviewers. In this case, the lead agency is only required to respond to: "(i) comments received during the initial circulation period [i.e., the Draft EIR, Volumes I and II circulation period] that relate to chapters or portions of the EIR that were not revised and recirculated, and (ii) comments received during the recirculation period [i.e., the Recirculated Draft EIR circulation period] that relate to the chapters or portions of the earlier EIR that were revised and recirculated." (CEQA Guidelines, section 15088.5, subd. (f)(2).)

On December 21, 2019, the State Water Board recirculated sections of the Draft EIR relating to air quality, greenhouse gas emissions and energy, and requested that reviewers limit their comments to the revised portions. The State Water Board is required to solicit and evaluate comments on the Recirculated Draft EIR, and to prepare written responses to significant environmental issues raised in those comments in accordance with section 15088 of the CEQA Guidelines. The comment period on the recirculated portions of the Draft EIR extended from December 21, 2019 until February 6, 2020.

Per section 15088.5 of the CEQA Guidelines, the State Water Board did not prepare written responses to comments received during the comment period for the recirculated portions of the Draft EIR, Volumes I and II if the comments do not pertain to the recirculated sections. However, such comments are included as part of the record and will be considered by the State Water Board before certifying the Final EIR.

R-2 Discussion of Windblown Dust from Recirculated EIR Section 3.9 (pages RE-3-29 to RE-3-30)

This master response addresses comments regarding drawdown of the Lower Klamath Project reservoirs and commenters' concerns that any subsequent exposure of sediments in the reservoir footprint could result in potential impacts relating to windblown dust and associated windblown dust related contaminates or other contaminates. Some commenters expressed concern regarding potential health impacts to surrounding residents. Additionally, commenters noted the Condit Dam removal had dust impacts and claim that similar impacts will occur with implementation of the Proposed Project. Also, commenters suggest that past drawdowns of Copco and Iron Gate Reservoir have resulted in increased dust exposure to residents around the reservoirs. As discussed herein and in the EIR, the character of the sediments, proposed revegetation measures, sampling of reservoir depositions, and other information, indicates that the potential impacts raised by commenters regarding windblown dust or related contaminates are unlikely to occur in a manner that would result in a change to the significance determinations.

With respect to comments regarding the potential for dust to be generated by sediment deposits remaining in the reservoir footprints following drawdown and dam removal, please refer to Volume III Attachment 1 Section 3.2.5.2 *Water Quality – Potential Impacts and Mitigation – Suspended Sediments* Potential Impact 3.2-3, which discusses how sediments remaining in the reservoir footprints would strengthen (i.e., harden) as they dry out and thus would be unlikely to result in windblown dust following reservoir drawdown. This understanding of sediment properties during and following drying is based on reservoir sediment field sampling and laboratory testing in 2012 (USBR 2012a) and 2018 (Volume II Appendix B: *Definite Plan – Appendix H*).

Moreover, as explained in the impact analysis and in Section 2.7.4 *Restoration Within the Reservoir Footprint* (pages 2-69 to 2-71), the Proposed Project includes revegetation of reservoir sediments remaining on the floodplain and the surrounding slopes during and immediately following drawdown to stabilize the sediments. Stabilization of sediments through planting is expected to be effective since laboratory revegetation "grow tests" showed that vegetation stabilized sediments from Copco No. 1 Reservoir (Appendix B: *Definite Plan – Appendix H* – Section 8.1.1 *Reservoir Sediment Characteristics*). The Proposed Project Reservoir Area Management Plan (Appendix B: *Definite Plan – Appendix H*; see also Volume I Section 2.7.4 *Restoration Within the Reservoir Footprint* [pages 2-69 to 2-71]) includes activities to promote revegetation and sediment stabilization such as sediment preparation and amendment; irrigation; aerial seeding using pioneer seed mixes; planting of pole cuttings, acorns, and container plants; and adaptively re-seeding or re-planting areas that do not sufficiently establish following initial restoration activities. Aerial seeding of grass seed mixes would occur during the reservoir drawdown period (January to March), as the reservoir water levels drop, and before the exposed reservoir

sediments dry and form a surface crust. During the dam removal period (March to December), additional seed plantings, irrigation, monitoring of plant growth and vegetation cover, re-seeding as needed, and maintenance of existing and previously planted vegetation would occur. Additionally, the Reservoir Area Management Plan includes relative vegetation cover targets for each year following dam removal; these targets are 70 percent cover for each planting zone by year 1, 75 percent by year 2, 80 percent by year 3, and 90 percent by year 5. Given the sediment properties, timing of reservoir drawdown, and the inclusion of a restoration plan, the potential for elevated levels of dust to be generated by sediment deposits remaining in the reservoir footprints following drawdown and dam removal is very low.

The use of revegetation efforts is well supported. As stated in Volume II Appendix B: *Definite Plan* (page 214), "The use of vegetation to stabilize reservoir sediments is a common practice and well documented approach to improve ecosystem processes. For instance, all of the dam removal and reservoir restoration plans that were reviewed as part of this work (Appendix H) had native vegetation establishment in reservoir areas as the primary component to provide long-term stabilization of exposed soils. Likewise, revegetation experiments, performed in 2008 by Ellen Mussman for the Elwha River dams, showed that vegetation reduced erosion of reservoir sediments by 33% and mulch could reduce erosion by as much as 99% (Mussman et al. Mussman et al. 2008)….KRRC also drew upon similar wildland restoration efforts found in wildfire area restoration, natural disaster areas (i.e. Mount St. Helens), and human-induced impacted areas since these altered and often barren landscapes are very similar to the remaining reservoir sediments. Establishment of native vegetation provides many important benefits for the stability of the remaining sediments in these disturbed areas."

Some commenters compare purported effects associated with the Lower Klamath Project reservoir sediments and the sediments remaining behind the Condit Dam (located in Oregon) following its removal. The two projects, however, are very different and it does not follow that the sediment deposits underlying the reservoirs would create the same degree of windblown dust. Specifically, the composition of the sediments of the two projects differs considerably, as does the timing of revegetation efforts following dam removal. The sediment deposits in Copco No. 1 and Iron Gate reservoirs contain approximately 14 to 16 percent sand (by mass) and 84 to 86 percent fine sediment (by mass) (Volume I Table 2.7-10 on page 2-67). In contrast, the sediment deposits behind Condit Dam contained a higher amount of sand (approximately 60 percent, by mass) and a lower amount of fine sediment (approximately 35 percent silt and clay, by mass) (Wilcox et al. 2014). The higher degree of fine sediment in the Lower Klamath Project deposits is aligned with the experimental observations of rapid strengthening (i.e., hardening) as these sediments dry out (see above), reducing the potential for windblown dust relative to the sediments that were originally behind Condit Dam. Furthermore,

Condit Dam was breached in October 2011, and vegetation seeding did not begin until 11 months later in September 2012 (PacifiCorp 2016f). As noted above, hydroseeding of the sediment deposits in the Lower Klamath Project reservoir footprints would begin *during* drawdown, and revegetation efforts would continue throughout the year of drawdown and dam removal, with monitoring and adaptive management occurring throughout the first five years following dam removal and completion of revegetation, or until the performance criteria have been met.

Commenters noted past occurrences where Copco No. 1 reservoir water surface elevations decreased, which the commenters believe may have resulted in increased airborne dust, and they expressed concern that the same effect could occur under the Proposed Project. The water surface elevation decreases of Copco No. 1 Reservoir as a part of Klamath Hydroelectric Project operations, however, are quite different from the anticipated management of reservoir drawdowns under the Proposed Project. During the extreme drought of 2014-2016, PacifiCorp coordinated late-2014 water releases from Iron Gate and Copco No. 1 reservoirs to provide a small degree of flexibility for managing irrigation water in the Upper Klamath Basin. A comparable water borrowing arrangement also occurred in 2018. These water-borrowing operations reduced the water surface elevations of Iron Gate and Copco No. 1 reservoirs and occurred during dry periods where the sediments would have dried quickly and may have been mobilized during wind events. In contrast, the Proposed Project's drawdown is scheduled to occur during January-March which is a period of cool temperatures and precipitation which is likely to reduce the speed at which sediments dry in comparison to sediment drying under past Klamath Hydroelectric Project operations. Additionally, as explained above, the Proposed Project includes restoration actions such as aerial seedings to help stabilize the sediments and prevent windblown dust. Water surface elevation changes under current Klamath Hydroelectric Project operations did not include restoration and seeding actions to reduce windblown dust to residents near Copco reservoir.

In the comments received related to windblown dust, there were several references to other dam removal projects or bodies of water in the West where commenters believe that windblown dust was an issue. These included Condit Dam (addressed above), Owens Lake, and the Salton Sea. The available information, however, does not indicate that the Proposed Project is similarly situated in either geography or operations. The Klamath Hydroelectric Reach during implementation of the Proposed Project is characterized by differing wind patterns, soil types, physical properties of reservoir sediments, topography, and the implementation of a robust reservoir restoration plan designed to stabilize remaining sediments and exposed areas after drawdown. Past drawdown events in the Klamath Hydroelectric Reach where residents have stated that windblown dust was an issue would be prevented during implementation of the Proposed Project due to implementation of the restoration plan. These efforts to stabilize reservoir sediments and exposed areas were not implemented during

past drawdowns. As noted above, the restoration plan for the reservoir areas is based on current knowledge of reservoir restoration and experience gained from recent dam removal projects. This includes designing a restoration plan intended to minimize the potential for undesirable sediment releases that would also reduce the potential for windblown dust.

As explained herein, the likelihood of substantial amounts of windblown dust occurring as a result of dam removal under the Proposed Project are low. Nonetheless, the EIR adequately disclose the potential contaminants associated with the Proposed Project. Volume III Attachment 1 Section 3.2.2.8 *Water Quality – Environmental Setting – Inorganic and Organic Contaminants* provides a general summary of the inorganic and organic contaminants measured in the Klamath River waters, the reservoir sediments, and aquatic biota. Please also refer to Volume III Attachment 1 Appendix C, Section C.7 *Inorganic and Organic Contaminants* for further details about the inorganic and organic contaminants measured in the reservoir sediments. Volume III Attachment 1 Section 3.2.2.8 *Water Quality – Environmental Setting – Inorganic and Organic Contaminants* includes the chemicals of potential concern detected in reservoir samples and comparisons of detected chemical concentrations with USEPA and California Environmental Protection Agency (CalEPA) human health screening levels to assess human health risk.

For example, as stated in Section 3.2.2.8 *Water Quality – Environmental Setting – Inorganic and Organic Contaminants*, 4,4'-dichlorodiphenyltrichloroethane (DDT), 4,4'-dichlorodiphenyldichloroethane (DDD), 4,4'-dichlorodiphenyldichloroethylene (DDE), dieldrin, and 2,3,7,8-tetrachlorodibenzodioxin (TCDD) were detected only in J.C. Boyle sediments. Additionally, no PCBs were found above U.S. Army Corps of Engineers (USACE) Puget Sound Dredged Disposal Analysis Program (PSDDA) screening levels (Shannon & Wilson, Inc. 2006), and the degree of exceedance for total PCBs may reflect regional background conditions. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Additionally, Volume III Attachment 1 Section 3.2 *Water Quality*, Volume II Appendix B *Definite Plan* (pages 148 to 150), and Volume III Attachment 1 Appendix C discuss the levels of contamination measured in the reservoir sediment deposits. Volume III Attachment 1 Section 3.2 *Water Quality* discusses the potential impacts from human exposure to inorganic and organic contaminants in the reservoir sediment deposits. Concentrations of inorganic and organic contaminants in the reservoir sediments mean that the potential for problematic levels of human exposure to these compounds once reservoir drawdown occurs is unlikely. As stated in Section 3.2.5.7 *Water Quality – Potential Impacts and Mitigation – Inorganic and Organic Contaminants* Potential Impact 3.2-13, for the Lower Klamath Project reservoir sediments remaining in the reservoir footprint and along the river banks, detected levels of dioxin, furan, and dioxin-like PCBs are only slightly above regional background concentrations,

and arsenic and nickel are the only compounds detected at levels exceeding USEPA and/or CalEPA residential screening levels to protect human health. The section also states that exposure to arsenic in these areas would be constrained by short-term activities and long-term future land use that would support only limited exposure patterns, such that human exposure to arsenic and nickel in sediments in the reservoir footprint would be a less-than-significant impact. The USEPA and CalEPA screening levels used in the analysis in Potential Impact 3.2-13 relate to the ingestion of soil, which differs from the inhalation of airborne dust. However, estimating exposure from both pathways is dependent on the concentration of contaminants and the timeframe over which exposure occurs. In sum due to the mitigating factors noted above (i.e., physical properties of reservoir sediments, level of contamination in reservoir sediments, seasonally wet conditions during drawdown, and implementation of the restoration plan immediately following reservoir drawdown), it is not anticipated that any additional emissions from windblown dust would result in a change to the significance determinations in recirculated Section 3.9 *Air Quality* related to the emissions of particulate matter and potential health effects.

Although there is the potential that criteria air pollutants and GHG emissions may be generated during any efforts to reduce windblown dust during restoration activity, these emissions are not anticipated to be substantial enough to result in a change in the significance determinations in recirculated Section 3.9 *Air Quality* and Section 3.10 *Greenhouse Gas Emissions and Energy*. Due to the conservative assumptions used to estimate the criteria air pollutant and GHG emissions from construction activity, any emissions generated to address windblown dust would be accounted for in the emissions estimates related to restoration activities.

2.3 Written Comments and Responses – Draft EIR

This section presents written comments received on the Draft EIR and the State Water Board's responses to those comments. Written comments and responses in this section are organized by comment affiliation type. To determine which affiliation your comment is associated with, please refer to Table 2-1 or Table 2-2.

Table of Written Comments and Responses

2.3.1 State Agencies 2-138
2.3.2 Local Agencies 2-145
2.3.3 Native American Tribes 2-283
2.3.4 Organizations 2-364
2.3.5 Individuals 2-1178

2.3.1 State Agencies

This section presents written comments received on the Draft EIR from state agencies and the State Water Board's responses to those comments. Written comments and responses in this section are organized alphabetically by agency name. To determine whether your comment is associated with an affiliation type other than state agencies, please refer to Table 2-1 or Table 2-2.

Table of Written State Agency Comments and Responses

CAL FIRE, Mike Hebrard 2-138
California Department of Fish and Wildlife, Tina Bartlett, Jeffrey Stoddard, Tiffanny Manko 2-139

CAL FIRE, Mike Hebrard

Comment SA4-1

The Water Board Environmental Impact Report found that the removal of the dams would have a "significant and unavoidable" impact due to the "elimination of a long-term water source for wildfire services" and a potential substantial increase in response time for suppressing wildfires.

The possible impact of the dam removals on CAL FIRE's wildland firefighting is a very complicated issue. It is fair to say the possible impact of the dam removal on firefighting would depend on a variety of factors including: Location of fire, type of fire, fire behavior, firefighting resources assigned to the fire, time of year when fire occurs, the water flow of the Klamath River on the day of the fire, etc.

Ultimately, the impact of the dam removals will have to be evaluated on a case by case basis. CAL FIRE is used to fighting wildland fires in a large variety of circumstances and will adapt to whatever conditions we encounter at each fire. Also, CAL FIRE understands that the Klamath River Renewal Corporation (KRRC) will be working with CAL FIRE on KRRC's Fire Management Plan to address the analyzed issues.

Please feel free to contact me with any questions regarding this letter.

Response to Comment SA4-1
Thank you for your comment. The information provided in this comment was used to help develop Master Response HAZ-2.

California Department of Fish and Wildlife, Tina Bartlett, Jeffrey Stoddard, Tiffanny Manko

Comment SA3-1
The California Department of Fish and Wildlife (Department) appreciates the opportunity to comment on the Draft Environmental Impact Report (DEIR) for the Lower Klamath Project License Surrender (Project). The proposed Project consists of the decommissioning and removal of the J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate dams and associated facilities located on the Klamath River. The Project implements portions of the Klamath Hydroelectric Settlement Agreement (KHSA), as amended. The Department is a signatory to the KHSA and has been actively participating in matters related to the Project since December 2000.

The Department provided a letter to the State Water Resources Control Board (SWRCB) on the Notice of Preparation for the subject DEIR on February 1, 2017. In addition, the Department provided a letter to the SWRCB regarding our support of the draft 401 water quality certification on June 26, 2018, and the aquatic resource measures as described in the Definite Plan on November 9, 2018. We hereby incorporate the comments provided in those letters by reference. The Department worked closely with the Klamath River Renewal Corporation (KRRC) on the development of the restoration plan, the terrestrial resource measures, and the aquatic resources measures as they are presented in the Definite Plan and we support their implementation. Department personnel have reviewed the DEIR and offer the following comments.

KRRC proposes to remove three dams in California and one in Oregon to create a free-flowing Klamath River in the Hydroelectric Reach and provide for volitional fish passage in accordance with the terms of the KHSA. Currently, the Klamath Hydroelectric Project is causing irreparable harm to the State's fish and wildlife resources. The dams alter the flow of the river, block fish passage, and create poor water quality conditions that cause toxic algal blooms, low dissolved oxygen(DO), and high-water temperatures. The dams also contribute to conditions that foster fish disease and result in high juvenile salmon mortality in

the Klamath River. The Project, if approved and implemented, will return the Klamath River in the Hydroelectric Reach to natural riverine conditions resulting in improved water quality and a more natural range of water temperatures. The Project will benefit anadromous fish populations by increasing access to historical habitat, restoring mainstem and tributary habitat, and improving biological and physical factors that heavily influence fish populations (e.g., flow conditions, sediment and bedload transport, water quality, fish disease, toxic algal blooms, and water temperature).

The Department supports the establishment of a free-flowing Klamath River and volitional fish passage through implementation of the proposed Project, specifically as it relates to the recovery and conservation of fish and wildlife resources. Although we recognize that the SWRCB's analysis indicates that the Project will result in short-term significant and unavoidable impacts, these impacts would largely be limited to the time frame of direct dam deconstruction actions and sediment release.

The short-term aquatic effects of the Project will primarily occur from the release of sediment during reservoir drawdown. These effects include high concentrations of suspended sediment, bedload mobilization and deposition, and low DO levels, all of which are well described in the DEIR. It is the Department's position that the measures proposed to minimize impacts to aquatic resources from these short-term effects are adequate.

The short-term effects of the Project on terrestrial resources will primarily occur due to construction related activities and noise-levels. Again, it is the Departments position that these effects will be adequately off-set by the measures proposed. We concur with the list of short-term effects identified in the DEIR and summarized on page ES-12.

The long-term benefits of the Project will ultimately outweigh the short-term impacts. The Department concurs with the list of the long-term benefits of the proposed Project provided in the DEIR starting on page ES-9. The Project would significantly improve Klamath River water temperatures and DO conditions, reduce algal toxins, reduce the incidence of fish disease in juvenile salmon, restore historical anadromous fish habitat, and eliminate fish passage barriers. In addition, the Project would result in long-term beneficial effects to terrestrial resources. Some of those benefits include, increased wildlife movement opportunities, and increased distribution of riparian habitat, which, in turn, will lead to beneficial effects on willow flycatcher (Empidonax trail/ii), a species listed as threatened under the California Endangered Species Act. We provide greater detail regarding the long-term benefits of dam removal below.

There has been an increase in dam removal projects over the last five years (O'Conner et al. 2015) and studies have demonstrated the following benefits: the successful establishment of self-sustaining populations of salmonids in

previously inaccessible habitat (Anderson et al. 2015), and the proportion of returning fish born in upstream reaches increasing over time (Engle et al. 2013; Hatten et al. 2015; Allen et al. 2016). On the Elwha River, the total escapement of Chinook Salmon (Oncorhynchus tshawytscha) (4,243 adults) approximately doubled over the 20-year average immediately following dam removal and, after the Savage Rapids Dam was removed from the Rogue River (2009), salmonid redds were documented within the bounds of the former reservoir in one year, and over twice that many redds were identified within the former reservoir in two years (ODFW 2011). Recent dam removal efforts show that the rivers are healing very quickly, and fish are instinctively repopulating historic habitat. In a comprehensive synthesis of dam removal literature prepared by O'Conner et al. (2015) they state that a major finding of dam removal research is that rivers are resilient with many responding quickly to dam removal by trending towards their pre-dam states.

Response to Comment SA3-1
Thank you for your comment. A response to this comment is not required under CEQA because the comment does not raise a significant environmental issue (CEQA Guidelines, section 15088) and/or would not change an environmental impact or mitigation measure analyzed in the EIR. This comment is included as part of the record and will be considered by the State Water Board before certifying the EIR (CEQA Guidelines section 15090).

Comment SA3-2
There are a number of peer-reviewed scientific and engineering studies that document the Project's benefits. The following documents more thoroughly discuss the Project's long-term benefits:

- *Klamath Dam Removal Overview Report for the Secretary of the Interior- an assessment of science and technical information (March 2013)*
- *Definite Plan for the Lower Klamath Project (Appendix I and Appendix J) (June 2018)*
- *The Joint Preliminary Biological Opinion on the Proposed Removal of Four Dams on the Klamath River, Conducted by: National Marine Fisheries Service and Fish and Wildlife Service Region 8 (November 2012).*
- *Klamath Facilities Removal Environmental Impact Statement/ Environmental Impact Report (EIS/EIR). (The Department and the Bureau of Reclamation were co-leads, 2012)*
- *Summary of Findings Informing the Secretarial Statement of Support (A transmittal to FERC from the Department of the Interior 2016)*
- *Preliminary Comments and Recommendations on PacifiCorp's Application for New Major License, Klamath River Hydroelectric Project, FERC No 2082, Klamath and Siskiyou Counties (a letter prepared by CDFW and submitted to FERC on March 27, 2006)*

In general, the Department concurs with all the benefits to natural resources from dam removal identified in the above referenced documents. Although this letter highlights some of the benefits identified in those documents, we want to emphasize that our silence as to any natural resource benefits described in any of the above identified documents should not be interpreted as a rejection or disagreement with any such benefits. We have drawn from the above listed documents to prepare the following section of this letter.

Response to Comment SA3-2
Please refer to response to comment SA3-1.

Thank you for providing a list of peer-reviewed scientific and engineering studies that document the Proposed Project's beneficial effects. During draft EIR development, the State Water Board considered all of the sources cited in California Department of Fish and Wildlife's (CDFW's) February 21, 2019 letter in addition to other resource materials included in reference sections for each resource area of the Draft EIR.

Comment SA3-3
The construction of PacifiCorp's hydroelectric dams on the Klamath River has blocked fish passage to the upper basin for nearly 100 years. The lack of fish passage at the hydroelectric facilities has resulted, and continues to result, in direct adverse impacts on anadromous fish resources of the Klamath Basin. Long-term declines of Klamath Basin fisheries have been estimated at 92 percent to 96 percent for wild fall-run Chinook Salmon, 98 percent for spring-run Chinook Salmon, 67 percent for steelhead trout (0. mykiss) (since 1960), 52 percent to 95 percent for Coho Salmon (0. kisutch), and 98 percent for Pacific Lamprey (Lampetra tridentata) (Overview Report). The research suggests that salmonids will benefit from a host of ecological improvements resulting from dam removal including access to miles of spawning and rearing habitat upstream from Iron Gate Dam. It is estimated that the Project will result in access to 76 miles of habitat for Coho Salmon, 300 miles for Chinook Salmon (Huntington 2004), and 420 miles for steelhead (Huntington 2004; 2006). In addition, recolonization of previously inaccessible reaches of the river will also restore the flow of marine-derived nutrients to upstream portions of the watershed resulting in an overall boost to ecosystem nutrient budgets and productivity (Tonra et al. 2015).

Water Quality and Water Temperature

The long-term benefits of dam removal include overall increases in DO concentrations. The reach of the Klamath River downstream of Iron Gate Dam is predicted to have a DO level increase of 3 to 4 mg/L during the summer and late fall (PacifiCorp 2005), which will reduce stresses to juvenile salmonids rearing in the mainstem.

In the long-term, it is anticipated that water temperatures downstream of the Iron Gate Dam site will be 2°c to 10°C lower during August through December and 2°c to 5°C higher during January through March than under the existing conditions. The generally warmer spring temperatures and cooler summer and fall temperatures are likely to benefit salmonid species. In addition, the more natural diurnal water temperature variation will be more synchronous with historical migration and spawning periods for salmon species. Benefits associated with increased spring water temperatures include increased growth rates for juveniles (Dunne et al. 2011) which has been shown to increase ocean survival (Bilton et al. 1982, Henderson and Cass 1991, Lum 2003, Jokikokko et al. 2006, Muir et al. 2006).

Hydrograph

Increased (i.e., natural) flow variability in the Klamath River mainstem will increase the effectiveness of environmental cues and better enable juvenile salmonids to adapt to changes in flow. Juveniles make localized movements in response to changes in environmental conditions at temporal scales of hours to months. Increased flow variability therefore is expected to increase the likelihood of juvenile survival due to their redistribution to suitable refugia sites upstream or downstream when they detect changes in flow.

Disease

Outmigrating juvenile salmonids within the Lower Klamath River Basin currently experience significant mortality from infectious disease, with recent estimates of disease-related mortality in downstream migrants as high as 90 percent, in specific areas for specific times (CDFW 2006). The Project will restore flows in the Klamath River that create channel bed scour. This bed scour will result in habitat disturbance of the polychaete worm that hosts Ceratonova shasta (FERC 2007), a myxosporean parasite that infects salmonids and can lead to mortality. In the long-term, reducing polychaete habitat will likely lead to an increase in the abundance of salmonids by increasing outmigration survival, particularly for juvenile Coho Salmon (FERC 2007).

Nuisance Algae

The Project will eliminate the habitat for the toxic blue-green algae (Dunne et al 2011, Hamilton et al. 2011). Blue-green algae thrives in stagnant water and is intolerant of turbulent water. The elimination of the reservoirs will result in an immediate and long- term reduction in toxic algal blooms which will improve long-term water quality (pH and DO) in the mainstem Klamath River.

Sediment and Debris Transport

The Project will result in a more natural sediment transport regime (Reclamation 2011, Hamilton et al. 2011, USDOI and CDFG 2012), which will increase the complexity in the channel bed. It is anticipated that these changes will enhance spawning, incubation, and rearing habitat for salmonids and reduce fish disease prevalence in the Klamath River. Increased delivery rate of debris will result in large wood deposition which has also been shown to increase salmonid abundance, survival, and production (Keeley et al. 1996, Solazzi et al. 2000, Roni and Quinn 2001, Whiteway et al. 201O, White et al. 2011).

Climate change

Based on the climate change model prediction of increasing water temperatures in the Klamath River watershed, access to the cold-water tributaries in the Hydroelectric Reach will improve salmonid population resilience and increase the probability of long-term persistence. The National Research Council (2004) wrote, "For salmonids, the most important potential changes [in the Klamath River aquatic environment due to climate change] include altered timing of snowmelt, lower base flows, and additional warming of water in summer." Access to spring-fed tributaries of the Klamath River in the Hydroelectric Reach will provide important refugia for salmonids as the climate continues to change.

In sum, the improved mainstem aquatic habitat conditions that will result from implementation of the Project (e.g., increased DO concentrations, increased flow variability, more natural water temperature patterns, decreases in disease, and increased gravel and large wood recruitment) and increased spatial distribution of habitat for native fishery resources are expected to improve ecosystem function and the survival of all fishery resources in the Klamath River in the long-term.

We look forward to working closely with KRRC and the SWRCB on an adaptive management and monitoring program for the Project. There are a number of plans that will require coordination with and approval from the Department prior to Project implementation including:

1. *Water Quality Monitoring Plan*
2. *Fish Presence Monitoring Plan*
3. *Tributary Mainstem Connectivity Plan*
4. *Spawning Habitat Availability Report and Plan*
5. *Juvenile Salmonid Rescue and Relocation Plan*
6. *Hatchery Operations and Maintenance Plan*
7. *Restoration Plan*
8. *Recreation Facilities Plan*
9. *Hydropower Operations Plan*

In closing, we would like to emphasize that the Department is committed to building and maintaining partnerships that achieve comprehensive and collaborative solutions to fisheries restoration and recovery in the Klamath River watershed. The Department will continue to coordinate with agricultural and water user communities, Tribes, Siskiyou County, our fish agency partners, commercial fishing interests, and conservation groups, to achieve that end. The Department continues to look for solutions to difficult natural resource issues by staying engaged with various stakeholders in the Klamath River Basin. Ultimately, the Department is interested in the long-term success of these holistic efforts beyond just dam removal.

Response to Comment SA3-3
Please refer to response to comment SA3-1.

2.3.2 Local Agencies

This section presents written comments received on the Draft EIR from local agencies and the State Water Board's responses to those comments. Written comments and responses in this section are organized alphabetically by agency name. To determine whether your comment is associated with an affiliation type other than local agencies, please refer to Table 2-1 or Table 2-2.

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Board of Harbor Commissioners of the Crescent City Harbor District, James Ramsey

Comment LA5-1
The Board of Harbor Commissioners of the Crescent City Harbor District wishes to voice their support for the removal of the dams located on the Klamath River.

The Board of Harbor Commissioners further supports the Klamath River Renewal Corporation's (KRRC) application to the State Water Board for a Clean Water Act section 401 certification for the Federal Energy Regulatory Commission Project No. 14803 license surrender of the Lower Klamath Project. The beneficial results

of the dam removal project include positively affecting the water quality of the Klamath River and by doing so, taking an historic step toward restoring traditional salmon runs. Dam removal is crucial to restoring the natural ecosystem that existed before construction of the dams.

Response to Comment LA5-1
Thank you for your comment. Please refer to Master Response GEN-1.

City of Crescent City, Blake Inscore

Comment LA7-1
Crescent City supports removal of the Klamath River dams as analyzed in the State Water Resources Control Board's recent Draft Environmental Impact Report (DEIR).

Crescent City serves as the home port for numerous commercial and recreational fishing vessels. The fishing industry is a major source of income for the City and includes fishing, seafood markets, seafood processing and support for local businesses like marine repair and supply services, restaurants and grocery stores. Many of our residents depend on these industries for their livelihood.

The Klamath River was once the third-largest salmon-producing river on the West Coast, and salmon played a large part in our fishing industry's prosperity. However, Klamath River dams blocked the migration of adult fish to historic upstream spawning grounds, greatly reducing salmon populations, and the region's commercial fishing industry has been severely compromised by these reduced salmon runs.

Crescent City-based recreational fishing has suffered as well, putting an unwelcome drag on our economy and pressuring city budgets and services.

We strongly believe, based on the DEIR, that a free-flowing Klamath will revitalize both segments of our fishing industry, and in turn create jobs and bring revenue to Crescent City that will allow us to better serve our residents.

For the reasons outlined above, Crescent City supports the Proposed Project reviewed in the DEIR and looks forward to the benefits it will provide to our region.

Response to Comment LA7-1
Thank you for your comment. Please refer to Master Response GEN-1.

City of Yreka, Steven Baker, Don Henion

Comment LA8-1

The State Water Resources Control Board ("SWRCB") has circulated for public comment (State Clearinghouse No. 2016122047) a Draft Environmental Impact Report (DEIR; KRRC 2018; hereafter known as the "DEIR") which sets forth the fact that PacifiCorp has applied to the Federal Energy Regulatory Commission ("FERC") for authority to decommission and remove four PacifiCorp owned and operated Klamath Hydroelectric Project dams, the flow of which is regulated by the Bureau of Reclamation ("BOR"). The application requests a substitution of permitees from PacifiCorp to the Klamath River Renewal Corporation, a 501(c)(3) corporation formed to potentially oversee the project ("KRRC").

The dams proposed to be decommissioned are the Iron Gate Dam, the Copco No. 1 Dam, the Copco No. 2 Dam, the J.C. Boyle Dam, and various appurtenant facilities, such as the removal and relocation of most of the infrastructure of the Iron Gate Fish Hatchery to a new fish hatchery located on Fall Creek immediately adjacent to the City of Yreka's diversions for its municipal water supply (collectively, the "Lower Klamath Facilities").

Response to Comment LA8-1

Thank you for your comment. This comment concerns a summary of the Lower Klamath Project.

Comment LA8-2

In significant part, the application has requested FERC to divide the Klamath River Basin Hydroelectric Project license into two separately designed projects: 1) The four lowermost dams on the Klamath River to a separate Lower Klamath Facilities project license; 2) The other PacifiCorp hydroelectric owned or operated facilities that are not proposed to be decommissioned. FERC has granted this request. The application also requests that FERC allow the transfer of the Lower Klamath Project license from PacifiCorp to KRRC. KRRC would then implement FERC approved steps to remove/decommission those facilities. Finally, the application requests that FERC stay its proceedings on PacifiCorp's (the current licensee) pending application for license renewal until FERC takes final action on the application. ("Proposed Project").

PacifiCorp's FERC license on the Lower Klamath Project expired in March 2006. FERC has not yet approved the Proposed Project, the transfer of the license, nor indicated what steps, if any, it will require should it approve the decommissioning of the Lower Klamath Facilities. FERC has referred the Proposed Project to an Independent Board of Consultants ("BOC") to fully review the Klamath Renewal Project and make its recommendations upon which FERC will base its ultimate decision to approve, disapprove or order modifications to the Proposed Project. The individuals on the BOC have expertise in dam construction and removal, engineering, aquatic and terrestrial biology, financial feasibility, construction cost estimating, insurance, and bonding for large infrastructure projects.

Response to Comment LA8-2
This comment concerns the Federal Energy Regulatory Commission (FERC) application for Lower Klamath Project and related issues.

Comment LA8-3
Significantly, although FERC has ultimate control over the nature and scope to the Proposed Project the DEIR is not being jointly submitted for comment with a NEPA environmental study. A NEPA Final Environmental Impact Study ("FEIS") was circulated and approved in 2012 but this study is outdated and FERC has required additional studies and information before that process can proceed.

Response to Comment LA8-3
Comment noted. Please see Master Response CEQ-1 for additional information.

Comment LA8-4
The Proposed Project is the product of an agreement between the United States Department of the Interior (which is the overseeing agency for the Bureaus of: Indian Affairs; Land Management; Reclamation; Park Service; U.S. Fish and Wildlife and U.S. Geological Survey), United States Department of Commerce's National Marine Fisheries Service, State of California, California Natural Resources Agency (which is the umbrella agency for Department of Water Resources, Department of Fish and Wildlife, Department of Conservation), California Department of Fish and Wildlife, the State of Oregon, Oregon State of Environmental Quality, Oregon Department of Fish and Wildlife, Oregon Water Resources Department and the permittee/owner PacifiCorp (a subsidiary of Berkshire Hathaway) as well as 35 other tribal, fish and conservation related NGOs, irrigation entities and water users. This agreement is entitled the Klamath Hydroelectric Settlement Agreement, dated February 18, 2010, as amended April 6, 2016 and November 30, 2016 ("AKSA"). The AKSA has not been sanctioned by the U.S. Congress nor ratified by state or federal law. It is an agreement whose validity has not been tested in Court and we are not aware of any pending litigation in that regard.

Response to Comment LA8-4
This comment concerns the Klamath Hydroelectric Settlement Agreement (KHSA).

Comment LA8-5
The federal compact to implement the 2010 agreement, was introduced and reintroduced to the House of Representatives and the U.S. Senate and variously referred to as S.1851 the "Klamath Basin Economic Restoration Act of 2011" and HR.3398, S2739 – the "Klamath Basin Water Recovery and Economic Restoration Act of 2014" and S.133 – the "Klamath Basin Water Recovery and Economic Restoration Act of 2015." None of these bills were signed into law and, accordingly, federal funds were not appropriated for its implementation.

Implementation of the AKSA is now being funded with a surcharge on PacifiCorp customers ($200 million) and by California State water bond funds ($250 million). It is estimated that if this agreement is not implemented, and FERC proceeds to relicense the dams, that PacifiCorp projects that it will incur a loss estimated at 20 million dollars per year on the Klamath Hydroelectric Project, which loss, PacifiCorp will be entitled to recover from its ratepayers under PUC regulatory standards.

Response to Comment LA8-5
This comment concerns the Klamath Hydroelectric Settlement Agreement (KHSA).

Comment LA8-6
Yreka's sole concerns, as related in these comments, are to ensure that the Proposed Project does not, in any manner, presently or consequently in any future period, adversely affect Yreka's right to divert and consumptively use water for municipal purposes under its Water Right Permit.

The possible areas that Yreka can presently identify through the data and plans proposed thus far, related to the following areas:

1. The replacement and reconstruction of its water transmission pipeline with a water transmission pipeline that is safe and secure from external threats that could cause any interruption in municipal water service.

2. The lack of specificity of the exact improvements to be made to Yreka's water diversion facilities on Fall Creek. The lack of such concrete specificity renders it premature and impossible to adequately address those particular impacts of the Proposed Project.

3. The effects of the proposed location, construction and expansion of a defunct fish hatchery and reconstruction of rearing ponds at Fall Creek, which are proposed to divert water under a junior water permit and further proposed to rear and release endangered species which could, in the future, cause further water restrictions upon Yreka's right to take under its consumptive water permit.

4. The effect of the project on PacifiCorp's pre-1914 water right to divert water from Spring Creek (16.5 cfs) and from Fall Creek to its Fall Creek Hydroelectric Facility upon which adequate water flow to Yreka's water diversion is predicated.

Response to Comment LA8-6
This comment summarizes some of the major concerns in the City of Yreka's letter. Please refer to Master Responses WSWR-3, WSWR-5, WSWR-6, WSWR-7, and responses to comments LA8-20 and LA8-22. Please also see responses to individual comments in this letter for more detailed information on the issues summarized here.

Comment LA8-7

5. The proposed deconstruction of the majority of the existing fish hatchery located at Iron Gate together with the lack of adequate studies and analysis of maintaining, improving and expanding hatchery activities at Iron Gate Hatchery or all other alternative locations which would thereby obviate any possible additional future adverse impacts on Yreka's right to divert or restrict the flow to such diversion, on Yreka's consumptive municipal water diversion from Fall Creek.

6. The data-deficient basis, lack of specificity and procedural compliance with applicable law in prematurely requiring Yreka to provide comments on a project that is still subject to change in the proceedings before the Federal Energy Regulatory Commission.

Response to Comment LA8-7

This comment summarizes some of the major concerns in the City of Yreka's letter. Please see responses to individual comments in this letter for more detailed information on the issues summarized here. Additionally, please see response to comment LA8-40 and Master Response CEQ-1.

Comment LA8-8

7. The assumption by the SWRCB of lead agency status when this status properly rests with the Klamath River Basin Compact Commission which has not been consulted, held public hearings, received public input or made any determinations regarding the Proposed Project.

Response to Comment LA8-8

Please refer to Master Response CEQ-4.

Comment LA8-9

Fall Creek is a tributary of the Klamath River and part of the Klamath Water Basin network. As stated in the DEIR, the City of Yreka, operates a public municipal water supply system and takes its normal water supply exclusively from Fall Creek under the allowance granted under California State Water Right Permit 15379, Application #22551, a water right that allows the diversion and consumption of up to 15 cubic feet per second ("cfs") (9.7 mgd) and allows diversion of 6,300 acre/feet annually for domestic and municipal water uses (the "Permit"). Yreka's water supply originates from two diversion impounds whose points of diversion are specified on the Permit. During extreme drought emergencies Yreka selectively provides other smaller municipalities with a small allocation of water in order for those municipalities to supply clean water to their inhabitants and businesses for subsistence purposes. No elaboration on the environmental impacts on humans would seem necessary if Yreka was deprived of its water supply. The effect of a project on humans is considered in the NEPA process.

The primary point where the city takes its water is known as the "A" Dam and is located directly below the tailrace of the PacifiCorp's Fall Creek Hydroelectric Facility. This powerhouse is fed by a penstock which receives water from a diversion canal from Fall Creek. The City "A" Dam is upstream of the intake of the California Department of Fish and Wildlife rearing ponds which the state ceased all operations in 2004.

City operations occasionally require adjustment due to the operational aspects of the powerhouse. Primarily, this happens when the PacifiCorp's powerhouse trips offline, or is taken offline for maintenance. PacifiCorp will then change the gates at the Fall Creek Diversion Dam to send water down the natural channel of Fall Creek to Yreka "B" Dam instead of the penstock to the powerhouse. The "B" Dam is located in the natural channel of Fall Creek directly below the lower set of barrier falls.4 City Staff must then manually install boards and open a valve to allow water from the "B" Dam to be gravity piped to the intake of the "A" Dam. This operational situation alters the flow over to the "A" Dam. Water from the tailrace of the powerhouse slowly reduces and depending on the situation, may cease entirely. It is important to understand that the convergence of the natural channel of Fall Creek and the tailrace section is located below the former rearing pond intake.

Yreka's headworks is located at the "A" Dam. It is this location where water enters the singular intake point of a 24" pipe of Yreka's water transmission system. From the headworks, gravity conveys the water to a pump station to the West. From that point the pipe lays on the bottom of Iron Gate Reservoir thence on to Yreka's water storage tanks and purification plant. The City's water conveyance pipeline is 23 miles long.

SWRCB required in Yreka's amended water diversion permit that 15 cfs or more must flow past the Dams "A" and "B" combined for fish and wildlife purposes (See Attachment 1). When this requirement was requested in 1967 by the California Department of Fish and Wildlife the Department had not yet sought its own water appropriation of 10 cfs, which was CWRQCB permitted in 1979. The bypass measurement is taken downstream of the confluence of the tailrace section and the natural watercourse of Fall Creek. The amount and quality of water for the California Department of Fish and Wildlife ("CDFW") operations will hinge upon the ability of the rearing pond intake to divert water from both the "A" Dam and "B" Dam to ensure flows are present at all times. It is rare to have 15 cfs flowing past both dams at the same time. Flow past the "A" dam varies depending on how many and of what size generators are online at PacifiCorp's Fall Creek Hydroelectric Facility. In the current configuration, Yreka has two options for flow into its headworks. It is believed that CDFW owns a pipe diversion from the "B" Dam to the rearing ponds but its condition, sizing, and ability to provide required flows for hatchery and rearing pond operations are unknown to this commenting party.

PacifiCorp diverts water from Fall Creek under Statements of Diversion and Use S015372 and S0153736. PacifiCorp claims a maximum non-consumptive diversion right to about 75 cfs based on a pre-1914 claim.

Yreka's diversion from Fall Creek is presently subject to a permit condition that requires the City of Yreka to bypass a minimum flow of 15.0 cfs or the natural flow of the stream whenever it is less than 15.0 cfs. The intent of the flow bypass is to benefit fish and wildlife purposes. Accordingly, without consideration for any diversion from Fall Creek or Spring Creek for the proposed 10 cfs permit allocation on its junior and subordinate priority Fall Creek Fish Hatchery, Fall Creek must have 30 cfs flowing through it for Yreka to divert its entire 15 cfs for its water supply.

Of primary significance to Yreka's ability to take its full appropriation is PacifiCorp's right to divert up to 16.5 cfs from Spring Creek to Fall Creek for the use of its power generation facilities which is also the product of a State of Oregon pre-code water right. After this 16.5 cfs is diverted from Spring Creek, it flows through PacifiCorp's Fall Creek Hydroelectric facility (the "Facility") and flows into Fall Creek thereby increasing Fall Creek's flow by 16.5 cfs, which then continues to flow on to the point of Yreka's water diversion. While PacifiCorp appears to have secured a right to divert up to 16.5 cfs under Oregon law, during FERC's earlier consideration of relicensing of the Facility, it was considered but not yet implemented, that PacifiCorp's Spring Creek diversion be greatly restricted. FERC's 2012 Final Environmental Impact Study determined to impose two conditions on PacifiCorp's federal power permit – no diversions from Spring Creek to Fall Creek from June 1 through September 15 and a reduction from 16.5 cfs to 4 cfs the remainder of the year. Accordingly, to great extent, the necessary volume of Yreka's water source is dependent on water that is diverted from Spring Creek to the Facility. When the flow of Fall Creek is at its lowest the demand by municipal water users is at its highest. Any implementation of a reduction to Spring Creek's diversion to the Facility, under present permitting conditions, would prevent Yreka from the benefit of its full 15 cfs allocation for domestic and municipal water uses.

Response to Comment LA8-9

The State Water Board acknowledges the detailed description of the City of Yreka's water supply diversions at Dam A and Dam B. These are also described and noted in figures within Volume I Section 2.7.6.2 *Proposed Project – Proposed Project – Hatchery Operations – Fall Creek Hatchery* (pages 2-81 to 2-84) and Volume I Section 2.7.7 *Proposed Project – Proposed Project – City of Yreka Water Supply Pipeline Relocation* (pages 2-84 to 2-86). Please also refer to Master Response WSWR-7 and Volume I Section 3.6.2.2 *Flood Hydrology – Environmental Setting – Basin Hydrology – Spring, Fall and Jenny Creeks* (pages 3-606 to 3-607). Reference to the Spring Creek diversion has been added to Section 3.8.2.1 *Water Supply/Water Rights – Environmental Setting –*

Upper Klamath Basin – Fall Creek Water Rights – City of Yreka. Please refer to Volume III Attachment 1 Section 3.8.2.1 *Water Supply/Water Rights – Environmental Setting – Upper Klamath Basin – Fall Creek Water Rights – City of Yreka* for the revisions.

Comment LA8-10

Table 2.7-16 of the DEIR purports to demonstrate "historical Fall Creek flow," which table, merely shows the flows during a short two-year period spanning 10/01/2003 through 9/01/2005. As discussed below, this data inaccurately describes the actual long-term flows especially as it would regard multiple-year low-flow periods, in which the 2012 FEIS proposed action by FERC to discontinue all flow diversion from Spring Creek to the Facility during the critical low-flow periods (and Yreka's high-use periods) and reduce Spring Creek's diversion to the Facility the rest of the year from 16.5 cfs to 4 cfs—Yreka would not have sufficient water for domestic/municipal use five months the first dry year, six months the second year and five months the third year. This is the case even if all consideration of the proposed diversion of up to 10 cfs for the newly erected Fall Creek Hatchery were disregarded.

With 30 cfs as a baseline for Yreka to fully take under its present permit, together with the year around flow to the PacifiCorp Facility from Spring Creek (16.5 cfs) to Fall Creek, flow records at the USGS operated Gage 11512000 near the confluence of Fall Creek and the Klamath River exist for the period April 1933 to September 1959. As shown in Table 1, the mean monthly flow for the period in August was 33 cfs.

Table 1. Monthly Mean Flow at USGS Gage 11512000 (1933–1959).

Month	***Calculated Flow (cfs)***
January	*46*
February	*51*
March	*49*
April	*45*
May	*38*
June	*35*
July	*34*
August	*33*
September	*34*
October	*35*
November	*37*
December	*43*

In 2018 the maximum flows decreased from the historical average high of 51 cfs down to 41 cfs. Although the low flow was greater that year, increasing in that one year from a mean average in august from 33 cfs to 38 cfs, one can objectively determine that, without the Spring Creek diversion, or if the CDWF

junior water right of 10 cfs depleted water flow at Yreka's point of diversion, there would be insufficient water for Yreka to divert enough flow under its permitted allocation even at Yreka's present population. See Table 2 below:

Table 2. Fall Creek—Annual Water Level Log Sheet Year: 2018. FALL CREEK MEASUREMENT PROCEDURE: Reads will be taken monthly on or near the 1st of each month.

1st of Month	***Fall Creek Gaging Station Level (ft – no pumps running)***	***Calculated Flow (cfs)***
January	*1.10*	*41.0*
February	*1.09*	*40.5*
March	*1.08*	*40.0*
April	*1.08*	*40.0*
May	*1.07*	*39.0*
June	*1.04*	*37.6*
July	*1.06*	*38.6*
August	*1.06*	*38.6*
September	*1.06*	*38.6*
October	*1.06*	*38.6*
November	*1.08*	*40.0*
December	*1.08*	*40.0*

Table 3. Illustrates the Maximum Rate of Water Diverted and used from Fall Creek by Yreka in the Year 2017.

Month	***Maximum Rate of Diversion (cfs)***
January	*10.9*
February	*10.8*
March	*10.7*
April	*11*
May	*11*
June	*11*
July	*11.7*
August	*13.7*
September	*11*
October	*11*
November	*5.8*
December	*13.8*

Table 4 demonstrates the monthly divertible flow for a multiple dry year period. PacifiCorp's present bypass flow requirement of 5.0 cfs is considered, and the City of Yreka's 15.0 cfs bypass flow requirement is included. Table 4 shows total divertible flows dipping to a low of 9.0 cfs in the first dry year, 8.0 cfs in the

second dry year, and 9.0 cfs in the third dry year. Yreka would not have enough water for its municipal use five months the first dry year, six months the second year and five months the third year. As we will go into in more detail later in these comments, SWQCB's consideration of this DEIR is premature when it is unknown all the conditions that FERC will approve/impose, should the Proposed Project be allowed to proceed in any manner.

Table 4. Monthly Divertible Flow for a Multiple Dry Year Period.

Table 4

Monthly Divertible Flow for a Multiple Dry Year Period

USGS Gage 1151200	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1939 (cfs)	30	32	35	30	29	28	28	28	29	28	29	33	358
w/o Spring Creek	26	28	31	26	25	24	24	24	25	24	25	29	n/a
Spring Creek "Add Back"	30	32	35	30	29	24	24	24	25	28	29	33	n/a
Flow @ Dam A (cfs)	25	27	30	25	24	19	19	19	20	23	24	28	n/a
City- divertible Flow @ Dam A (cfs)	10	12	1	10	9	4	4	4	5	8	9	13	n/a
City- divertible Flow @ Dam B (cfs)	5	5	5	5	5	5	5	5	5	5	5	5	n/a
City-total Diversion ("A" + "B")	18	17	20	15	14	9	9	9	10	13	14	18	n/a

USGS Gage 1151200	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1940 (cfs)	34	44	44	37	29	27	28	27	29	30	30	33	392
w/o Spring Creek	30	40	40	33	25	23	24	23	25	26	26	29	n/a
Spring Creek "Add Back"	34	44	44	37	29	23	24	23	25	30	30	33	n/a
Flow @ Dam A (cfs)	25	27	30	25	24	19	19	19	20	23	24	28	n/a
City- divertible Flow @ Dam A (cfs)	10	12	1	10	9	4	4	4	5	8	9	13	n/a
City- divertible Flow @ Dam B (cfs)	5	5	5	5	5	5	5	5	5	5	5	5	n/a
City-total Diversion ("A" + "B")	18	17	20	15	14	9	9	9	10	13	14	18	n/a

USGS Gage 1151200	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1941 (cfs)	33	37	30	32	30	29	28	28	29	29	29	31	376
w/o Spring Creek	29	33	26	28	26	25	24	24	25	25	27	36	n/a
Spring Creek "Add Back"	33	37	30	32	30	25	24	24	25	29	31	40	n/a
Flow @ Dam A (cfs)	28	32	25	27	25	20	19	19	20	29	31	40	n/a
City- divertible Flow @ Dam A (cfs)	10	12	1	10	9	5	4	4	5	9	11	20	n/a
City- divertible Flow @ Dam B (cfs)	5	5	5	5	5	5	5	5	5	5	5	5	n/a

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City-total Diversion ("A" + "B")	18	22	15	17	15	10	9	9	10	14	16	25	n/a

All of this data is publicly available on SWQCB's website.

All of this data is publicly available on SWQCB's website.

Table 5 demonstrates the recent multiple year drought effect in the years 2015 and 2016

Table 5. Year 2015.

1st of Month	***Fall Creek Gaging Station Level***	***Calculated Flow***
January	*1.48*	*40.4*
February	*1.44*	*39.0*
March	*1.32*	*33.6*
April	*1.28*	*32.0*
May	*1.26*	*31.2*
June	*1.24*	*30.5*
July	*1.16*	*27.4*
August	*1.26*	*31.2*
September	*1.29*	*32.4*
October	*1.30*	*32.8*
November	*1.30*	*32.8*
December	*1.30*	*32.8*

2016

1st of Month	***Fall Creek Gaging Station Level***	***Calculated Flow***
January	*1.33*	*34*
February	*1.48*	*40.4*
March	*1.50*	*41.2*
April	*1.24*	*30.5*
May	*1.20*	*28.6*
June	*1.20*	*28.6*
July	*1.17*	*27.8*
August	*1.17*	*27.8*
September	*1.17*	*27.8*
October	*1.17*	*27.*
November	*1.24*	*30.5*
December	*1.20*	*28.6*

Response to Comment LA8-10

The commenter is expressing concern that flow information included in the EIR for Fall Creek is insufficient for analyzing long-term low flow conditions in Fall Creek and the impacts to the City of Yreka's water right associated with long-term low flow conditions and the Proposed Project's hatchery operations. Specifically, the commenter notes the "2012 FEIS" proposed action by Federal

Energy Regulatory Commission (FERC) to discontinue all flows diversions from Spring Creek during critical low flow periods. Additionally, the commenter provides flow data from 1933 to 1959.

Historical United States Geological Survey (USGS) gage data from Fall Creek are consistent with Figure 2.7-16 in Volume I Section 2.7.8.3 *Proposed Project – Proposed Project – Hatchery Operations – Fall Creek Hatchery* (page 2-84) and illustrate that mean monthly flows in Fall Creek exceed 30 cubic feet per second (cfs) in all months, which indicates the City of Yreka's diversion of 15 cfs, with a bypass flow of 15 cfs, could have occurred. However, it is possible that during historical multi-year drought periods mean monthly flows in Fall Creek could be lower and potentially affect any water right holder on Fall Creek. Please note that the Proposed Project's water diversion at Fall Creek Hatchery (FCH) would be non-consumptive, primarily diverted downstream of the City of Yreka's diversion point, and returned to Fall Creek upstream of the City of Yreka's bypass flow compliance point. Therefore, the Proposed Project's water diversion at Fall Creek Hatchery would not impact the City of Yreka's water right or bypass flow requirements. Please refer to Master Response WSWR-5 for further information on the City of Yreka's water supply and water rights. Please refer to Master Response WSWR-6 for further information on Fall Creek Hatchery water rights. Please refer to Master Response WSWR-7 for further information on PacifiCorp water rights in Fall Creek and Spring Creek.

Comment LA8-11

If the FERC determines, as it did in its 2012 FEIS, to curtail the diversion from Spring Creek to the Facility from June 1st through September 15th together with a 4 cfs diversion limit the remainder of the year – with the present 15cfs bypass in effect – Yreka would rarely be able to divert the 15 cfs it requires for domestic/municipal uses. As further discussed in these comments, the circulation of this DEIR is premature, in part because it is not clear what proposed action the presently designated federal lead agency, FERC, will propose as its Preferred Alternative. If FERC continues to pursue restrictions to the Spring Creek diversion to the Facility, Yreka recommends that the effects of the Proposed Project be mitigated by action through SWQCB to amend Yreka's permit to entirely eliminate the 15 cfs bypass (15 cfs – 16.5 cfs = -1.5 cfs). It is precisely these types of unknowns that the requirement that a joint DEIR/DEIS be submitted for circulation.

Response to Comment LA8-11

Please refer to Master Responses WSWR-7 and CEQ-1.

Comment LA8-12

Water Laws Granting Domestic Water Use as the State's Highest Priority

According to California, Oregon and the United States Code, municipal water use has the highest priority of any other use, including those uses related to fish and wildlife considerations.

First, California Water code §106 provides:

"It is hereby declared to be the established policy of this State that the use of water for domestic purposes is the highest use of water ..."

Water Code §106.3 provides, in part:

"(a) It is hereby declared to be the established policy of the state that every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes.

(b) All relevant state agencies, including the department, the state board, and the State Department of Public Health, shall consider this state policy when revising, adopting, or establishing policies, regulations, and grant criteria when those policies, regulations, and criteria are pertinent to the uses of water described in this section. [Emphasis added]

(e) The implementation of this section shall not infringe on the rights or responsibilities of any public water system."

Thus, it is clear under California water law that municipal water use has the priority of any other use and that the SWQCB is statutorily bound to afford Yreka with its "highest use" priority.

However, there is even a more specific statutory scheme affirming this principal which is specifically applicable to the use of water from the Klamath River Basin. Those principals are set out in Federal, California and Oregon laws collectively known as the Klamath River Basin Compact, Public Law 85-222, ratified by Congress and signed into law by the President on August 30, 1957, colloquially dubbed "The Law of the River" (the "Compact"). The law creates a federally designated commission to implement its provisions called the "Klamath River Compact Commission" (the "Commission.") Each of the ancillary state laws also refer to, and are members of, the Commission.

Oregon has adopted the KORS 542.610 which provides:

"The Legislative Assembly of the State of Oregon hereby ratifies the Klamath River Basin Compact set forth in ORS 542.620 (Klamath River Basin Compact), and the provisions of such compact hereby are declared to be the law of this state upon such compact becoming effective as provided in subsection (2) of this section.

(2) The compact shall become effective when it has been ratified by the legislatures of the States of California and Oregon, and has been consented to by the Congress of the United States as provided in Article XIII of the compact. [1957 c.142 §1]"

The compact was ratified by the State of Oregon by Chapter 142, Oregon Laws 1957 (signed by Governor on April 17, 1957).

The State of California has adopted the Compact at Water Code §5900, et seq. The Compact was ratified by the State of California by Chapter 113, California Statutes 1957 (signed by Governor on April 17, 1957, and effective on September 11, 1957). The provisions of said Klamath River Basin Compact reiterated in California Water Code 5901 are:

Article I. Purposes

The major purposes of this compact are, with respect to the water resources of the Klamath River Basin:

A. To facilitate and promote the orderly, integrated and comprehensive development, use, conservation and control thereof for various purposes, including, among others: the use of water for domestic purposes; the development of lands8 by irrigation and other means; the protection and enhancement of fish, wildlife and recreational resources; the use of water for industrial purposes and hydroelectric power production; and the use and control of water for navigation and flood prevention.

B. To further intergovernmental co-operation and comity with respect to these resources and programs for their use and development and to remove causes of present and future controversies by providing (1) for equitable distribution and use of water among the two states and the Federal Government, (2) for preferential rights to the use of water after the effective date of this compact for the anticipated ultimate requirements for domestic and irrigation purposes in the Upper Klamath River Basin in Oregon and California, and (3) for prescribed relationships between beneficial uses of water as a practicable means of accomplishing such distribution and use.

Article II. Definition of Terms

As used in this compact:

A. "Klamath River Basin" shall mean the drainage area of the Klamath River and all its tributaries within the States of California and Oregon and all closed basins included in the Upper Klamath River Basin.

B. …

C. "Commission" shall mean the Klamath River Compact Commission as created by Article IX of this compact.

D. "Klamath Project" of the Bureau of Reclamation of the Department of the Interior of the United States shall mean that area as delineated by appropriate legend on the official map incorporated by reference under subdivision B of this article.

E. "Person" shall mean any individual or any other entity, public or private, including either state, but excluding the United States.

F. …

G. "Water" or "waters" shall mean waters appearing on the surface of the ground in streams, lakes or otherwise, regardless of whether such waters at any time were or will become ground water, but shall not include water extracted from underground sources until after such water is used and becomes surface return flow or waste water.

H. "Domestic use" shall mean the use of water for human sustenance, sanitation and comfort; for municipal purposes; for livestock watering; for irrigation of family gardens; and for other like purposes.

I. …

J. …

Article III. Distribution and Use of Water

A. There are hereby recognized vested rights to the use of waters originating in the Upper Klamath River Basin validly established and subsisting as of the effective date of this compact under the laws of the state in which the use or diversion is made, including rights to the use of waters for domestic and irrigation uses within the Klamath Project. There are also hereby recognized rights to the use of all waters reasonably required for domestic and irrigation uses which may hereafter be made within the Klamath Project.

B. Subject to the rights described in subdivision A of this article and excepting the uses of water set forth in subdivision E of Article XI, rights to the use of unappropriated waters originating within the Upper Klamath River Basin for any beneficial use in the Upper Klamath River Basin, by direct diversion or by storage for later use, may be acquired by any person after the effective date of this compact by appropriation under the laws of the state where the use is to be made, as modified by the following provisions of this subdivision B and subdivision C of this article, and may not be acquired in any other way:

1. In granting permits to appropriate waters under this subdivision B, as among conflicting applications to appropriate when there is insufficient water to satisfy all such applications, each state shall give preference to applications for a higher use over applications for a lower use in accordance with the following order of uses:

(a) Domestic use,

(b) …

(c) Recreational use, including use for fish and wildlife,

(d) …

(e) Generation of hydroelectric power,

(f) These uses are referred to in this compact as uses (a), (b), (c), (d), (e) and (f), respectively. Except as to the superiority of rights to the use of water for use (a) or (b) over the rights to the use of water for use (c), (d), (e) or (f), as governed by subdivision C of this article, upon a permit being granted and a right becoming vested and perfected by use, priority in right to the use of water shall be governed by priority in time within the entire Upper Klamath River Basin regardless of state boundaries. The date of priority of any right to the use of water appropriated for the purposes above enumerated shall be the date of the filing of the application therefor, but such priority shall be dependent on commencement and completion of construction of the necessary works and application of the water to beneficial use with due diligence and within the times specified under the laws of the state where the use is to be made. Each state shall promptly provide the commission and the appropriate official of the other state with complete information as to such applications and as to all actions taken thereon."

Response to Comment LA8-12

The EIR finds no significant impact with mitigation to the City of Yreka's water supply. Please see Volume I Section 3.8.5 *Water Supply/Water Rights – Potential Impacts and Mitigation* Potential Impact 3.8-4 (pages 3-682 to 3-683) and Master Response WSWR-5 for further discussion. In the absence of a conflict between water uses – and any potential environmental impacts from an ensuing need for one right holder to curtail use – it is not necessary for the EIR to address the City's statements concerning use priorities in the Klamath River Basin Compact and in California Water Code sections 106 and 106.3. Please also refer to Master Response CEQ-4.

Comment LA8-13

Why does the Compact matter? The interstate compacts clause of the United States Constitution, Article I, §10, cl. 3, which states in pertinent part: "No State shall, without the Consent of Congress . . . enter into any Agreement or Compact with another State, or with a foreign Power." Since a Compact has already been entered regarding the exact prioritization of the use of Klamath River Basin waters in Oregon, California and throughout the federal reservations (i.e., the U.S. Forests, the Wildlife Refuges, the Tribal Nations, the Bureau of Reclamation, etc.) it is required that to encroach on the jurisdiction of the Compact requires the consent of the Commission.

Prior to the entry of the AKSA there were many attempts to gain the "consent of Congress." Each of those attempts failed. Nowhere in the provisions of the Compact is there any time-limitation that causes the compact to expire. It is not clear whether the Congress even has the authority under the Constitution to reserve to itself in compact legislation the ability to "alter, amend, or repeal" the terms of a compact. Litwak, Compact Law 33, 241, notes:

After Congress gives its consent to a compact, two questions arise relating to the relationship between the compact and the federal government. First, does that consent limit the ability of the federal government to enact subsequent law that might affect the implementation of the compact? . . . Second, does consent alter the responsibilities of the federal government under existing federal law that relates to the subject matter of the compact?

Consent matters not only because it satisfies the constitutional requirement but also because it makes clear the fact that, in addition to whatever specific interests the two states might have in a given situation, there is a national interest in the matter that is critical. The states are not free to assert that only their particular concerns count, either at the time of the agreement or later when disputes may arise over its terms. As the Supreme Court made clear in Dyer v. Sims: "A compact is more than a supple device for dealing with interests confined within a region. That it is also a means of safeguarding the national interest is well illustrated in the Compact now under review." West Virginia ex rel. Dyer v. Sims 341 U.S. 22, 27 (1951). In Hess v. Port Authority Trans-Hudson Corp., Justice Ginsburg echoed the Dyer language., 341 U.S. 22, 27 (1951).

Litwak explains at length, and with excerpts from a variety of key cases, this national interest and the constitutional consent requirement that protects it. This doctrine allows Congress to ensure that agreements among states do not injure either other states or the nation as a whole, and is key to understanding why states cannot act unilaterally with respect to existing compacts. He stresses that: "Dyer v. Sims is the Supreme Court's clearest statement on holding states to their obligations under a compact, even if a state believes its constitution restricts the state's ability to fulfill the compact."

The Dyer Court held that it would not be states that would decide, but the federal courts.

"But a compact is after all a legal document. Though the circumstances of its drafting are likely to assure great care and deliberation, all avoidance of disputes as to scope and meaning is not within human gift. Just as this Court has power to settle disputes between States where there is no compact, it must have final power to pass upon the meaning and validity of compacts. It requires no elaborate argument to reject the suggestion that an agreement solemnly entered into between States by those who alone have political authority to speak for a State can be unilaterally nullified, or given final meaning by an organ of one of the contracting States. A State cannot be its own ultimate judge in a controversy with a sister State. To determine the nature and scope of obligations as between States, whether they arise through the legislative means of compact or the "federal common law" governing interstate controversies (Hinderlider v. La Plata Co., 304 U.S. 92, 110), is the function and duty of the Supreme Court of the Nation. Of course, every deference will be shown to what the highest court of a State deems to be the law and policy of its State, particularly when recondite or unique features of local law are urged. Deference is one thing; submission to a State's own determination of whether it has undertaken an obligation, what that obligation is, and whether it conflicts with a disability of the State to undertake it is quite another."

The Commission's exercise of powers is conditioned on the ability of "any interested party [to] have the opportunity to present his views on the proposed action" before Commission action, after "reasonable" advance notice of the action. (71 Stat. at 505.) Decision-making by the compact entity is thus nothing like the negotiation of a settlement agreement without such opportunity for public comment. The Supreme Court has confirmed that the requirement of decision-making by a compact entity involves a different sort of "political accountability;"

"An interstate compact, by its very nature, shifts a part of an authority to another state or states, or to the agency the several states jointly create to run the compact. Such an agency under the control of special interests or gubernatorially appointed representatives is two or more steps removed from popular control, or even of control by a local government."

Hess v. Port Auth. Trans-Hudson Corp., 513 U.S. 30, 42 (1994) (quoting M. Ridgeway, Interstate Compacts: A Question of Federalism 300 (1971)).

Moreover, compact issues under agreements to which the Congress has consented are matters of federal, not state law, known generally as the "Law of the Union" doctrine. This critically important doctrine is one that many state officials do not appear to understand, but the Supreme Court has made the point clearly in Cuyler v. Adams 449 U.S. 433 (1981). "Because congressional consent transforms an interstate compact within [the Compact] Clause into a law

of the United States, we have held that the construction of an interstate agreement sanctioned by Congress under the Compact Clause presents a federal question." The Court added "[W]here Congress has authorized the States to enter into a cooperative agreement, and where the subject matter of that agreement is an appropriate subject for congressional legislation, the consent of Congress transforms the States' agreement into federal law under the Compact Clause."

In addition to the obvious points, Litwak stresses that because compact law is federal law, the usual considerations of federal preemption are not present and the compact law "supersedes the party states' statutes and constitutions." That being understood, the Compact Commission itself is not always an agency of the United States but, can be, depending on the language of the compact itself, a regional planning agency.

Statutes are exercises of the legislative power to prescribe or prohibit public or private conduct, establish policy, or mandate processes by which public agencies operate and are part of the body of positive law. Compacts are agreements that represent a meeting of the minds among different parties and are interpreted today against a longstanding common law tradition.

An interstate compact is clearly an agreement among states, but it is also statutory, both in terms of the legislation adopted by the participating states to sanction the agreement but also because of the critically important fact that Congress adopts legislation consenting to the agreement. The congressional action is not only an exercise of its authority under the interstate compact clause of the Constitution, but also transforms issues that arise under the compact into federal questions under the Law of the Union doctrine.

If the focus is on statutory interpretation and if the issues are matters of federal law, compact agencies may be entitled to deference by courts in their interpretation of the legislation they implement and administer under the Supreme Court's Chevron doctrine. Indeed, the Oregon Supreme Court recognized that Chevron deference is due to the Gorge Commission. Litwak even notes that a number of compacts empower the compact agency "to provide guidance on compact responsibilities and interpretation of compact provisions."

Response to Comment LA8-13
Comment noted. Comment refers to interstate compacts and related legal analysis. Please see Master Response CEQ-4.

Comment LA8-14
The California and Oregon state statutes and the United States Code make it clear that the Compact's application not only applies to the Upper Klamath Basin, which is defined as the portion of the Klamath Project within Oregon commencing at the Stateline, but also to the entire Klamath River Basin in California; which,

without question and specifically, includes the Klamath River's tributaries such as Fall Creek. California Water Code § 5901, Article II(H) defines "domestic use" among other uses as "municipal use." Thus, the California Water Code specifically provides that the use of water for "domestic purposes," that being, the use of water for "municipal purposes" has the first priority in the allocation of Klamath Basin water usage.

Response to Comment LA8-14
Please refer to response to comment LA8-12 and Master Response CEQ-4.

Comment LA8-15
Significantly, public policy specifically declares water for municipal use to be of a higher priority than water use for fish and wildlife purposes. That does not mean that Yreka is opposed to the use of conservation hatcheries, just that any operational conflicts which negatively impacts Yreka's present or future right to take water must be resolved in favor of the protection of Yreka's municipal usage.

Response to Comment LA8-15
Please refer to response to comment LA8-12 and Master Response CEQ-4.

Comment LA8-16
As set out in the Compact itself, the purpose of the Compact is to further intergovernmental co-operation and comity with respect to these resources and programs for their use and development and to remove causes of present and future controversies by providing (1) for equitable distribution and use of water among the two states and the Federal Government, (2) for preferential rights to the use of water after the effective date of this compact for the anticipated ultimate requirements for domestic and irrigation purposes in the Upper Klamath River Basin in Oregon and California, and (3) for prescribed relationships between beneficial uses of water as a practicable means of accomplishing such distribution and use.

This provision encompasses this exact circumstance – one in where it is being determined how the SWQCB shall determine, in the context of the Proposed Project, whether Yreka's municipal use of water is of a higher priority than that of any other use, regardless of when the right was appropriated. It goes without saying that any portion of the Proposed Project that could impact or adversely affect Yreka's right to utilize its fully permitted allocation must be adequately studied and modified so that Yreka's municipal water use is not adversely impacted. Thus, when considering whether the relocation of a fish hatchery that propagates ESA designated threatened species would detrimentally affect the city's right to take in the future, it is clear that any wildlife consideration must give way to the priority granted to municipal water usage.

Accordingly, SWQCB is constrained to construe the laws and environmental regulations of the State of California in a manner that is consistent with the provisions and existence of the Compact. No joint or individual action by Oregon, California or any of the parties to the Proposed Project, can take lawful action other than to prioritize Yreka's water use as the highest priority use in the Klamath River Basin.

Response to Comment LA8-16
Please refer to response to comment LA8-12 and Master Response CEQ-4.

Comment LA8-17
It is equally clear that the Commission is the proper lead agency to the Proposed Project as the regional planning agency. The circulation of this DEIR by an agency without authorization, public hearings before the Commission and delegation under the Compact is premature as the Commission is the appropriate regional planning agency to circulate it. Any other course of conduct would constitute a violation of both the "Law of the River" and the "Law of the Union." The correct application of these doctrines make crystal clear that the DEIR must be circulated for comment as a joint state and federal DEIR/DEIS.

Response to Comment LA8-17
Please refer to Master Responses CEQ-1 and CEQ-4.

Comment LA8-18
The Preservation of Yreka's Right to Take as Agreed by the Parties to the Amended Klamath Settlement Agreement

As noted in the preface to these comments the Proposed Project is the genesis of the AKSA. The SWRCB, if it proceeds to the stage of a FEIR, must make its determinations regarding the Proposed Project by construing the AKSA as providing Yreka's municipal water use with the highest priority use over lesser priorities set out in the Compact. Fortunately, the AKSA contains multiple provisions intended to protect Yreka's municipal water supply. The provision relating to the protection of Yreka's municipal water permit and its water conveyance infrastructure as follows:

AKSA ¶ 7.2.3 "Assessment and Mitigation of Potential Impacts to the City of Yreka The Parties understand that actions related to this Settlement may affect the City of Yreka. In recognition of this potential, the Parties agree to the following provisions, which shall remain in effect so long as this Settlement remains in effect.

A. The Parties collectively and each Party individually shall agree not to oppose the City of Yreka's continued use of California State Water Right Permit 15379, which provides for the diversion of up to 15 cfs for municipal uses by the City of Yreka.

B. As part of implementation of this Settlement, an engineering assessment to study the potential risks to the City of Yreka's water supply facilities as a result of implementation of Facilities Removal shall be funded and conducted by the Secretary. Actions identified in the engineering assessment necessary to assure continued use of the existing, or equivalent replacement, water supply facilities by the City of Yreka shall be funded from the California Bond Measure and implemented. Actions that may be required as a result of the engineering assessment and in consultation with the City of Yreka include, but are not limited to:

(1) Relocation, replacement, and/or burial of the existing 24-inch diameter water line and transmission facilities from the City of Yreka's Fall Creek diversion;

(2) Assessment, mitigation, and/or funding to address potential damage to the City of Yreka's facilities located along the Klamath River, including mitigation of potential impacts that may occur as a result of a dam breach. Such assessment, mitigation, and/or funding shall include consideration of the cathodic protection field located near the north bank of the Iron Gate crossing and the facilities that house the City's diversion and pump station; and

(3) Assessment, mitigation, and/or funding to address any impacts resulting from implementation of the Settlement, on the ability of the City to divert water consistent with its Water Right Permit 15379.

C. As part of implementation of this Settlement, an assessment of the potential need for fish screens on the City of Yreka's Fall Creek diversion facilities was completed in the Detailed Plan and it identified the need for fish screens on Dam A and Dam B. As a result of implementation of this Settlement, in order to meet regulatory requirements and screening criteria, construction of the required fish screens, including, but not limited to, necessary costs to preserve City facilities with additional species protection, shall be funded through the California Bond Measure pursuant to Section 4.2.3, or through other appropriate sources." [Emphasis added]

Since the State of California, SWQCB and the Department of Fish and Wildlife are all parties to this agreement, the parties have agreed that all their actions will support the continued and unimpaired use of Yreka's 15 cfs water diversion. This would include all determinations made on the Proposed Project and on the DEIR.

Response to Comment LA8-18

Please note that the State Water Resources Control Board is not a signatory to the amended Klamath Hydroelectric Settlement Agreement (KHSA). The provision of the KHSA related to City of Yreka's water supply is noted.

Please refer to Volume I Section 3.8.4 *Water Supply/Water Rights – Potential Impacts and Mitigation* Potential Impact 3.8-4 (pages 3-682 and 3-683), which analyzes the potential impact of relocating the City of Yreka's water supply pipeline under the Proposed Project on the City's water supply. Potential Impact 3.8-4 includes Mitigation Measure WSWR-2, which would ensure that there would be uninterrupted water supply during replacement of the pipeline section, any required intake screen modifications, and throughout Project implementation. Potential Impact 3.8-4 concludes that with mitigation there would be no significant impact to the City of Yreka's water supply. Please also refer to Master Responses WSWR-5 and WSWR-6.

Comment LA8-19

ASKA Interim Measure 17 states in relevant part:

"Additionally, if anadromous fish have passage to the Fall Creek following removal of the California dams, flows will be provided in the Fall Creek bypass reach to provide for the appropriate habitat needs of the anadromous fish species of any kind that are naturally and volitionally present in the Fall Creek bypass reach. Flows will be based on species specific habitat needs identified by the IMIC. The operation will also avoid and minimize take of any listed species present."

Accordingly, if anadromous fish take passage into Fall Creek, processes must be put into place to ensure that Yreka receives its full allocation of water as well as any additional water needed for the anadromous fish. This should not be interpreted to imply that anadromous fish should be encouraged to take passage into Fall Creek through the imprinting of being raised in a hatchery located there. In fact, use of the words "naturally and volitionally" should be correctly interpreted as those anadromous fish that are the product of the natural production of fish occupying the Klamath River Basin rather than those caused to immigrate to Fall Creek after their rearing as hatchery Yearlings. There is no reason to single out Fall Creek from any of the other Klamath tributaries except for the purpose of the protection of Yreka's water diversion. Another provision of the Fish and Game Code that could apply is section 5937, which requires the owner of any dam to "allow sufficient water at all times to pass through …to keep in good condition any fish …below the dam…." This section is notable because third-parties like environmental groups can bring lawsuits against public entities that own dams to enforce this duty, which appears to be frequently occurring.

Response to Comment LA8-19

The provision of the Klamath Hydropower Settlement Agreement (KHSA) relating to PacifiCorp's obligation to continue to provide 5 cubic feet per second (cfs) in the Fall Creek bypass reach is noted. Please also refer to Master Responses WSWR-5 and WSWR-6.

Comment LA8-20

The DEIR Fails to Select a Preferred Alternative of Three Types of Replacement to Yreka's Water Transmission Pipeline and the Improvements That Will be Made to Yreka's Water Diversion Facilities Thereby Rendering Yreka's Ability to Comment Impossible

Yreka's water transmission pipeline lays along the bottom of Iron Gate Reservoir. When the reservoir is drawn down, it will be subject to high velocity waters and scouring that will be harmful to it. The DEIR states that a replacement pipe crossing is needed before dam removal and reservoir drawdown to ensure an uninterrupted water supply to the City of Yreka. The DEIR generally opines that, as a result of any chosen alternative, excepting the no removal alternative, that Yreka's water transmission pipeline, must be reconstructed in one of three methods:

1. A new buried pipeline by micro-tunneling in the immediate vicinity of the existing waterline crossing.

2. A new aerial pipeline on a dedicated utility pipe crossing in the immediate vicinity of the existing waterline crossing.

3. A new buried pipeline and an aerial pipeline crossing on the existing timber traffic bridge along Daggett Road located approximately 2,000 feet upstream of the existing waterline crossing.

How this pipeline is replaced is of vital importance to Yreka. No selection is made even though the DEIR states that this is one of the first projects that must be completed before the water in Iron Gate Reservoir is drawn down.

Response to Comment LA8-20

The comment expresses concern that a final water supply pipeline alignment has not yet been selected, inhibiting the commenter's ability to accurately comment on pipeline alignment options.

The commenter notes that the EIR explains that the City of Yreka's water transmission pipeline lays along the bottom of the Iron Gate Reservoir, that a replacement pipe crossing would need to be installed before dam removal and reservoir drawdown, to prevent damage to the pipeline, and that the pipe crossing would consist of one of three options. (please refer to Volume I Section 2.7.7 *Proposed Project – Proposed Project – City of Yreka Water Supply Pipeline Relocation* [pages 2-84 to 2-85.). Volume I Potential Impact 3.8-4 (3-682 to 3-683) evaluates the potential environmental impacts of replacing the City of Yreka water supply pipeline regardless of which pipeline alignment alternative is selected, consistent with CEQA Guidelines section 15126. A number of resource areas consider potential construction-related impacts of replacing the pipeline, including Water Quality (Section 3.2.5.2 *Water Quality – Potential Impacts and*

Mitigation – Suspended Sediments Potential Impact 3.2-4 and Section 3.2.5.7 *Water Quality – Potential Impacts and Mitigation – Inorganic and Organic Contaminants* Potential Impact 3.2-15 [please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality]*), Aquatic Resources (Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-21, Potential Impact 3.3-22, and Potential Impact 3.3-24 [please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*]), Water Rights/Water Supply (Volume I Section 3.8.5 *Water Supply/Water Rights – Potential Impacts and Mitigation* Potential Impact 3.8-4 [pages 3-682 to 3-683], which includes Mitigation Measure WSWR-2), recirculated Air Quality (Potential Impact 3.9-1 and Potential Impact 3.9-4), recirculated Greenhouse Gas Emissions (Potential Impact 3.10-1), Aesthetic Resources (Section 3.19.5 *Aesthetics – Potential Impacts and Mitigation* Potential Impact 3.19-6 [please refer to Volume III Attachment 1 for the final Section 3.19 *Aesthetics*]), Cumulative Effects (Volume I Section 3.24.17 *Cumulative Effects – Public Services* Potential Impact 3.24-8 [pages 3-1160 to 3-1161], Potential Impact 3.24-55 [pages 3-1205 to 3-1206], Potential Impact 3.24-59 [pages 3-1210 to 3-1211 as modified in Volume III Attachment 1 Potential Impact 3.24-59], and Potential Impact 3.24-64 [pages 3-1215 to 3-1216]). The EIR also analyzes the potential for long-term (permanent) visual changes resulting from the proposed removal of the existing, submerged portion of the pipeline and replacement with new bridge or aerial pipeline infrastructure in Section 3.19.5 *Aesthetics – Potential Impacts and Mitigation* Potential Impact 3.19-5. Please refer to Volume III Attachment 1 for the final Section 3.19 *Aesthetics*.

The three pipeline alignment options came from the project proponent, which has not yet committed to a specific option. The impact analyses referenced above provide ample basis for the City of Yreka to provide public comments and other input on the ultimate method of reconstructing its water supply pipeline, notwithstanding that three potential methods remain available.

Comment LA8-21

A DEIR must consider all phases of project planning, implementation, and operation. Cal Code Regs §15063(a)(1). It is referred to as Potential Impact 3.8-4. The DEIR states merely that it will determine the preferred alternative in consultation with the City of Yreka. Consultation is not the equivalent of consent and deprives Yreka of any ability to comment. It concludes that any of the selections made will result in the same quantity and quality of water conveyed to the city. However, because the exact plans for pipeline re-routing are incomplete, it is not possible to determine the reasonableness of the assumed timeframe for pipeline disconnection. An interruption in service is not limited to the time it takes to reconnect a water line. If the pipeline is constructed in a manner that permits service interruption in the future it is also an environmental consideration that must be considered. Environmental Protection Inf. Ctr. v Department of Forestry & Fire Protection (2008) 44 C4th 459, at 503. The level

of specificity required in the DEIR regarding this part of the Proposed Project is therefore inadequate.

Response to Comment LA8-21
Volume I Section 2.7.7 *Proposed Project – Proposed Project – City of Yreka Water Supply Pipeline Relocation* (pages 2-84 to 2-86) and Potential Impact 3.8-4 (pages 3-682 to 3-683) describe the need for replacement of a section of the City of Yreka's water supply pipeline, and present three potential options for such replacement, based on the options under discussion between the City and the applicant, as presented in the Definite Plan.

The potential for service interruption under the Proposed Project is analyzed in Volume I Section 2.7.7 *Proposed Project – Proposed Project – City of Yreka Water Supply Pipeline Relocation* Potential Impact 3.8-4 (pages 3-682 to 3-683). There is no evidence that any of the pipeline configurations would have greater or lesser ability to avoid a service disruption. Regardless, Potential Impact 3.8-4 describes Mitigation Measure WSWR-2, which avoids future service interruptions regardless of how the City of Yreka's supply pipeline is replaced, by setting a performance standard.

Comment LA8-22
In regard to the replacement of the water diversion fish screens, the DEIR states: "While the fish screens have recently been updated, their compliance to NMFS, USFWS, and CDFW screen criteria for anadromous fish still needs to be confirmed. These fish screens would require updates, if found to be non-compliant." To mitigate the impact the DEIR states: "Any work the KRRC undertakes to ensure that the City of Yreka water supply intakes' screens comply with fish screen criteria shall be completed within the water delivery outage period specified above." This lack of specifics in the DEIR impermissibly disables Yreka to comment.

Response to Comment LA8-22
Please refer to Volume I Section 3.8.5 *Water Supply/Water Rights – Potential Impacts and Mitigation* Potential Impact 3.8-4 (pages 3-682 to 3-683) for discussion of fish screens as part of the Proposed Project. Mitigation Measure WSWR-2 permissibly requires a performance standard which would mitigate the potential significant effect of a Project, and which may be accomplished in more than one specified way.

Comment LA8-23
The DEIR circulated is required to avoid vagueness, incompleteness, or untested mitigation measures. Mitigation measures must not be remote and speculative. Federation of Hillside & Canyon Assn's v City of Los Angeles (2000) 83 CA4th 1252, 1260. Here the mitigation measures are inadequate because they are so undefined that it is impossible to gauge their effectiveness. Preserve Wild Santee v City of Santee (2012) 210 CA4th 260 San Franciscans for Reasonable

Growth v City & County of San Francisco (1984) 151 CA3d 61, 79); Kings County Farm Bureau v City of Hanford (1990) 221 CA3d 692, 727.

Response to Comment LA8-23
Please refer to response to comments LA8-20 and LA8-22.

Comment LA8-24
Yreka's present water pipeline is buried or covered with many feet of water. It is of critical importance that the reconstruction of the pipeline be done in a manner that ensures that water service will remain as uninterrupted as it was before the Proposed Project. Yreka is concerned about possible terrorist attacks on exposed portions of the pipeline (if simply suspended over the riverbed or placed in open view under a bridge structure) and simple vandalism with rural citizens sporting .50-caliber rifles. Thus, Yreka recommends the imposition of a mitigation measure which requires the selection of a new buried pipeline by tunneling in the immediate vicinity of the existing waterline crossing or that the DEIR be recirculated with the proper amount of specificity required to enable Yreka to comment.

Response to Comment LA8-24
The existing water supply pipeline for the City of Yreka is primarily under ground and under water between the Fall Creek diversion and the City's treatment plant, although portions of the pipeline are exposed above ground in accessible areas. Bridge crossings in rural and urban areas commonly have attached and exposed utility lines (see, e.g., CalTrans 2018 [providing standards of construction for utility bridge crossings].) The California Division of Drinking Water (DDW) has no evidence that any vandalism or terrorist acts have been perpetrated against any utilities in the vicinity of the Proposed Project. Therefore, concerns anticipating such acts are speculative, and it is not necessary to impose further mitigation for replacing a segment of the City of Yreka's water supply pipeline.

Please also refer to responses to comments LA8-20 and LA8- 21 regarding specificity.

Comment LA8-25
The same situation applies to the Fish Screens that the DEIR indicates need to be replaced but does not provide any specificity as to what improvements or modifications will be undertaken.

Response to Comment LA8-25
If the existing fish screens at the City of Yreka water supply pipeline are found to be non-compliant, as described in Volume I Section 2.7.7 *Proposed Project – Proposed Project – City of Yreka Water Supply Pipeline Relocation* (page 2-85) the existing screens would be replaced with screens that meet modern criteria from NMFS (National Marine Fisheries Service), USFWS (United States Fish and Wildlife Service), and CDFW (California Department of Fish and Wildlife). Please

refer to Volume III Attachment 1 Section 3.3.4 *Aquatic Resources – Potential Impacts and Mitigation* Potential Impact 3.3-22 for a discussion of the potential impacts of replacing the existing fish screens at the City of Yreka water supply pipeline. In this discussion, the potential impacts of the Proposed Project are assessed with and without installation of fish screens to allow for the possibility that the screens would not need to be replaced. If screen replacement is necessary, standard construction best management practices would be applied, as described in Volume 1 Section 2.7.8.7 *Proposed Project – Proposed Project – Other Project Components – Water Quality Monitoring and Construction BMPs*. Therefore, sufficient specificity is available to assess the potential impacts to environmental resources from installation of fish screens at the City of Yreka water supply pipeline (if they are found to be non-compliant).

Further, the Klamath River Renewal Corporation (KRRC) has recently indicated that the Proposed Project would involve installation of a permanent fish passage barrier just downstream of the confluence of Fall Creek and the Fall Creek powerhouse tailrace to prevent fish entrainment in the existing City of Yreka diversions (KRRC 2019a). A permanent fish passage barrier at this location would negate the need for fish screen installation at the existing City of Yreka water diversions. Although details surrounding the proposed design and implementation of a permanent fish passage barrier associated with the Fall Creek Hatchery (FCH) are not yet available, they would be required to adhere to all construction Best Management Practices (BMPs) and relevant mitigation measures associated with all construction for larger Proposed Project, including requirements tailored for in-stream work. Construction of a barrier would also eliminate the potential need for construction associated with modifying or replacing the existing fish screen. Thus, should a barrier be constructed instead of modifying or replacing the City of Yreka's fish screen, the EIR analyses of potential impacts and significance determinations associated with the City of Yreka's water supply infrastructure would not require revision. Volume I Section 2.7.7 *Proposed Project – Proposed Project – City of Yreka Water Supply Pipeline Relocation* has been revised to note the permanent fish passage barrier. Please refer to Volume III Attachment 1 Volume I Section 2.7.7 *Proposed Project – Proposed Project – City of Yreka Water Supply Pipeline Relocation* for the revisions.

Comment LA8-26

The lack of concrete specificity of the exact improvements to be made to Yreka's water pipeline and water diversion facilities on Fall Creek renders it premature and impossible to adequately address those particular impacts of the Proposed Project.

Response to Comment LA8-26

Please refer to Master Response WSWR-5, Volume I Section 3.8.5 *Water Supply/Water Rights – Potential Impacts and Mitigation* Potential Impact 3.8-4 (pages 3-682 to 3-683), and Section 7.5 *Yreka Water Supply* in Volume II

Appendix B: *Definite Plan*. Please also refer to comment responses LA8-20 through LA8-25.

Comment LA8-27

The Decommissioning of the Iron Gate Hatchery and the Construction of the Fall Creek Hatchery

The ASKA contains the following provisions regarding the fish hatcheries.

7.6.6 PacifiCorp Hatchery Facilities:

A. Hatchery Funding

"PacifiCorp will fund 100 percent of hatchery operations and maintenance necessary to fulfill annual mitigation objectives developed by the California Department of Fish and Wildlife in consultation with the National Marine Fisheries Service. This includes funding the Iron Gate Hatchery facility as well as funding of other hatcheries necessary to meet ongoing mitigation objectives following Facilities Removal…"

B. Hatchery Production Continuity

"PacifiCorp will fund a study to evaluate hatchery production options that do not rely on the current Iron Gate Hatchery water supply. The study will assess groundwater and surface water supply options and water reuse technologies that could support hatchery production in the absence of Iron Gate Dam. The study may include examination of local well records and increasing production potential at existing or new facilities in the Klamath Basin as well as development of a test well or groundwater supply well. Based on the study results and with the approval of the California Department of Fish and Wildlife and the National Marine Fisheries Service, PacifiCorp will provide one-time funding to construct and implement the measures identified as necessary to continue to meet current mitigation production objectives for a period of eight years following the Decommissioning of Iron Gate Dam….Production facilities capable of meeting current hatchery mitigation goals must be in place and operational upon removal of Iron Gate Dam. PacifiCorp shall not be responsible for funding hatchery programs, if any, necessary to reintroduce anadromous fish in the Klamath basin."

Response to Comment LA8-27

The comment's recitation of Klamath Hydropower Settlement Agreement (KHSA) provisions is noted.

Please note that the State Water Resources Control Board is not a signatory to the amended KHSA.

Comments LA8-28 and LA8-29

The DEIR Proposes to Construct a new Fall Creek Hatchery adjacent to Yreka's Municipal Water Supply Improvements located at Fall Creek. The DEIR proposes to reopen Fall Creek Hatchery with upgraded facilities (e.g., install circular tanks, UV treatment system, renovate existing raceways, upgrade plumbing, provides for settling ponds, etc.) for raising coho salmon (an ESA designated "threatened" species) and Chinook salmon yearlings within the existing facility footprint and an area adjacent to the upper raceways (Figure 2.7-15 in the DEIR). Additional space requirements needed for most operations (e.g., vehicle parking, pertinent buildings, tagging trailer, etc.) can be accommodated on existing developed or disturbed areas around the hatchery and powerhouse, but the settling pond would need to be located outside of this area. The settling pond would be constructed on one of two potential nearby sites located on Parcel B lands downstream of the Fall Creek Hatchery, with a minimally buried or at-grade conveyance pipeline transporting flows from the hatchery to the settling pond.

The AKSA does not obligate PacifiCorp to fund the study of the construction of a hatchery at Fall Creek adjacent to Yreka's water diversion facilities in particular. One study opines that once Iron Gate Dam is removed the river will have cooler water, which cooler water could supply IGH. It does not consider any filtering methods to improve IGH water quality. The DEIR does not reference any studies undertaken to generate further cooling of the water that IGH uses. It would appear that geothermal cooling could be studied. If geothermal cooling were not sufficient for optimal fish propagation, it could be supplemented with water cooler. PacifiCorp has access to the cheapest source of power than anyone else.

How was FCH selected when it is known that there are other better sources of cool water in the area which would sustain a fish hatchery. Under the "dams out" alternative, adult salmon access will be provided to cool water tributaries (i.e., Shovel Creek, 2.1 mi; and upper/middle Spencer Creek, 7.1 mi) above the dams, springs currently inundated by reservoirs, and groundwater areas above the Keno Reservoir (the Wood River, the Williamson River, and springs on the west side of Upper Klamath Lake). In addition, a large spring complex discharging directly to the mainstem Klamath River downstream from JC Boyle Dam provides ~225 cubic feet per second of cool water year-round (USDI Bureau of Land Management 2003), creating a large thermal refuge area currently unavailable to salmon, particularly during summer and fall months. Accordingly, Yreka requests further studies be conducted before the selection of a site adjacent to Yreka municipal water source and the construction of FCH is implemented.

Response to Comments LA8-28 and LA8-29

The comment requests that further studies be conducted regarding the water source for Iron Gate Hatchery and further studies be conducted prior to selection of a hatchery location adjacent to the City of Yreka's water supply intake.

Please refer to Volume I Section 2.7.6 *Proposed Project – Proposed Project – Hatchery Operations* (pages 2-77 to 2-84) for a discussion of the Proposed Project hatchery operations, including production goals and water supply. Please refer to Section 3.2.5.1 *Water Quality – Potential Impacts and Mitigation – Water Temperature* Potential Impact 3.2-1 for an analysis of the water temperature in the Klamath River in the vicinity of the Iron Gate Hatchery (i.e., downstream of Iron Gate Dam) after dam removal. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*. Overall, dam removal under the Proposed Project would result in warmer water temperatures adjacent to Iron Gate Hatchery (i.e., downstream of Iron Gate Dam) earlier in the spring, cooler temperatures earlier in the fall, and increased daily variability compared to existing conditions. These changes would be consistent with a more natural thermal regime for the Klamath River (refer also to Volume III Attachment 1 Section 3.3.5.4 *Aquatic Resources – Potential Impacts and Mitigation – Water Temperature*). Currently, water temperatures delivered to Iron Gate Hatchery from Iron Gate Reservoir range from 38 to 45°F (3.7 to 7.2°C) and 50 to 60°F (10 to 15.7°C) in the winter and summer months, respectively (CDFW and PacifiCorp 2014). As analyzed in Volume III Attachment 1 Section 3.2.5 *Water Quality – Potential Impacts and Mitigation* Potential Impact 3.2-1 and shown in Figure 3.2-8, modeled Klamath River water temperature downstream of Iron Gate Dam after dam removal under the Proposed Project would typically be greater than 50 to 60°F (10 to 15.7°C) during summer, so Klamath River water could not provide a similar level of cold water to Iron Gate Hatchery as Iron Gate Reservoir does under existing conditions.

Note that the Klamath River Renewal Corporation (KRRC) originally considered the following potential water supply options for Iron Gate Hatchery:

- direct diversion from the Klamath River,
- groundwater,
- Fall Creek diversion and transfer, and
- Bogus Creek diversion.

Based on further exploration of the feasibility of each of the aforementioned options, KRRC proposed that water for Iron Gate Hatchery would be diverted from Bogus Creek within 1,000 feet of the confluence with the mainstem Klamath River. Diversion from Bogus Creek represents the Proposed Project As discussed in Volume I Section 2.7.6.1 *Proposed Project – Hatchery Operations – Iron Gate Hatchery* (pages 2-77 to 2-80), if Bogus Creek flows are insufficient to meet minimum operational needs while balancing flow requirements in the creek, water reuse (recirculation) from the rearing raceways could be utilized. In addition to recirculation, early release of smolts (i.e., prior to April 1) may occur to reduce water use requirements in the hatchery. The effectiveness of recirculation and early smolt release would be studied to determine whether they could be used to meet minimum operational flow and water temperature needs in the hatchery given annual variations in Bogus Creek flow and water temperature

during the early release period. Thus, based on the studies and modeling already conducted and the alternatives already vetted for feasibility and effectiveness, the additional studies requested by the comment would not uncover additional feasible alternatives.

Comments on the Definite Plan (i.e., the Proposed Project), including the approach for supplying cold water to Iron Gate Hatchery and the selection of the location for Fall Creek Hatchery (FCH), should be submitted to the KRRC. As described in Volume I Potential Impact 3.8-4 (pages 3-682 to 3-683), with mitigation the EIR does not find a significant impact on the City of Yreka's water supply.

Comment LA8-30

The Fall Creek Hatchery was originally built in 1919 and operated until 1948. The facility thereafter consisted of rearing ponds used from 1979 to 2003 to raise 180,000 chinook salmon which were released at the Iron Gate Hatchery. Chinooks are not an ESA listed species. There are six raceways that remain, unused since 2003. Photographs taken on February 21, 2019 of the current state of what remains of the "hatchery" are attached as Attachment 4. The hatchery itself is completely demolished. Since the DCFW 10 cfs junior and subordinate water appropriation was acquired in 1979[21], it could not have been used for hatchery purposes, only for the rearing ponds from 1979 through 2003. This CDFW permits the diversion of 5,463 acre-feet per year while Yreka's permit allows 6,300 acre-feet per year. If CDFW were to fully use its permitted allocation Yreka would not be able to take under its permit as agreed by the parties to the ASKA.

Response to Comment LA8-30

Please refer to Master Response WSWR-6 and response to comment LA8-10.

Comment LA8-31

To operate the Fall Creek Hatchery, up to 10 cfs of water would be diverted from the PacifiCorp Fall Creek powerhouse return canal downstream of the City of Yreka's diversion facility at Fall Creek Dam A. Hatchery water would be diverted from Fall Creek Dam B to Dam A during periods when the powerhouse return canal is not flowing. While the Definite Plan specifies diverted water would be returned to Fall Creek at the fish ladder located in the lower tank area or the settling pond location (Appendix B: Definite Plan −Section 7.8.3), an October 2018 update specifies the upper rearing tank would discharge diverted water directly to Fall Creek, the lower rearing tank would discharge to the fish ladder adjacent to the tank, and the settling pond would discharge to Fall Creek further down, but upstream of the USGS 11512000 gage on Fall Creek (S. Leonard, AECOM as KRRC Technical Representative, pers. comm., October 2018). Fall Creek diverted water would be gravity fed and plumbed to each rearing location and all circular tanks.

It is proposed that the hatchery diversion would not significantly alter Fall Creek flows measured at the USGS 11512000 gage or compliance with minimum Fall Creek flow requirements since the diversion flows for Fall Creek Hatchery would be diverted and returned (less evaporative losses) to Fall Creek upstream of the USGS 1151200 gage under the Proposed Project. This action would return most hatchery flows to Spring Creek before the point where the CDFW imposed Yreka's Fall Creek bypass is measured.

However, the effect, if any, that Mitigation Measure 17[22] has at this point, is relevant because it is not clear where the flows will come from to satisfy the concept that "flows will be provided in the Fall Creek bypass reach to provide for the appropriate habitat needs of the" fish. Is this phrase meant to apply to Yreka's municipal diversion or PacifiCorp's 75 cfs Fall Creek and 16.5 cfs Spring Creek right to take? There is no explanation of how these flows can be created and not affect Yreka's diversion.

Response to Comment LA8-31
The cited provision is not a Mitigation Measure under the EIR: the text is from the Klamath Hydropower Settlement Agreement's (KHSA's) Interim Measure 17. The 5 cubic feet per second (cfs) minimum flow in the Fall Creek bypass reach described in KHSA Interim Measure 17 is a continuation of PacifiCorp's existing operations of Fall Creek powerhouse. No change to this bypass reach flow is anticipated under the Proposed Project. Please also refer to Volume I Section 2.7.9 *Proposed Project – Proposed Project – KHSA Interim Measures* Table 2.7-19 (pages 2-103 to 2-107), Volume I Section 3.6.2.2 *Flood Hydrology – Environmental Setting – Basin Hydrology – Spring, Fall, and Jenny Creeks* (page 3-606), and Master Response WSWR-7.

Comment LA8-32
Further, unless Yreka's permit is amended, the permit's Condition F provides:

"This permit does not authorize any act which results in the taking of a threatened or endangered species or any act which is now prohibited, or becomes prohibited in the future, under either the California Endangered Species Act (Fish and Game Code sections 2050 to 2097) or the federal Endangered Species Act (16 U.S.C.A. sections 1531 to 1544). If a "take" will result from any act authorized under this water right, the permittee shall obtain authorization for an incidental take prior to construction or operation of the project. Permittee shall be responsible for meeting all requirements of the applicable Endangered Species Act for the project authorized under this permit."

Response to Comment LA8-32
Comment noted. The comment refers to Condition F of the City of Yreka's water right permit. Please refer to LA8-37 for response to related comments.

Comment LA8-33

The KRRC Definite Plan set out that the intention is to raise 75,000 Coho Yearlings and 115,000 Chinook Yearlings at the proposed Fall Creek Hatchery ("FCH").23. These Coho Yearlings are now being raised at Iron Gate Hatchery ("IGH"). The DEIR 2.3.4, et seq. summarizes that the IGH, now raises steelhead, coho salmon, and Chinook salmon. The hatchery includes a warehouse, a hatchery building, four fish-rearing ponds, a fish ladder, a visitor center, and four employee residences. It has a fish trapping and holding facility including a fish ladder, holding tanks, and a processing facility at the downstream base of Iron Gate Dam. It is supplied by water from the present reservoir.

The objectives of the AKSA as detailed in the Definite Plan present imminent risks for the City of Yreka's Fall Creek water right. Specifically, the broad objective of the AKSA Fisheries Program is intended to reintroduce anadromous fish species which could migrate into Fall Creek. Reintroduction of fish species could lead to the increased prevalence of threatened or endangered species in and around the City of Yreka's points of diversion. Also, various habitat restoration requirements could have an impact on the nature of the flow in Fall Creek. CDFW's proposal to construct a new hatchery facility at the site of its defunct fish hatchery is adjacent to Yreka's points of diversion will likely cause the hatchery raised fish to return to Fall Creek due to these species homing mechanisms. The objective of the AKSA is for the reintroduction of anadromous species throughout their historic range above Iron Gate Dam and provides that the focus of habitat restoration and monitoring is to be the Upper Klamath River Basin. Retaining coho prorogation at the IGH is directly in line to the Upper Klamath Basin and must remain the place of propagation of coho hatchery production. Instead the majority of this hatchery is proposed for demolition and eliminates coho production.

Response to Comment LA8-33

Please refer to responses to comments LA8-28/29 and LA8-37. Additionally, please refer to Volume I Section 2.7.6 *Proposed Project – Proposed Project – Hatchery Operations* (pages 2-77 to 2-86) for a detailed description of both the Fall Creek Hatchery (FCH) and the Iron Gate Hatchery plans.

Comment LA8-34

The data clearly demonstrates that Yreka would only receive its fully permitted water allocation one month out of the three-year period during low flow years if CDFW's junior, lower priority appropriation was permitted for the use of a Fall Creek hatchery/rearing ponds and if CDFW did not be return its hatchery flows above the gage as is presently proposed or if more water is used by the hatchery than is proposed CDFW. If CDFW is allowed to construct a hatchery at Fall Creek, the return of its flows above the gage must be a made condition of that allowance.

Response to Comment LA8-34
As described in Volume I Section 2.7.6.2 *Proposed Project – Proposed Project – Hatchery Operations – Fall Creek Hatchery* (pages 2-81 to 2-84), diversions associated with California Department of Fish and Wildlife's (CDFW's) non-consumptive water right on Fall Creek would return to the creek upstream of the United States Geological Survey [USGS] gage (Gage no. 11512000). Additionally, please refer to Master Responses WSWR-5 and WSWR-6.

Comment LA8-35
Further, as noted in the DEIR, it is "unclear" how the Fall Creek Hatchery would be "decommissioned" or "repurposed" at the expiration of the eight-year PacifiCorp financial commitment. What is known to this commentator is that at least one Indian Tribe desires to take over the operation of the hatchery. Should the State transfer its operation to a sovereign nation the next step, five years later, is for that tribe to request the Bureau of Indian Affairs to transfer the property into trust for the benefit of the Tribe. At that point neither the State, nor Yreka, would have any degree of control over the diversion to the hatchery and one would have to assume that, rather than the projected monthly Fall Creek Hatchery diversions set out in the DEIR, that the full allocation of 10 cfs would be used year around. On the basis of "federal reservation" arguments, some additional extraction might occur.

Response to Comment LA8-35
Please refer to Master Response WSWR-5 and WSWR-6. The comment's hypothetical series of events in which a Native American tribe would take ownership of Fall Creek Hatchery (FCH) after it is decommissioned, take the property into trust to remove it from state authority, and operate it using a greater amount of water than the current proposal and in violation of the principles of seniority to the detriment of a municipal diversion is speculative.

Comment LA8-36
Accordingly, the threat to Yreka's continued extraction of 15 cfs is clear and imminent unless a mitigation measure is placed into effect that the Fall Creek Hatchery be decommissioned at the end of PacifiCorp's financial commitment. The State of California should be required to set aside sufficient revenues to adequately finance this obligation.

If the Proposed Fall Creek Hatchery is allowed to be constructed, given this consideration, Yreka requests that the effects of the Proposed Project be mitigated by action through SWRCB to amend Yreka's permit to reduce the present 15 cfs bypass to 5 cfs (15 cfs – 10 cfs = 5 cfs). As previously mentioned, when Fish and Wildlife requested this bypass flow it did not then have its own 10 CFS appropriation intended for its rearing ponds/raceways. If the Fall Creek Hatchery is permitted to be constructed, the rationale for the bypass is then mooted since proactive propagation measures would be in effect through the

operation of the Fall Creek Hatchery and there would be no additional environmental need for the bypass.

Response to Comment LA8-36
Similar to the discussions in responses to comments LA8-10, LA8-28, LA8-29, LA8-34, LA-37,and LA8-40, no Mitigation Measure is required to protect City of Yreka's ability to divert for municipal supplies, because the Proposed Project does not have a significant impact on the City's water supply or use. Please also refer to Master Responses WSWR-5 and WSWR-6.

Comment LA8-37
The Definite Plan and DEIR propose hatchery propagation of threatened Coho salmon at the proposed FCH to the stage of yearling maturation. By hatchery raising cohoes to the yearling stage it is certain that they will be imprinted to return to Fall Creek as their "home" rather than where they are actually planted in the various tributaries, the Klamath River itself or within the Upper Klamath River Basin – which is the actual objective of the Proposed Project. This imprinting occurs at different times caused by differing hormonal conditions in natural salmon, but in hatchery raised salmon, the homing mechanism is almost certainly imprinted between the fry and smolt stages. Thus, not only is Yreka's water diversion suddenly directly in conflict with protections for ESA species but the objectives of the Proposed Plan themselves are not accomplished. As a consequence, Fall Creek is likely to be designed as "critical habitat" for the cohoes in a creek that does not itself provide good habitat for spawning, in which previous studies have shown varying returns between 0 to 10%. What data does the latest Biological Opinion have to say about this effect? "Little is known about juvenile coho salmon movement into, out of, and within the mainstem of the Klamath River. The analysis for this BA assumes similar movement patterns as nearby drainages, where data is available."

Response to Comment LA8-37
Comments regarding coho imprinting and juvenile salmon movement are noted. These comments and references are consistent with the analysis in Section 3.3.5.6 *Aquatic Resources – Potential Impacts and Mitigation – Fish Hatcheries*, which analyzes the rate of recolonization based on observed stray rates of coho salmon produced at Iron Gate Hatchery; and assumes that fish return to natal streams unless straying occurs. Impacts associated with hatchery operations including coho straying is discussed in Potential Impact 3.3-9. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*. Additionally, please refer to Volume I Section 3.8.4 *Water Supply/Water Rights – Potential Impacts and Mitigation* Potential Impact 3.8-4 (pages 3-682 to 3-683) for a discussion of fish screen assessments and potential upgrades as part of the Proposed Project.

No critical habitat for coho salmon is currently designated upstream of Iron Gate Dam. Following dam removal, National Marine Fisheries Service (NMFS) may

consider whether to designate the newly available habitat as critical habitat as part of its five-year status review or as a separate reconsideration of the critical habitat designation for the species (J. Simondet, NMFS, pers. comm., 2011). It is speculative at this point to prejudge the outcome of any such consideration. Adult coho salmon that return to Fall Creek would presumably be collected for hatchery brood stock, potentially locate suitable spawning habitat, or may stray to other tributaries upstream of Iron Gate Dam.

Comment LA8-38

The ESA, enacted in 1973, tasked all federal agencies with the protection of endangered species, declaring: "the policy of Congress that all Federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purposes of this chapter." Early litigation clarified that species protection occupied a position of utmost priority, superseding other policy and economic considerations.

Two federal agencies—the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS)—are primarily responsible for implementing the ESA, under authority delegated by the U.S. Department of the Interior and the U.S. Department of Commerce, respectively.

To oversimplify how ESA operates, endangered or threatened species are first recognized and listed through a science-based administrative process, and the implementing agencies also identify their critical habitat. Federal agency actions that might adversely affect a listed species can proceed only after consultation with either the FWS or NMFS (depending on the species involved), which then advise the federal agency through a Biological Opinion (BiOp) whether the proposed action would jeopardize the continued existence of the species or damage or destroy its critical habitat, and what "prudent and reasonable alternatives" might be available.

Response to Comment LA8-38

Comment noted. The comment relates an overview of the Endangered Species Act (ESA).

Comment LA8-39

Coho salmon once existed throughout the Basin but are now extinct above Iron Gate Dam, the lowermost Klamath mainstem dam that blocks fish passage. This salmon species was listed as threatened in 1997 and is NMFS's responsibility to manage and recover.

Meanwhile the BOR BiOp contains a request for formal consultation under section 7(a)(2) of the ESA with NMFS relating to coho salmon and their designated critical habitat. Until this occurs, it is premature to circulate this DEIR

because it is impossible for Yreka to comment upon the Proposed Project with that issue unresolved.

Response to Comment LA8-39
The 2013 BiOp Flows served as the United States Bureau of Reclamation (USBR) Klamath Irrigation Project operational flow requirements for the Klamath River and specified the minimum flow requirements downstream of Iron Gate Dam at the time of the Notice of Preparation (NOP) for the Lower Klamath Project EIR (i.e., December 22, 2016) and the Draft EIR considered the potential effects of dam removal using the 2013 BiOp Flows to represent existing hydrology. In 2017, re-consultation on revisions to the biological opinion began again. After the issuance of the Lower Klamath Project Draft EIR on December 27, 2018, the applicable biological opinion and the operational flow requirements for the Klamath River changed again in March 2019, when the new biological opinions were issued by the National Marine Fisheries Service [NMFS] (2019) and United States Fish and Wildlife Service [USFWS] (2019). The 2019 Biological Opinion flows (2019 BiOp Flows) are now the current operational flow requirement for the Klamath River.

However, the fact that the flow schedules required for the USBR's Klamath Project were being revisited did not render CEQA analysis for the Klamath River Renewal Corporation's (KRRC's) project speculative so as to require a delay in CEQA review. Therefore, it was not premature to circulate the Draft EIR.

Please refer to Volume III Attachment 1 Section 3.1.6 *Introduction – Summary of Available Hydrology Information for the Proposed Project* for a comparison of the 2019 BiOp Flows, the 2013 BiOp Flows, and the Klamath Basin Restoration Agreement (KBRA) Flows, and a discussion of how the 2019 BiOp Flows are analyzed in the Lower Klamath Project Final EIR as a second CEQA baseline, representing flows under newly defined existing conditions. Please note that there are no changes in significance determinations relating to the inclusion of the 2019 BiOp Flows in the Final EIR analyses. For additional detail, please refer to Master Response HYD-1.

Comment LA8-40
Because of the inherent conflict between Yreka's right to take water for municipal purposes and the potential effect of the propagation of threatened species negatively affecting that right to take its full 15 cfs, as the parties agreed in the AKSA, Yreka requests that a mitigation measure be imposed that, should the FCH be constructed, no ESA endangered or threatened species be propagated at FCH.

Response to Comment LA8-40
The commenter is expressing concern regarding hypothetical future water diversion restrictions for the City of Yreka, based on the presence of a larger number of threatened species (coho salmon) in Fall Creek than would occur due

to fish barrier removal alone and due to the operations of the Proposed Project's coho salmon conservation program at Fall Creek Hatchery (FCH). Based on this concern, the commenter is requesting that mitigation measures be added to the Proposed Project for Fall Creek Hatchery operations.

Mitigation measures requested by the commenter to protect their water supplies are not required because there is no significant impact to the City of Yreka's water supply associated with Proposed Project's Fall Creek Hatchery operations (please also refer to responses to comments LA8- 10, LA8-28, LA8-29, LA8-34, LA8-37, LA8-41, and Master Responses WSWR-5 and WSWR-6). As described in Potential Impact 3.3-24, there is no evidence that the existing 15 cubic feet per second (cfs) bypass requirement is insufficient to supply adequate flows for listed salmonids that would use Fall Creek to access the Proposed Project's Fall Creek Hatchery. During the period of coho salmon migration and spawning (December through early winter), flows are typically much higher than the minimum 15 cfs bypass flow as a result of precipitation. If coho salmon adult returns were to become relatively high in Fall Creek as a result of hatchery returns, there is no basis to speculate that increased instream flows from reduced water diversions would be a reasonable or effective means to reduce crowding. Furthermore, the current program at Iron Gate Hatchery does not indicate that a similar program at Fall Creek Hatchery become high enough to induce "crowding." At Iron Gate Hatchery from 2004 to 2016, from zero to around 350 hatchery return spawners were observed, without crowding issues noted (Knechtle and Chesney 2011, 2016a, 2017). In addition, the proportion of anadromous salmonids anticipated to use the habitat in Fall Creek is relatively minor in comparison with the totality of newly accessible habitat upstream of Iron Gate Dam under the Proposed Project. The state (California Department of Fish and Wildlife [CDFW]) and federal (National Marine Fisheries Service [NMFS]) resource managers responsible for hatchery operations and the recovery of coho salmon have not indicated the release location of coho salmon smolts from the Fall Creek Hatchery, and it is speculative to assume that releases would occur in a location that would lead to adult crowding.

The 15 cfs is a flat bypass requirement that applies regardless of whether the City of Yreka's consumptive diversion is increased to 15 cfs (as was assumed for purposes of the flow analysis for salmonids in the EIR (please refer to Volume III Attachment 1 Section 3.3.5 *Aquatic Resources – Potential Impacts and Mitigation* Potential Impact 3.3-24). Additionally, NMFS and CDFW were involved in developing the hatchery proposal for Fall Creek, and these agencies have not indicated concern that the existing flows or that the City Yreka's bypass requirements in Fall Creek (negotiated with CDFW) are insufficient. The comment's concern that a greater number of listed coho salmon will return to Fall Creek and subsequently require restriction of City of Yreka's diversions is speculative (please also refer to response to comment LA8-37).

Additionally, the mitigation requested—that no threatened species be raised at Fall Creek Hatchery—does not appear to be feasible under CEQA. The goals for coho production are for a conservation hatchery and require a year-round supply of cold water which may not be available at Iron Gate Hatchery.

Comment LA8-41

It has been found that it is possible to prevent imprinting by treating water with activated carbon and ion-exchange resin, insoluble in petroleum-ether, dialyzable, non-volatile, and heat-stable and then imprinted with ÃŸ-phenylethyl alcohol (PEA) or morpholine for at least 14 days during smoltification and lured into unfamiliar streams scented with these odors during homing migration a few years later. Alternatively, in a natural stream environment, however, after preventing imprinting in the hatchery environment, smolts should be imprinted immediately by different odors when they encounter a branch stream that flows into a main stream during downstream migration as in the sequential imprinting hypothesis. If construction of the FCH is approved, and further if CDFW is not prohibited from raising ESA threatened species at FCH, this mitigation measure must be imposed to mitigate the probability that the cohoes will be imprinted to return to Fall Creek as a result of their rearing at the FCH.

To further prevent Fall Creek from becoming a magnet for salmonid spawning, Yreka seeks a mitigation condition that all fish propagated at FHC be planted at other tributaries and areas where they will be likely to return and that they not be released at Fall Creek itself.

This means planting the yearlings where the habitat is favorable to coho spawning propelling spawning upward into the Upper Klamath Basin. However, Oregon and California do not agree on whether hatchery fish should be propagated to accomplish the objectives of the Proposed Project. Oregon endorses a policy of native fishery production while CDFW originally proposed a "wait and see" approach before engaging in hatchery operations. All parties agree that hatchery fish compete with native fish, could create increased risk of disease, and could negatively affect natural fish production. In this regard the latest BiOp states:

"Uncertainty exists concerning the interrelationship of hatchery produced fish with the naturally produced coho salmon when both are present in the natural environment (i.e., after the hatchery fish are released into the Klamath River). This includes the role of hatchery produced salmon in the spread and proliferation of fish disease. The effects of hatchery operations are included as a Baseline condition."

Yet, CDFW is proposing to directly and immediately proceed with the demolition of IGH and construction of FCH. While it is understandable that CDFW desires to proceed while the project funding is occurring, PacifiCorp's commitment for

funding would remain in place in the event that "waiting and seeing" proves out to require hatchery produced fish following dam decommissioning.

Response to Comment LA8-41
Klamath River Renewal Corporation's (KRRC) Definite Plan (Section 7.8.3 *Proposed Fish Hatchery Plan*) describes the proposed Fall Creek Hatchery (FCH) facilities and improvements, water supply requirements, and operations including the production of coho salmon. As described in Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project Fish – Hatcheries*, coho salmon hatchery operations are proposed to continue operating as a conservation hatchery under a Hatchery Genetic Management Plan, including specific assessment of hatchery impacts on species spatial structure and operation of Fall Creek Hatchery with a particular emphasis on recolonization, including rearing and release techniques. The proposed fish hatchery plan states that California Department of Fish and Wildlife (CDFW) and National Marine Fisheries Service (NMFS) are evaluating release strategies for coho salmon produced at Fall Creek Hatchery. The state and federal agencies responsible for managing the recovery of coho salmon would continue to adjust hatchery operations, including release strategies, to maximize production, recovery, and recolonization while minimizing crowding and other potential issues in Fall Creek, in the operations of the facility under the Hatchery Genetic Management Plan. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Section 3.3.5.6 *Aquatic Resources – Potential Impacts and Mitigation – Fish Hatcheries* analyzes the effect of continued hatchery production of coho salmon. Impacts associated with hatchery operations including coho straying are discussed in Potential Impact 3.3-9. Potential Impact 3.3-9 was not found to be significant in the short term and to be beneficial for coho salmon populations in the long term. Under CEQA, mitigation measures are not required for impacts that are not found to be significant. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Regarding recolonization without hatchery operations, please refer to Section 4.7.3 Alternatives – *Aquatic Resources – No Hatchery Alternative.* Please also refer to Master Response AQF-2 for general discussion of future hatchery operations, and response to comment LA8-40 for further discussion of crowding concerns.

Comment LA8-42
While Yreka is neutral on whether or not the Proposed Project dams are decommissioned, it is interesting that it has been determined that the parasites that are largely creating the mortality of the salmon can be obviated by simply flushing the parasites off the rocks on the bottom of the river. While it is proposed that this flushing will naturally occur through flooding once the dams are decommissioned, there are no studies presented in the Definite Plan nor any

proposed alternative in the DEIR, that suggests that the BOR cannot simply perform this task though the rapid release of water with the dams intact. This is one of the functions of the BOR – to regulate the flow of water while balancing water usage with species recovery alternatives.

Response to Comment LA8-42

United States Bureau of Reclamation (USBR) regulates flows released at Link River Dam in the Upper Klamath Basin, including the provision of flushing flows for the Middle Klamath River to address polychaete habitat. The flushing flows prescribed in the 2017 court order and incorporated in the 2019 Biological Opinion (BiOp) could be achieved with dams in place or with dams removed. As described in Volume III Attachment 1 Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*, 2017 court-ordered flushing flows were required in 2017 and 2018, with the intent of reducing disease in the Lower Klamath River by mobilizing bedload sediments to disrupt the periphyton intermediate host (discussed below). The court-ordered flushing flows and emergency dilution flows are not modeled as part of existing conditions hydrology under the Proposed Project. As described in Volume III Attachment 1 Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*, the 2017 court-ordered flows included a requirement to ensure that certain high flows are reached each winter, and they also included an emergency dilution requirement if juvenile fish disease reached high levels in the infection nidus. The emergency dilution flows were used in 2018. In March 2019, the court-required re-initiation of USBR consultation with National Marine Fisheries Service (NMFS) and United States Fish and Wildlife Service (USFWS) was completed and new biological opinions (BiOps) were issued by NMFS (2019) and USFWS (2019a). The 2019 BiOp flow requirements include annual surface flushing flows of at least 6,030 cubic feet per second (cfs) for 72 hours at Iron Gate Dam between March 1 and April 15, and the potential for dilution flows and/or enhanced spring flows should water be available and disease conditions support their use. Dilution flows also occurred in June 2019 under the new BiOp flow requirements. While there has not been sufficient time to collect data characterizing the efficacy of the flushing flows since they were initiated in 2017, the necessity to use dilution flows in 2018 and 2019 suggests that flushing flows are insufficient on their own to resolve the issue of fish disease downstream of Iron Gate Dam.

Please refer to Volume III Attachment 1 Section 3.3.5.5 *Fish Disease and Parasites* and Master Response AQF-6 for a discussion of the multiple additional factors (in addition to flushing flows and the resulting bed mobilization) that affect fish disease and parasite prevalence in the Klamath River that potentially would be altered by the Proposed Project. The Lower Klamath Project EIR has been updated to reflect the 2019 BiOp Flows as an additional CEQA baseline for both the Proposed Project and the alternatives, as applicable. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment LA8-43

There is no study, proposal requiring or discussion that hatchery raised fish be genetically diversified to assure they do not pose a risk to wild populations. This mitigation is requested.

Response to Comment LA8-43

Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* analyzes the effect of continued hatchery production of coho and Chinook salmon on wild populations of these species. Potential Impact 3.3-7 (Effects on the fall-run Chinook salmon population due to short-term sediment releases and long-term changes in habitat quality, habitat quantity, and hatchery operations due to dam removal) and Potential Impact 3.3-9 (Effects on coho salmon populations due to short-term sediment releases and long-term changes in habitat quality, habitat quantity, and hatchery operations due to dam removal) were not found to be significant in the short term and were found to be beneficial for these populations in the long term. Under CEQA, mitigation measures are not required to be included for impacts that are not found to be significant. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

As described in Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project Fish – Hatcheries*, the Hatchery Genetics Management Plan (HGMP) for the Iron Gate Hatchery (CDFW and PacifiCorp 2014) specifically addresses conservation of genetic resources for hatchery produced coho salmon. The hatchery program will operate in support of the basin's coho salmon recovery efforts by conserving a full range of the existing genetic, phenotypic, behavioral, life history, and ecological diversity of the run.

Comment LA8-44

The characterization in the DEIR that there would be "upgraded plumbing" with the construction of a new Fall Creek Hatchery is a gross minimization of the water facilities that would be constructed. Attachment 5 demonstrates the last water layout design plan provided to Yreka by KRRC's engineers. Attachment 6 is the latest Fall Creek Hatchery layout provided to Yreka. The DEIR Should Yreka's water diversion impounds be altered in any manner, coordination between all parties would be absolutely necessary to maintain operations. In fact, the same coordination from all who are diverting water from Fall Creek (including any newly constructed fish hatchery) is necessary when Yreka performs periodic maintenance on its diversion impounds and fish screens.

Response to Comment LA8-44

Comments on the Definite Plan should be submitted to the Klamath River Renewal Corporation (KRRC). The figure shown in Attachment 5 is generally consistent with information provided in the KRRC's Definite Plan and the EIR. Please note that the figure shown in Attachment 6 of this comment is also

provided in Section 2.7.6.2 *Proposed Project – Proposed Project – Hatchery Operations – Fall Creek Hatchery* as Figure 2.7-15 (page 2-83). The caption for Figure 2.7-15 has been revised to note that specific details regarding the location of facilities at the re-opened hatchery are subject to minor changes within the Limits of Work. Further, as described in Volume I Section 3.8.5 *Water Supply/Water Rights – Potential Impacts and Mitigation* Mitigation Measure WSWR-2 (pages 3-682 to 3-683) is consistent with CEQA Guidelines section 15126.4, and in particular subdivision (a) (1) (B), which states that a mitigation measure may specify performance standards which would mitigate the significant effect of the project and which may be accomplished in more than one specified way. Additionally, Mitigation Measure WSWR-2 states that a short water delivery outage is necessary to make the final connections following construction of the new pipeline; the KRRC shall limit the water delivery outage to a maximum of 12 hours, unless the KRRC receives prior approval for a longer outage from the State Water Board, based on detailed information that the outage proposed will not interfere with City of Yreka's ability to supply water; and the KRRC shall coordinate the water delivery outage period with the City of Yreka to ensure the City of Yreka has an adequate supply of water stored to cover the maximum water delivery outage period, with adequate buffer.

Comment LA8-45

The Consequences of the Proposed Spring Creek Flow Restriction Condition Taken Together with Yreka's Water Permit Bypass Condition Will Restrict Yreka From Taking its Permitted Allocation

In the conditions proposed for renewal of the hydroelectric licenses, it has been proposed that PacifiCorp's 16.5 diversion from Spring Creek to its Fall Creek Hydroelectric facility be discontinued during the low-flow months of the summer. These are also Yreka's highest demand months. If this condition were implemented, together with the consequences of the CDFW 15 cfs bypass, Yreka would be deprived of its municipal water source during its most critical period. Accordingly, Yreka requests that a mitigation measure be imposed that SWQCB recommend to FERC that it not impose the proposed restriction of the diversion of Spring Creek water to the Facility.

Response to Comment LA8-45

Please refer to Master Response WSWR-7.

Comment LA8-46

The Klamath River Basin Compact Commission is an Essential party and is Properly the Lead Agency for the Purposes of this Circulating the DEIR and making Determinations Upon it.

Section 1.1 of the Draft Environmental Impact Report (DEIR; KRRC 2018; hereafter known as DEIR) states that the Klamath River Renewal Corporation (KRRC) has applied to the Federal Energy Regulatory Commission (FERC) to decommission and remove the four Lower Klamath Project dams (Proposed

Project). Section 1.1 further states that FERC is the federal lead agency that licenses the construction, operation, and decommissioning of most hydroelectric dams in the United States. However, in the DEIR we are now required to comment upon, the SWRCB has assumed the lead agency role and prepared the Lower Klamath Project License Surrender Project DEIR without following the legislative intent of CEQA, CEQA Guidelines, and CEQ NEPA regulations and, equally significant, the state and federal laws relating to the Klamath River Compact.

Response to Comment LA8-46
Please refer to Master Response CEQ-4.

Comment LA8-47
This is a logical non sequitur under the law since the project is intended to be carried out by the KRRC, a non-public 501(c)(3) organization. If 14 Cal Code Regs §15051(a) applies at all, it does not apply to SWQCB but to the Compact Commission. Pursuant to the Law of the River and the Law of the Union, the Commission is specifically designated as the regional planning agency with the greatest responsibility for supervising or approving the project as a whole pursuant to 14 Cal Code Regs §15051(b).

Article IX (Administration) of the Compact creates the Klamath River Compact Commission. (See 69 Stat. 613, 71 Stat. 497 [1957]; Cal. Water Code §§ 5900-5901 and ORS 542.610 to 542.630) Under Article IX subparagraph 1 creates the commission to administer the compact (the "Commission"). The Commission consists of three: a ex officio representative designated by the State of Oregon Water Resources; an ex officio representative designated by the SWRCB and a nonvoting Chair of the Commission designated by the President of the United States. Action is effective only if it is unanimously affirmed by both voting members. The Commission is required to appoint an executive director. Subparagraph 8 requires the Commission to be subject to open meeting laws.

The Commission is obligated to hold public hearings and to submit to the Governor of each state a budget of its estimated expenditures for such period as required by the laws of that state for presentation to the legislature thereof. Each state pledges itself to appropriate and pay over to the commission one-half of the amount required to finance the commission's estimated expenditures as set forth in each of its budgets. The Commission is required to transmit to the legislature and Governor of each state and to the President of the United States an annual report covering the finances and activities of the Commission and embodying such plans, recommendations and findings as may have been adopted by the Commission and to be annually audited by a Certified Public Accountant.

The Commission has monetary restrictions. It is prohibited from pledging the credit of any government except by and with the authority of the legislative body thereof given pursuant to and in keeping with the constitution of such government

and is also prohibited from incurring any obligations prior to the availability of funds adequate to meet them. The Commission is empowered to: 1) borrow, accept or contract for the services of personnel from any government or agency thereof, from any intergovernmental agency, or from any other entity; 2) Accept for any of its purposes and functions under this compact any and all donations, gifts, grants of money, equipment, supplies, materials and services from any government or agency thereof or intergovernmental agency or from any other entity; 3) Acquire, hold and dispose of real and personal property as may be necessary in the performance of its functions; and 4) Make such studies, surveys and investigations as are necessary in carrying out the provisions of this compact. Obviously, the studies relevant to the Proposed Project and the preparation of the related environmental DEIR fall within these categories.

Response to Comment LA8-47
Please refer to Master Response CEQ-4.

Comment LA8-48
The DEIR and the DEIS Should be Required to be jointly Submitted

The National Environmental Policy Act (NEPA) (42 USC §§4321-4370h), was adopted to mandate public agencies to consider the environmental impacts of their actions, to document those impacts, and to disclose that documentation to the public. See No Oil, Inc. v City of Los Angeles (1974) 13 C3d 68, 86 n21, 118 CR 34; Friends of Mammoth v Board of Supervisors (1972) 8 C3d 247, 261, 104 CR 761; Selmi, The Judicial Development of the California Environmental Quality Act, 18 UC Davis L Rev 197 (1984).

If a project requires approvals from a California public agency but will also be carried out, financed, or approved in part by a federal agency, preparation of a joint EIR/EIS may be required (see 14 Cal Code Regs §§15220-15228), and the joint document must usually meet the requirements of both CEQA and NEPA. This is particularly applicable where projects that have a significant impact on matters within federal jurisdiction, such as some projects that require a permit to fill wetlands or that may affect waters that are subject to United States jurisdiction under §404 of the Federal Water Pollution Control Act (Federal Clean Water Act) (33 USC §1344).

This project expressly concerns the flow of navigable water between Oregon and California and through federal (US Forest Service) and Tribal reservations Klamath Tribe, Karuk Tribe, Hoopa Tribe and Yurok Tribe). Each of these tribes are federally recognized. Not only is an express federal approval an integral part of the implementation of this plan, the deconstruction of four hydroelectric dams, under FERC required considerations, significantly affects the quality of the human environment which separately requires NEPA environmental assessment. 42 USC §4332(2)(C), 40 CFR §§1501.4(b), 1508.9.

The National Environmental Policy Act (NEPA), is intended to ensure that Federal agencies actively participate as cooperating agencies in other agency's NEPA processes. The CEQA regulations addressing cooperating agencies status (40 C.F.R. §§ 1501.6 & 1508.5) implement the NEPA mandate that Federal agencies responsible for preparing NEPA analyses and documentation do so "in cooperation with State and local governments" and other agencies with jurisdiction by law or special expertise. (42 U.S.C. §§ 4331(a), 4332(2)).

Response to Comment LA8-48
Please refer to Master Response CEQ-1.

Comment LA8-49
The Intergovernmental Cooperation Act contains specific coordinated planning requirements for local, state and federal agencies. Presidential Executive Order 12372 requires federal agencies to coordinate actions and projects with local governments so that local impacts arising from federal projects may be identified.

The National Environmental Policy Act (NEPA) applies to projects that are carried out, financed, or approved in whole or in part by federal agencies; therefore, FERC must prepare an environmental impact statement prior to acting with respect to the Proposed Project.

Yreka respectfully requests SWQCB to take the action above stated.

Response to Comment LA8-49
Please refer to Master Response CEQ-1.

County of Siskiyou, Ashley J. Remilllard

Comment LA9-1
On behalf of Siskiyou County ("County"), we are writing to express our significant concerns regarding the Draft Environmental Impact Report ("DEIR") for the Lower Klamath Project License Surrender ("Proposed Project") prepared by the California State Water Resources Control Board ("State Board") pursuant to the California Environmental Quality Act, Cal. Pub. Res. Code, § 21000 et seq. ("CEQA"). As the State Board is aware, the Klamath River Renewal Corporation ("KRRC") and PacifiCorp have submitted applications to the Federal Energy Regulatory Commission ("FERC") for hydropower license transfer and surrender. Together, these applications propose to transfer, decommission, and remove four lower Klamath River dams—Iron Gate, Copco I, Copco II, and J.C. Boyle. Three of these dams are located within Siskiyou County. The County has, on multiple occasions, expressed its concerns regarding the potential impacts of dam removal on imperiled species, water quality, and the overall health of the Klamath River ecosystem, as well as other environmental and societal impacts, including air quality, climate change, cultural resources, hazardous materials, and traffic impacts, in addition to socioeconomic impacts on the local community. See, e.g., PacifiCorp, 162 FERC 61,236 at 28 (Mar. 15, 2018). Accordingly, the

County has a vested interest in ensuring that the public is appropriately and lawfully informed of the consequences of the Proposed Project.

As part of the license surrender process, and pursuant to section 401 of the Clean Water Act, 33 U.S.C. § 1341 et seq., KRRC must also obtain a water quality certification from the State Board. Because the section 401 certification must be based on a finding that the Proposed Project will meet water quality standards and other applicable requirements, the State Board must comply with CEQA. Here, however, the State Board has failed to do so.

As further set forth in the Technical Memorandum attached hereto as Exhibit A, the DEIR fails to satisfy the requirements of CEQA and its implementing guidelines, 14 Cal. Code Regs. §§ 15000 et seq. ("CEQA Guidelines"), and therefore fails to provide the public with an adequate assessment of the significant environmental effects associated with implementation of the Proposed Project. The County's concerns include, among other things, the following:

As the State Board is aware, FERC is required under the National Environmental Policy Act ("NEPA") to prepare an environmental impact statement to evaluate the potential environmental impacts of the Proposed Project. Various provisions of the CEQA Guidelines, as well as NEPA's implementing regulations, state that lead CEQA and NEPA agencies should avoid duplication and jointly prepare one environmental document. Such an approach improves efficiency, preserves public resources, and avoids public confusion and complexity. Here, the State Board's failure to prepare a joint environmental document with FERC is problematic. For example, the fact that FERC has not begun the NEPA process reinforces the uncertain nature of the Proposed Project description (also discussed below). Likewise, having two documents with multiple alternatives makes the Proposed Project unnecessarily complex and risks causing unneeded public confusion. Thus, the County requests that the State Board issue a revised DEIR prepared in coordination with FERC.

Response to Comment LA9-1
Thank you for your comment. Please refer to Master Response CEQ-1.

Comment LA9-2
The State Board has improperly failed to consult with responsible agencies and other local agencies that exercise authority of the resources that will be affected by the Proposed Project. See Cal. Pub. Res. Code § 21104; 14 Cal. Code Regs. § 15086(a). Specifically, the State Board has taken the position that the County is not a responsible agency because the County's local permitting requirements will be preempted by federal law. This determination is improperly premature. Not only has FERC required compliance with all local permitting requirements in other dam removal contexts, Arizona Public Service Co., 109 FERC ¶ 61,036 (2004); Wisconsin Electric Power Co., 94 FERC ¶ 61,038 (2001), but this is a determination to be made by FERC—not the State Board. In addition, FERC has

made it clear that KRRC must comply with state and local laws to the extent practicable. E.g., Definite Plan at 38, citing PacifiCorp, 115 FERC ¶ 61,194 (2006) ("We prefer for our licensees to be good citizens of the communities in which projects are located, and thus to comply with state and local requirements, where possible.") Unless and until FERC makes a determination regarding preemption, it is improper for the State Board to assume that the County is not a responsible agency under CEQA.

Response to Comment LA9-2
Please refer to Master Response CEQ-2 for a discussion of the effect of Federal Power Act preemption on responsible agencies.

Comment LA9-3
The purpose and objectives of the Proposed Project are improperly narrow. More specifically, the purpose and objectives foreclose meaningful consideration of alternatives that should properly be considered under CEQA. For example, the objective to '[r]estore volitional anadromous fish passage in the Klamath Basin to viable habitat currently made inaccessible by the Lower Klamath Project dams' is narrower than, and not justified by, the project purpose (i.e., improving water quality and upstream access). This objective essentially preselects the preferred alternative-dam removal-thereby precluding consideration of other alternatives that could significantly improve fish passage and survival (e.g., trap and haul, or other means of assisted migration). Likewise, the purpose and objectives improperly focus exclusively on improving "anadromous fish passage." This ignores the fact that multiple other non-anadromous species inhabit the Proposed Project area, including imperiled shortnose and Lost River suckers. It is improper for the purpose and objectives to be defined so narrowly as to exclude consideration of alternatives that would benefit other Klamath Basin aquatic species.

Response to Comment LA9-3
The State Water Board has set forth an underlying purpose and project objectives that are reasonably focused on restoration goals related to the Lower Klamath Project facilities (see Volume I *Executive Summary* page ES-4). The Proposed Project purpose and objectives are not improperly narrow or conflated, nor do they preclude meaningful consideration of a reasonable range of alternatives to the Proposed Project in the EIR.

Specifically, the objective specifying volitional anadromous fish passage is aligned with the requirements of National Marine Fisheries Service's (NMFS) Biological Opinion issued to the Klamath Hydroelectric Project (KHP) in prior proceedings regarding these facilities – while being broader than the four-dam-removal goal stated by the applicant and included in the Klamath Hydroelectric Settlement Agreement (KHSA).

Long-term declines in Klamath Basin fisheries have been observed for wild fall-run Chinook salmon, spring-run Chinook salmon, steelhead, coho salmon, and Pacific lamprey. These declines, which are attributable to the cumulative effects of a multitude of changing conditions including dam construction, hydrologic modifications, changing ocean conditions, and land use changes, have created hardships for commercial fisheries and tribal communities that depend on these fisheries as an important cultural resource. Commercial fishery trollers in the Pacific Ocean that catch coho and fall- and spring-run Chinook salmon originating from river systems including the Klamath River have suffered severe economic impacts due to decreases in fish numbers and related harvest limitations in the past several decades (see also Volume I Section 5.4.1.1 *Other Required CEQA Discussion and Consideration of Social and Economic Factors – Social and Economic Factors Under CEQA – Consideration of Economic Information for Resources Potentially Affected by Dam Removal – Commercial Fishing* [pages 5-5 to 5-7]). A lack of access to native food sources, including an inability to get salmon due to poor river conditions, is primary among the reasons that Klamath Basin Native community food assistance users report a reliance on food assistance, with 70 percent of all surveyed households reporting that they rarely or never have access to their desired foods including salmon (Sowerwine et al. 2019). Salmon are also ecologically important to the Klamath River Basin, providing a nutrient-rich food source for terrestrial species, including bald eagles, osprey, and many other species of birds and mammals. The declines in coho salmon in the Klamath Basin have contributed to the listing of this species as threatened under the Endangered Species Act (ESA) (Volume III Attachment 1 Section 3.3 *Aquatic Resources* Table 3.3-2). Improvements to listed suckers in this reach would not be an appropriate objective for the Hydroelectric Reach because, as further discussed in response to comment LA9-19, the sucker populations in Iron Gate and Copco No. 1 reservoirs are “sink populations” and are not likely to be self-sustaining.

The Lower Klamath Project EIR presents a range of reasonable alternatives to the Proposed Project that meet most of the project objectives. As described in Volume I Section 4.1 *Alternatives Selection/Overview* (pages 4-1 to 4-15), the State Water Board considered all of the potential alternatives discussed in the 2007 FERC EIS and the 2012 KHSA EIS/EIR and evaluated them as potential objectives, including consideration of their ability to meet the Proposed Project’s underlying purpose and objectives. In addition to revisiting the alternatives considered for the prior related environmental reviews, the State Water Board considered three additional potential alternatives raised in Lower Klamath Project scoping, including a fish passage alternative that looks at a combination of trap and haul, fish cannons (a new technology since 2012), and other mechanisms for fish passage without dam removal proposed by Siskiyou County and others.

Ultimately, the State Water Board brought forward six alternatives for detailed analysis in the EIR. Of these, two involve removal of all four Lower Klamath Project Dams, and four involve some or all of the dams remaining in place with

mandatory fishway prescriptions. While none of the additional proposals for fish passage were found to be feasible alternatives for review, the EIR notes where the potential impacts of trap and haul might differ from the impacts of the mandatory fishway prescriptions in the Continued Operations with Fish Passage and Two Dam Removal alternatives (Volume I Section 4.4 *Alternatives – Continued Operations with Fish Passage* [pages 4-99 to 4-180] and Section 4.5 *Alternatives – Two Dam Removal* [pages 4-100 to 4-246]).

There are potential impacts and beneficial effects identified for each of these alternatives in the EIR and each will be fully considered by the State Water Board before certifying the EIR (CEQA Guidelines section 15090).

Comment LA9-4

The Proposed Project is improperly defined. Specifically, the DEIR defines the Proposed Project as the project set forth in the Definite Plan for the Lower Klamath Project ("Definite Plan") that was submitted to FERC in June 2018. As the State Board is aware, the Definite Plan is currently under review by FERC, and has not been deemed technically or financially feasible. Furthermore, KRRC has indicated that the Definite Plan will be revised and reissued in April 2019. See http://www.klamathrenewal.org/wp-content/uploads/2018/12/2018-12-12-Letter-Report-BOC-Mtg-No-1.pdf; see also November 2018 Comments from Siskiyou County re Definite Plan (attached hereto as Exhibit B). The State Board's use of a tentative, yet-to-be-vetted project as the Proposed Project is contrary to CEQA. See Washoe Meadows Community v. Department of Parks and Recreation, 17 Cal.App.5th 277 (Cal. Ct. App. 2017).

Response to Comment LA9-4

Prior to issuance of the Draft EIR in December 2018, the Klamath River Renewal Corporation (KRRC) indicated that updates to the Definite Plan primarily would be focused on updating cost information associated with the Proposed Project and that any updates to the proposed activities and/or project components would be minor.

In July 2019 and February 2020, KRRC provided updates to the Definite Plan, in which KRRC provided cost-related information, including funding for mitigation surety, which is not integral to the analyses in the EIR. KRRC (2019b) also proposed that pre-drawdown construction activities would occur in 2021 and primary reservoir drawdown and dam removal would occur in 2022, which does not constitute significant new information. Please refer to KRRC (2019b) here: http://www.klamathrenewal.org/wp-content/uploads/2019/07/KRRC-July-29-FERC-Filing.pdf. Please refer to KRRC (2020) here: http://www.klamathrenewal.org/wp-content/uploads/2020/02/Public-02-28-2020-Supp-Response-Letter.pdf

CEQA does not require that a lead agency delay environmental review until a federal agency makes particular determinations regarding a proposed project. Therefore, the project description is not improper.

Comment LA9-5

Throughout the DEIR, the State Board refers to "measures that would not be considered feasible for the purposes of CEQA because the SWRCB cannot ensure that they would occur." The State Board's approach with respect to these measures is improper. Where mitigation measures can be devised consistent with CEQA, the State Board cannot lawfully shirk its responsibility to identify such measures and require compliance with them in order to reduce impacts to less than significant. Importantly, "a condition requiring compliance with regulations is a common and reasonable mitigation measure, and may be proper where it is reasonable to expect compliance." Oakland Heritage Alliance v. City of Oakland, 195 Cal. App. 4th 884, 906 (Cal. Ct. App. 2011), cited in Center for Biological Diversity v. Department of Fish & Wildlife, 234 Cal. App. 4th 214, 246 (Cal Ct. App. 2015). It is reasonable to expect compliance with, for example, the federal Endangered Species Act, pertinent provisions of the California Fish and Game Code, and other federal and state laws. Therefore, the State Board should revise the DEIR to incorporate mitigation measures (rather than recommended measures) wherever possible.

Response to Comment LA9-5

Please refer to Master Response CEQ-2.

Comment LA9-6

The State Board acknowledges that the Proposed Project will result in exceedances of air quality thresholds established by the Siskiyou County Air Pollution Control District ("SCAPCD"), including with respect to NOX, PM10, and PM2.5. DEIR at 3-703, citing SCAPCD Rule 6.1, Construction Permit Standards for Criteria Pollutants. The State Board further concludes that, based on those exceedances, construction emissions for the Proposed Project would be significant. Id. In Section 2.8 of the Project Description, however, the State Board has not identified SCAPCD as a responsible agency that will rely on the DEIR for permitting or other regulatory purposes. See, e. g., SCAPCD Rule 2.1(A), Permits Required. This contravenes CEQA Guidelines section 15124, subdivision (d). The State Board should revise the DEIR to properly comply with this requirement.

Response to Comment LA9-6

This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (Air Quality). With respect to the comment's concern that the EIR does not identify the Siskiyou County Air Pollution Control District (SCAPCD) as a responsible agency that will rely on the EIR for permitting or other regulatory purposes, please refer to Master Response CEQ-2.

Comment LA9-7

The DEIR's analysis of greenhouse gas emissions is inadequate. For example, the impact analysis indicates that emissions have not been quantified since the 2012 EIR/EIS, despite significant changes to the Proposed Project. The State Board should either perform a new analysis to quantify emissions or explain why it has not performed such an analysis. See Cleveland Nat'l Forest Found. v. San Diego Assn. of Governments, 3 Cal. 5th 497, 515-516 (Cal. Ct. App. 2017). Furthermore, the DEIR's 10,000 MT threshold of significance is contrary to recent court decisions holding that, without an analysis explaining why the data is relevant to a particular project, reliance on statewide data or other regional data to prepare significance thresholds is improper. E.g., Golden Door Properties, LLC v. Cty. of San Diego, 27 Cal. App. 5th 892 (Cal. Ct. App. 2018); Ctr. for Biological Diversity v. Dep't of Fish & Wildlife, 62 Cal. 4th 204 (Cal. 2015). Thus, at a minimum, the State Board should revise the DEIR to include an additional analysis demonstrating why the data that it used is relevant to the Proposed Project, including with respect to both its type and location. Id.; see also DEIR at 3- 720. Moreover, because of the burden and risk associated with tailoring thresholds to particular projects, many local agencies have instead adopted a net zero threshold. See, e.g., Newhall Ranch Project, https://netzeronewhall.com/. This is also the approach recommended by the California Air Resources Board. See, e.g., https://www.arb.ca.gov/cc/scopingplan/scoping_plan_2017.pdf at 101. The County encourages the State Board adopt a net zero threshold for the Proposed Project. In any event, the County reaffirms its position that the DEIR must include mitigation measures to reduce air quality impacts to less than significant rather than simply allowing KRRC to endanger public health by proceeding with an action that has unmitigated, significant air quality impacts.

Response to Comment LA9-7

This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (Greenhouse Gas Emissions and Energy).

Comment LA9-8

Section 1.1 of the Draft Environmental Impact Report (DEIR) states that the Klamath River Renewal Corporation (KRRC) has applied to the Federal Energy Regulatory Commission (FERC) to decommission and remove the four Lower Klamath Project dams (Proposed Project). Section 1.1 further states that FERC is the federal lead agency that licenses the construction, operation, and decommissioning of most hydroelectric dams in the United States.

The National Environmental Policy Act (NEPA) applies to projects that are carried out, financed, or approved in whole or in part by federal agencies; therefore, FERC must prepare an Environmental Impact Statement (EIS) prior to taking action with respect to the Proposed Project. California Environmental Quality Act (CEQA) Guidelines Section 15006, Reducing Delay and Paperwork,

states that lead agencies should eliminate duplication with federal procedures by providing for joint preparation of environmental documents with federal agencies and by adopting documents prepared in fulfillment of NEPA and its implementing regulations. In addition, CEQA Guidelines Section 15222, Preparation of Joint Documents, states that a lead agency should try to combine an Environmental Impact Report (EIR)/EIS to avoid the need for the federal agency to prepare a separate document for the same project. According to CEQA Guidelines Section 15222 this involvement is necessary because federal law generally prohibits a federal agency from using an EIR prepared by a state agency unless the federal agency was involved in the preparation of the document. Furthermore, Council on Environmental Quality (CEQ) NEPA Regulations encourage cooperation with state and local agencies in an effort to reduce duplication in the NEPA process (40 Code of Federal Regulations [C.F.R.] § 1506.2). The CEQ NEPA regulations state that cooperation shall include joint planning processes, joint environmental research and studies, joint public hearings, and joint environmental assessments (Id. § 1506.2(b)(1-4)).

The State Water Resources Control Board (SWRCB) has prepared the Lower Klamath Project License Surrender Project DEIR without following the legislative intent of CEQA, CEQA Guidelines, and CEQ NEPA regulations. The SWRCB has created undue confusion and complexity for the public, local agencies, and other state and federal agencies involved in reviewing the project by initiating two separate, duplicative environmental review processes. Thus, it's recommended that the SWRCB issue a revised DEIR in coordinating with FERC.

Although the County clearly outlines the need for a revised EIR, it is important to note that due to SWRCB's failure to follow the process outlined above the potential for future amendments to the DEIR, requiring recirculation, results in financial hardship to economically stressed stakeholders and local agencies, such as Siskiyou County, who will be obligated to expend further limited resources to review and respond to the new documents the SWRCB circulates. Had the SWRCB followed typical and acceptable procedural steps in developing this DEIR, there would have been a significant decrease in the financial strain experienced by affected stakeholders and local agencies, including Siskiyou County.

Response to Comment LA9-8
Please refer to Master Response CEQ-1.

Comment LA9-9
Under Public Resources Code section 21104, "[p]rior to completing an environmental impact report, the state lead agency shall consult with, and obtain comments from, each responsible agency, trustee agency, any public agency that has jurisdiction by law with respect to the project, and any city or county that borders on a city or county within which the project is located unless otherwise designated annually by agreement between the state lead agency and the city or

county, and may consult with any person who has special expertise with respect to any environmental impact involved." Under 14 California Code of Regulations (CCR) § 15086(a), the lead agency "shall consult with and request comments… from" responsible agencies and other local agencies that exercise authority over resources that may be affected by the project, and "may consultant directly with: (1) Any person who has special expertise with respect to any environmental impact involved, (2) Any member of the public who has filed a written request for notice with the lead agency or the clerk of the governing body." Here, SWRCB has taken the position that Siskiyou County is not a Responsible Agency because FERC will preempt all of Siskiyou County's local permitting requirements. However, FERC has, in some dam removal cases, required licensees to obtain all local permits. See Arizona Public Service Co., 109 FERC 61,036 (2004), and Wisconsin Electric Power Co., 94 FERC 61,038 (2001). As FERC has explained to PacifiCorp in the past, "federal preemption does not necessarily mean that the Commission will not elect to require PacifiCorp to comply with those of the Counties' requirements that the Commission concludes will not interfere with the company's ability to carry out the Commission's orders"; rather, "[i]t only establishes that it is within the Commission's sole discretion to determine the extent to which such compliance will be required." (PacifiCorp Project No. 2342-18; Order available at: https://www.ferc.gov/whats-new/comm-meet/051806/H-2.pdf.) Given that counties may be permitted to exert regulatory authority to the extent its regulations do not make compliance with FERC orders impossible or unduly difficult, and given that FERC prefers licensees to be good citizens of the communities in which projects are located, and thus to comply with all local requirements, where possible, the SWRCB is in error in not consulting with the County as a Responsible Agency so that the EIR would be useful for its purposes as well.

Response to Comment LA9-9
Please refer to Master Response CEQ-2.

Comment LA9-10
Section 2.1 of the DEIR, Project Purpose and Objectives, outlines the SWRCB identified objectives of the Proposed Project as well as the underlying purpose. The purpose is "timely improving water quality related to the Lower Klamath Project within and downstream of the current Hydroelectric Reach and restoring anadromous access upstream of Iron Gate Dam." This purpose is unduly narrow. It appears the SWRCB and KRRC have conflated the underlying purpose, objectives, and Proposed Project. This is contrary to CEQA. North Coast Rivers Alliance, et al. v. A.G. Kawamura/Our Children's Earth Foundation, et al. v. California Department of Food and Agriculture (2015) 243 Cal.App.4th 647 (opining that failing to properly distinguish between the project purpose, project objectives, and project violates CEQA).

The four project objectives outline improvements to water quality and fish populations, but notably absent are considerations by the lead agency of any

consideration of the potential benefits for and costs to local communities, including but not limited to agricultural and ranching interests. The SWRCB should consider the interest of the citizens of Siskiyou County in their project objectives.

Furthermore, the objective to "Restore volitional anadromous fish passage in the Klamath Basin to viable habitat currently made inaccessible by the Lower Klamath Project dams" is narrower than, and not justified by, the project purpose (improving water quality and upstream access). This objective can be used to justify dam removal over any other alternative including trap and haul or other means of assisted migration. Restoring volitional anadromous fish passage rather than conserving wild salmonid populations, for example, gives the appearance of purposefully manipulating the objectives in order to identify the applicant's long-preferred alternative of dam removal as the preferred alternative.

Response to Comment LA9-10

Please refer to response to comment LA9-3. Please also refer to Volume I Section 5.4 *Other Required CEQA Discussion and Consideration of Social and Economic Factors – Social and Economic Factors Under CEQA*. Additionally, please refer to Master Responses WSWR-1, WSWR- 2, WSWR-3, and WSWR-4, and to Volume 1 Section 3.15.5 *Agriculture and Forestry Resources – Potential Impacts and Mitigation* for further discussion regarding potential impacts to agriculture.

Comment LA9-11

Section 2.7 of the DEIR, Proposed Project, states that the Detailed Plan and Definite Plan constitute the applicant's Proposed Project. As the SWRCB is aware, the Definite Plan is currently being reviewed by FERC and the Independent Board of Consultants for technical adequacy. In fact, the project proponent has committed to revise the Definite Plan, issuing a new document in April 2019. See http://www.klamathrenewal.org/wp-content/uploads/2018/12/2018-12-12-Letter-Report-BOC-Mtg-No-1.pdf. According to Washoe Meadows Community v. Department of Parks and Recreation (2017) 17 Cal.App.5th 277, an EIR must contain an "accurate, stable, and finite" project description. Given the potential changes to the Proposed Project as a result of the commitment to issue revised documents, additional pending review and subsequent comments, using the draft plan as a basis for the project description and baseline for analysis is inadequate. Further, as FERC is the lead federal agency for the project, SWRCB should wait for their input on the Definite Plan before having forged ahead on the DEIR (CEQA Guidelines 15223). SWRCB's release of the DEIR precluded FERC's ability to review and comment on the project itself.

Section 2.7.8 of the DEIR, Project Component, summarizes project components outside of the major dam and powerhouse deconstruction. These components primarily address environmental, safety, and quality of life issues and are

outlined in the appendices to the Definite Plan. Siskiyou County has provided substantive comments on the Definite Plan (and appendices). As these components are instrumental in the mitigation of environmental impacts, please ensure that our comments are addressed in subsequent drafts of these essential components of the Proposed Project.

Response to Comment LA9-11
Comments on the Definite Plan should be submitted to the Klamath River Renewal Corporation (KRRC). Please refer to response to comment LA9-4 regarding sufficient stability of the Proposed Project and to Master Response CEQ-1 for a discussion of the relationship between the CEQA and the National Environmental Policy Act (NEPA).

Comment LA9-12
Section 15126.4(a) of the CEQA Guidelines states "(a) An EIR must include a description of the physical environmental conditions in the vicinity of the project, as they exist at the time the notice of preparation is published, or if no notice of preparation is published, at the time environmental analysis is commenced, from both a local and regional perspective. This environmental setting will normally constitute the baseline physical conditions by which a lead agency determines whether an impact is significant."

There are many sections in the DEIR that rely on future surveys or studies to be prepared to identify resources or habitats that may be present in the project impact area. Without quality data that allow for an assessment of baseline conditions of resources within the project area, the impact analysis is unreliable. The impacts of a Proposed Project must be evaluated by comparing expected environmental conditions after project implementation to conditions at a point in time referred to as the baseline. The changes in environmental conditions between those two scenarios represent the environmental impacts of the Proposed Project. The adequacy of a document's baseline is a factual issue to be determined based on whether there is substantial evidence in the record supporting the agency's determination.

Baseline is not a policy choice to be made at the end of CEQA Review (Save Our Peninsula Committee v. Monterey County (2001) 87. Cal. App. 4th 99). For a new project, courts have required that the baseline reflect actual existing physical conditions at the start of environmental review. The DEIR relies on future surveys and studies to identify wetlands, special-status plants, culturally significant resources, special-status wildlife, groundwater wells, and other affected resources. The impact determination directly correlates to the existing or baseline conditions. If those conditions are unknown then making a determination of significance is not possible or reliable. The SWRCB has abdicated its responsibility in providing quality data regarding the baseline/existing conditions so that realistic and accurate impact determinations can be made. We have noted specifically in Table 1, below, where individual

resource topics do not have the adequate environmental setting information to make an informed impact analysis.

Response to Comment LA9-12
As described in Volume I Section 3.1.2 *Introduction – Environmental Setting*, the EIR establishes and evaluates the relevant baseline as part of each resource area. The EIR incorporates available existing information to describe the baseline under CEQA. The environmental setting analysis relies on a range of available information, including studies that are relevant to the description of existing conditions. In some instances, the analyses discuss new or updated studies like those noted in the comment, to confirm the presence and/or extent of a particular resource that has been identified as potentially present using existing information, or to confirm whether associated impacts have the potential to occur. These additional studies can be relevant for a range of reasons, including the abundance of available data for characterizing a resource, the likelihood that data collected in prior studies would change over time and the rate of that change, and the degree of granularity in the existing data. Where the analyses discuss new or updated studies, the EIR conservatively assumes the presence and extent of resources in light of available information, and appropriately evaluates the breadth of potential impacts as well as feasible mitigation. This approach is consistent with CEQA's requirement to describe the environmental setting in order to "give the public and decision makers the most accurate and understandable picture practically possible of the project's likely near-term and long-term impacts" (CEQA Guidelines section 15125, subd. (a)).

Referencing ongoing studies related to current conditions or requiring further, more exact information regarding resources prior to implementation of a project does not constitute an impermissible delayed policy decision regarding establishment of a baseline.

The comment notes that Table 1 raises specific allegations of lack of specificity in the baseline. Please see the responses to those more specific comments, below.

Comment LA9-13
(1) An EIR shall describe feasible measures which could minimize significant adverse impacts, including where relevant, inefficient and unnecessary consumption of energy.

(A) The discussion of mitigation measures shall distinguish between the measures which are proposed by project proponents to be included in the project and other measures proposed by the lead, responsible or trustee agency or other persons which are not included but the lead agency determines could reasonably be expected to reduce adverse impacts if required as conditions of approving the project.

(B) This discussion shall identify mitigation measures for each significant environmental effect identified in the EIR.

(2) Mitigation measures must be fully enforceable through permit conditions, agreements, or other legally-binding instruments. In the case of the adoption of a plan, policy, regulation, or other public project, mitigation measures can be incorporated into the plan, policy, regulation, or project design.

Throughout the DEIR, the SWRCB refers to "measures that would not be considered feasible for the purposes of CEQA because the SWRCB cannot ensure that they would occur." In these cases, recommended measures are provided that would reduce potential impacts if implemented by KRRC. However, the impact analysis herein cannot rely on the implementation of these measures. In many of these cases the DEIR concludes that a significant and unavoidable impact would result. It is unclear why the SWRCB has taken this position with so many of the impacts. The excerpt below is from pages ES-9–ES-15.

"[T]he determination of whether a project will have significant environmental impacts, and the formulation of measures to mitigate those impacts, must occur before the project is approved." California Native Plant Society v. City of Rancho Cordova (2009) 172 Cal.App.4th 603, 621. Here, the SWRCB has failed to formulate mitigation measures, arguing time and again, it is not feasible to do so. For example, with respect to terrestrial resources, the SWRCB states: "implementation of terrestrial resources measures would be not be considered feasible for the purposes of CEQA because the State Water Board cannot ensure that they would occur. In these cases, recommended measures are provided that would reduce potential impacts if implemented by KRRC" (DEIR, p. 3-516). Where mitigation measures can be devised consistent with CEQA Guidelines Section 15126.4, the SWRCB cannot lawfully shirk its responsibility to identify such measures and require compliance with them in order to reduce impacts to less than significant. Importantly, "a condition requiring compliance with regulations is a common and reasonable mitigation measure, and may be proper where it is reasonable to expect compliance." Oakland Heritage Alliance v. City of Oakland (2011) 195 Cal. App. 4th 884, 906 cited in Center for Biological Diversity v. Department of Fish & Wildlife (2015) 234 Cal. App. 4th 214, 246. It is reasonable to expect compliance with the federal Endangered Species Act, pertinent provisions of the Fish and Game Code, and other federal and state laws. Therefore, the SWRCB must revise the DEIR to incorporate mitigation measures rather than recommended measures wherever possible. In those circumstances where the SWRCB believes it is not possible, it must comply with CEQA Guidelines Section 15126.4(a)(5) by explaining the reasoning for its determination. Simply reciting the conclusory claim that there are no feasible mitigation measures does not suffice. "The failure to provide enough information to permit informed decision-making is fatal." Napa Citizens for Honest Government v. Napa County Bd. of Supervisors (2001) 91 Cal. App. 4th 342,

361. Furthermore, in those circumstances where the SWRCB proposed recommended measures, consistent with Public Resources Code section 21081(a)(2), the SWRCB should clearly identify other public agencies that have the responsibility and jurisdiction to require implementation of those recommended measures.

Response to Comment LA9-13
Please refer to Master Response CEQ-2.

Comment LA9-14
The Executive Summary to the DEIR states:

Below is a summary, by resource area, of impacts found to be 'significant and unavoidable' with or without mitigation (Table ES-1). Please note, the KRRC proposes to further develop Proposed Project actions relating to certain state and local regulatory requirements for several resource areas that fall outside of State Water Board's water quality certification authority. The State Water Board anticipates implementation of additional measures (e.g., good neighbor agreements between the KRRC and relevant state or local agencies, recommended measures in this EIR, and any modifications developed through the FERC process that provide the same or better level of protection for the resource in question) would reduce impacts. The EIR notes where such protection would eliminate the potential for a significant impact. However, the State Water Board cannot ensure implementation of good neighbor agreements, recommended measures included in this EIR, or modifications anticipated to be developed through the FERC process. Therefore, the State Water Board has identified impacts that rely on implementation of such agreements or recommended measures in this EIR as significant and unavoidable.

DEIR at ES-11.

This section included significant and unavoidable impacts on the following resources: Water Quality, Aquatic Resources, Phytoplankton and Periphyton, Terrestrial Resources, Flood Hydrology, Air Quality, Historical Resources and Tribal Cultural Resources, Public Services, Aesthetics, Recreation, Hazards and Hazardous Substances, Transportation and Traffic, and Noise. Most of the resource areas also included recommended mitigation measures that the SWRCB states are not enforceable and therefore cannot be relied upon. In some cases the recommended measures are under the purview of other state or federal agencies that may require those measures through their permits or consultations that must be completed as part of the project permitting process and that may be enforceable by the permitting agency (e.g. California Department of Fish and Wildlife [CDFW] for special-status terrestrial species and rare natural communities or state-listed species; U.S. Fish and Wildlife Service [USFWS] and/or National Marine Fisheries Service [NMFS] for federally listed species, etc.).

The DEIR does not rely on other trustee or lead agency authority in cases where it reasonably could to ensure that these measures would be implemented to reduce impacts to less than significant. Part A of the above statute clearly indicates that "mitigation measures shall distinguish between" (1) "measures which are proposed by project proponents to be included in the project," and (2) "other measures proposed by the lead, responsible or trustee agency or other persons which are not included but the lead agency determines could reasonably be expected to reduce adverse impacts if required as conditions of approving the project."

The SWRCB asserts its authority to enforce or require mitigation for certain resources. As an example, the DEIR asserts that it has jurisdiction over wetlands and waterways and can enforce that mitigation, therefore concluding that it can imposed mitigation measures to mitigate effects to reptiles and amphibians so that they are less than significant (based on Mitigation Measure TER-2 − Amphibian and Reptile Management). This measure, just as any terrestrial mitigation measure, will require approval by CDFW and normally would be included in a Streambed Alteration Agreement (SAA) and, in the event any reptiles are listed as threatened or endangered, in a California Endangered Species Act (CESA) permit.

The SWRCB has interpreted law with respect to CEQA to provide that any required mitigation measures would have to be fully enforceable through SWRCB permit conditions. Therefore, where mitigation cannot be enforced by SWRCB under its non-CEQA authorities, such as the Porter Cologne Water Quality Control Act, the SWRCB must make significant and unavoidable impact determinations rather than identifying mitigation to mitigate effects to less than significant. The SWRCB goes on in these significant and unavoidable impact determinations to refer to "recommended measures" that if implemented would reduce impacts to less than significant. In many cases these measures would be reasonably expected to be conditions of approving the project by another trustee or responsible agency. One such example is CDFW through their responsibilities under Lake and Streambed Alteration Program. Section 1600 of the Fish and Game Code states:

The Legislature finds and declares that the protection and conservation of the fish and wildlife resources of this state are of utmost public interest. Fish and wildlife are the property of the people and provide a major contribution to the economy of the state, as well as providing a significant part of the people's food supply; therefore their conservation is a proper responsibility of the state.

The Lake and Streambed Alteration Program establishes a regulatory scheme to protect and conserve fish and wildlife resources, and the habitats upon which they depend. This includes notification to CDFW and a procedure to reach agreement with CDFW. This regulatory program codifies CDFW's responsibility

to protect public trust resources. The SWRCB, being a state agency likewise charged with protection of public trust resources, is responsible to ensure that conservation of fish and wildlife is part of any project it authorizes or acts as lead agency with respect to under CEQA. Because CDFW and the SWRCB are both state agencies, the EIR should require mitigation measures that avoid violation of state laws. The Water Board cannot simply determine that impacts are significant and unavoidable in violation of state law.

The DEIR also includes significant and unavoidable impact determinations for several federally listed species using the same reasoning that SWRCB cannot enforce mitigation measures outside the water quality certification conditions. However, the significant and unavoidable impacts that would result from the Proposed Project to listed species (including Bald and Golden Eagle Protection Act [BGEPA] species) without USFWS consultation and approved avoidance, minimization and mitigation would be in violation of the ESA. Because the project will require both a U.S. Army Corps of Engineers (USACE) Section 404 permit and FERC surrender license, there is a federal nexus and both will require a Section 7 consultation with the USFWS. The SWRCB analysis should require:

1) implementation of Recommended Terrestrial Measures 3–12,
2) acquisition of an SAA from CDFW, and
3) consultation with the USFWS to secure a Biological Opinion or Letter of Concurrence to avoid violation of state and federal law.

Section 15126.2 of the CEQA Guidelines states:

(a) The Significant Environmental Effects of the Proposed Project. An EIR shall identify and focus on the significant environmental effects of the Proposed Project on the environment. In assessing the impact of a Proposed Project on the environment, the lead agency should normally limit its examination to changes in the existing physical conditions in the affected area as they exist at the time the notice of preparation is published, or where no notice of preparation is published, at the time environmental analysis is commenced. Direct and indirect significant effects of the project on the environment shall be clearly identified and described, giving due consideration to both the short-term and long-term effects. The discussion should include relevant specifics of the area, the resources involved, physical changes, alterations to ecological systems, and changes induced in population distribution, population concentration, the human use of the land (including commercial and residential development), health and safety problems caused by the physical changes, and other aspects of the resource base such as water, historical resources, scenic quality, and public services. The EIR shall also analyze any significant environmental effects the project might cause or risk exacerbating by bringing development and people into the area affected. For example, the EIR should evaluate any potentially significant direct, indirect, or cumulative environmental impacts of locating development in areas susceptible to hazardous conditions (e.g., floodplains,

coastlines, wildfire risk areas), including both short-term and long-term conditions, as identified in authoritative hazard maps, risk assessments or in land use plans, addressing such hazards areas.

Response to Comment LA9-14
Please refer to Master Response CEQ-2 regarding preemption under the Federal Power Act including the effects of preemption on mitigation measures and responsible agencies. As discussed in Master Response CEQ-2, recommended measures to reduce impacts on federally-listed species to less than significant have been modified to be mitigation measures; coordination with applicable federal and state agencies has been incorporated within these mitigation measures, as appropriate. To reduce impacts on bald and golden eagles to a less than significant level, Recommended Terrestrial Measure 11 has been revised to be a Mitigation Measure (Mitigation Measure TER-7). To reduce impacts on grey wolf, Recommended Measure 8 has been revised to be a Mitigation Measure (Mitigation Measure TER-6). Please refer to Volume III Attachment 1 Section 3.5.5.3 *Terrestrial Resources – Potential Impacts and Mitigation – Special-Status Species and Rare Natural Communities* for these revised measures.

Additionally, this comment provides a summary introduction of items raised, with more specific items listed in commenter's Table 1. For a response to the more specific items raised in commenter's Table 1, please see the individual responses below.

Comment LA9-15
Data relied upon for the water quality analysis is too old to adequately assess existing conditions of the project area. The information relating to total phosphorus, total nitrogen, dissolved oxygen, pH, inorganic and organic matter, sediment contaminants, and aquatic biota contaminants is all over ten years old and does not represent the current environment, particularly given alterations in climate and surrounding land uses.

Response to Comment LA9-15
Please refer to Master Response WQ-4.

Comment LA9-16
The Klamath River Water Quality Model (KRWQM) includes the assumption that all waters that enter the state of California are fully compliant with applicable Total Maximum Daily Loads (TMDLs). That is, the model assumes that reservoir conditions and waters that flow into California meet all water quality standards for water temperature, organic enrichment/dissolved oxygen, nutrients, pH and microsystins. As such, the effects of dam removal on the TMDL target constituents are underestimated, since it's likely that the TMDLs will not be being met upstream. The DEIR then states: "dam removal would rapidly and substantially move the Hydroelectric Reach towards achieving California TMDL

Compliance." This is disingenuous, as it relies heavily on the improper and unsupported assumption that waters entering California will be TMDL-compliant. It also ignores the short term effects and the consequence of sending a huge, contaminated debris flow that will end up downstream of the Hydroelectric Reach, the Klamath River estuary, and the Pacific Ocean. The DEIR should analyze water quality constituents without assuming TMDL compliance upstream.

Response to Comment LA9-16
Please refer to Master Response WQ-5.

The language quoted in the comment – "dam removal would rapidly and substantially move the Hydroelectric Reach towards achieving California TMDL compliance" – is part of Section 3.2.5.1 *Water Quality – Potential Impacts and Mitigation – Water Temperature*, so it is specifically referring to achieving California Total Maximum Daily Load (TMDL) compliance for water temperature. Additionally, it is the final sentence in the first full paragraph in Volume I page 3-76 describing why this conclusion is accurate for water temperature despite the California Klamath River TMDL model's assumption of compliance. Section 3.2.5.1 *Water Quality – Potential Impacts and Mitigation – Water Temperature* has been revised to clarify that dam removal would rapidly and substantially move the Hydroelectric Reach towards achieving California TMDL compliance for water temperature. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Sediment impacts are addressed in Section 3.2.5.2 *Water Quality – Potential Impacts and Mitigation – Suspended Sediments*, not in the cited temperature section. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Comment LA9-17
The KRWQM model notes that removal of the dams would increase water temperatures in the spring, with climate change possibly resulting in a 1.8˚F to 5.4˚F increase in water temperatures. With increases in temperatures between 1.8˚F to 5.4˚F, conditions for spring spawners and adult/juvenile migration would potentially be worse than with the dams in place, as the dams are able to release deeper, cold water during the spring and summer months. Also, for the Middle and Lower Klamath, Estuary, and Pacific Nearshore environment, the KRWQM predicts warmer water during April through August (migration/spring spawning) and warmer (4–18˚F) water during August through November (fall spawning time). The DEIR should consider the negative effects of warmer water on migrating and spawning salmonids.

Response to Comment LA9-17
Please refer to Section 3.2.5.1 *Water Quality – Potential Impacts and Mitigation – Water Temperature* Potential Impact 3.2-1 for a discussion of the potential

impacts of the Proposed Project on water temperature in the Klamath River. The model results discussed in the comment are not from the Klamath River Water Quality Model (KRWQM). The model results are from the River Basin Model-10 (RBM-10) model that estimates Klamath River water temperature conditions from Link River Dam to the Pacific Ocean over the next 50-years under climate change for a scenario with the Lower Klamath Project dams remaining in place (i.e., "dams-in") under 2010 BiOp Flows and for a scenario with the Lower Klamath Project dams removed (i.e., "dams out") under Klamath Basin Restoration Agreement Flows (KBRA Flows). In addition to water temperature changes due to the dams remaining in place or the dams being removed, water temperature was predicted to increase 1.8°F to 5.4°F under both "dams in" and "dams out" scenarios over the next 50-years due to climate change (Perry et al. 2011). Water temperature increases under climate change generally resulted in a progressive, nearly uniform increase in water temperature throughout the modeled Klamath River reaches over time, suggesting variations in the flow between the "dams-in" and "dams-out" scenarios did not influence the predicted increase in water temperature from climate change.

Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Water Temperature* provides an analysis of water temperature dynamics and effects on aquatic resources under existing conditions. Section 3.3.5.4 *Aquatic Resources – Potential Impacts and Mitigation – Water Temperature* provides an analysis of the potential influence of warmer water on salmonids, including the potential for adverse impacts to aquatic resources due to increased water temperatures during spring and summer under the Proposed Project. The Chinook Salmon Expert Panel concluded that Lower Klamath Project dam removal offers greater potential than the existing conditions for Chinook salmon to tolerate climate change and changes in marine survival (Goodman et al. 2011). Similarly, the Coho Salmon and Steelhead Expert Panel concluded that dam removal would provide greater mitigation to climate change for coho salmon and steelhead than existing conditions (Dunne et al. 2011). Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impacts 3.3-7, 3.3-9, and 3.3-10 provide discussion of the effects of dam removal on Chinook salmon, coho salmon, and steelhead populations, including changes in water temperature under the Proposed Project. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Please also refer to Master Response WQ-2.

Comment LA9-18

If barriers are removed to allow upstream access by Oncorhynchus mykiss irideus (steelhead), the potential effects of this subspecies on O. mykiss newberrii, and vice versa, needs to be analyzed in the DEIR. Hatcheries have had a large influence on the genetic structure of salmonids in the basin, and

thought should be given to how restoring upstream passage may affect the resident trout population.

- "In addition, non-native stocks of O. mykiss have been widely planted in the basin, and large hatcheries exist on both the Klamath (Iron Gate Hatchery) and Trinity (Trinity River Hatchery) rivers. The extent of their genetic impact on wild, naturally-spawning, O. mykiss is not known." (Pearse et al 2007)

Response to Comment LA9-18
Volume I Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-18 discusses how removal of Lower Klamath Project dams under the Proposed Project and resulting habitat access to steelhead (*O. mykiss*) would affect resident redband trout. Because these two species evolved together in the Upper Klamath Basin of the Klamath River and co-existed prior to the construction of dams (Goodman et al. 2011), there is no predicted significant impact to either species from restoring the potential for interactions. Pearse et al. (2007) does not raise concerns about genetic implications from interactions between *O. mykiss* downstream and upstream of Iron Gate Dam, and their research did not include collection of samples upstream of Iron Gate Dam. Both populations have already been subjected to hatchery trout genetics, there have been no steelhead hatchery releases from Iron Gate Fish Hatchery since 2012, and the comment presents no information that is not already included in the EIR appropriate for assessing species interactions. Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-18 has been revised to include discussion of the information presented in Pearse et al. (2007). Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment LA9-19
California Fish and Game Code 2081.11 states that "(a) The department may authorize, under this chapter, the take or possession of the Lost River sucker (Deltistes luxatus) and shortnose sucker (Chasmistes brevirostris) resulting from impacts attributable to or otherwise related to the decommissioning and removal of the Iron Gate Dam, Copco 1 Dam, Copco 2 Dam, or J.C. Boyle Dam, consistent with the Klamath Hydroelectric Settlement Agreement, if all of the following conditions are met:

- (1) The department determines the authorized take will not jeopardize the continued existence of the Lost River sucker or shortnose sucker.

- (2) The impacts of the authorized take are minimized.

- (3) The take authorization provides for the development and implementation of an adaptive management plan, approved by the department, for monitoring the effectiveness of, and adjusting as necessary, the measures to minimize the impacts of the authorized take.

- (b) This section shall not be construed to exempt the project described in subdivision (a) from any other law."

Most work with these species is centered on their status in Upper Klamath Lake and the tributaries that feed the lake. There is no recent information presented addressing the status of the population in the downstream reservoirs. The KRRC cites work conducted by Desjardins and Markle (2000), which was approximately 20 years ago. Desjardins and Markle (2000) indicated that further studies were needed to investigate recruitment of adults and juveniles. Therefore, there is a data gap on the current status of these species in these downstream reservoirs. If adequate recruitment to spawning age is an issue in both the Upper Klamath Lake and downstream areas, it is improper to sacrifice the downstream population as a "sink population" without adequately understanding and describing the justification (i.e., genetics, current population structure). As stated in the U.S. Geological Survey (USGS) Report (Hewitt et al 2018), "Despite relatively high survival in most years, we conclude that both species have experienced substantial decreases in the abundance of spawning adults because losses from mortality have not been balanced by recruitment of new individuals." Furthermore, this position is reflected in another USGS Report (Burdick et al. 2018), which states: "Upper Klamath Lake populations are decreasing because adult mortality, which is relatively low, is not being balanced by recruitment of young adult suckers into known spawning aggregations. Most Upper Klamath Lake juvenile sucker mortality appears to occur within the first year of life."

Response to Comment LA9-19

Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species – Fish – Resident Riverine Fish Species – Lost River and Shortnose Suckers* provides a comprehensive summary of recent information used to inform the USFWS (2013) revised recovery plan, which determined that the populations in Iron Gate and Copco No. 1 reservoirs are "sink populations" and are not likely to be self-sustaining. The issues noted in the comment regarding a reduction in survival of the sucker population in Upper Klamath Lake (citing recent reports) are not potentially alleviated by the existing sucker populations in Iron Gate and Copco No. 1 reservoirs. Low recruitment in the reservoir populations is due to the lack of access to spawning habitats, as described in Moyle (2002) and NRC (2004), and as determined through extensive sampling conducted by Oregon State University, citing Desjardins and Markle (2000). No data are available, and United States Fish and Wildlife Service (USFWS) has released no information to suggest that the sink populations in Iron Gate and Copco No. 1 reservoirs are a viable source for supporting the Upper Klamath Lake population.

The issues of poor recruitment, reduced survivorship of adults, and low age class diversity are discussed in the recovery plan for these species (USFWS 2013), and the discussion is consistent with the information included in the Hewitt et al.

(2018) and Burdick et al. (2018) United States Geological Survey (USGS) reports mentioned in the comment.

Comments regarding the summary of Fish and Game Code 2081.11 noted.

Comment LA9-20

In the DEIR, the Resident Fish Panel Expert states that the Upper Klamath Lake populations are self-sustaining. However, both reports from the USGS on adult (Hewitt et al 2018) and juvenile status (Burdick et al. 2018) indicate inadequate numbers of new spawning recruits. Therefore, the Panel's findings are inconsistent with current science on the Lost River and shortnose Suckers. This inconsistency should be acknowledged and discussed.

Response to Comment LA9-20

The comment claims that recent United States Geological Survey (USGS) reports (Hewitt et al. 2018 and Burdick et al. 2018) demonstrate that the Upper Klamath River sucker populations are no longer "self-sustaining." However, this appears to be a misunderstanding of the term "self-sustaining". The cited reports affirm that the status of the Lost River and Shortnose sucker populations in Upper Klamath Lake remains distressed. "Self-sustaining" simply means that the population is capable of occurring without influence from other sucker populations. The endangered status of these species clearly speaks to the United States Fish and Wildlife Service (USFWS) position that the population abundances are in decline. The issues of poor recruitment, reduced survivorship of adults, and low age class diversity are discussed in the recovery plan for these species (USFWS 2013).

Comment LA9-21

If the USFWS or other agencies are worried about hybridization of Klamath smallscale suckers (Catostomus rimiculus) with the other sucker species, as detailed in the 2013 Biological Opinion (USFWS 2013), removal of barriers such as J.C. Boyle Dam could allow access of Klamath smallscale suckers to migrate upstream where Lost River and Shortnose suckers more commonly occur. This could potentially increase incidences of hybridization. This is further stated as a concern by Buettner et al. (2006) and others to caution against supporting migration of individuals from Iron Gate and Copco Reservoirs into the Upper Klamath Lake population.

Response to Comment LA9-21

Hybridization of Klamath smallscale suckers is directly addressed in the EIR through the discussion of implementing Klamath River Renewal Corporation's (KRRC's) proposed Aquatic Resource Measures. The Aquatic Resource Measures are summarized in Section 2.7.8.1 *Proposed Project – Proposed Project – Other Project Components – Aquatic Resource Measures* and detailed in Volume II Appendix B: *Definite Plan − Appendix I*. The Proposed Project includes Aquatic Resource Measure AR-6 (*Suckers*) to reduce the short- and

long-term effects of reservoir removal (including increased connectivity to upstream habitats). Aquatic Resource Measure AR-6 involves the following two primary actions: reservoir and river sampling to estimate the abundance of suckers in the Hydroelectric Reach and to conduct genetic testing for hybridization; and, sucker salvage and release into waterbodies isolated from the Upper Klamath Lake populations. The proposed actions are anticipated to increase the survival of individual Lost River and shortnose suckers currently inhabiting the Hydroelectric Reach, without increasing exposure of the Upper Klamath Lake population to adults that possess a high degree of hybridization.

Smallscale sucker have been found to be common in J.C. Boyle Reservoir (Buettner et. al 2006) and improving connectivity in the Hydroelectric Reach through dam removal has not been identified as a short-term or long-term concern with respect to the potential for increasing hybridization between smallscale sucker and federally listed Lost River and shortnose suckers. Buettner et al. (2006) note that Miller and Smith (1981) claimed that hybridization was pronounced in the hydroelectric reservoirs, but Buettner et al. (2006) do not provide evidence, or state a concern, with hybridization resulting from potential upstream habitat connectivity. The USFWS Biological Opinion (2013) does not state a concern with removal of J.C. Boyle Dam, or suggest a link between increased habitat connectivity and hybridization, both as suggested in the comment. USFWS (2013) states that hybridization among Klamath Basin suckers is consistent with a pattern of historical intercrossing.

In addition, minor typographical errors in the section this comment refers to, Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species,* have been corrected. Please refer to Volume III Attachment 1 Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species* for the revisions.

Comment LA9-22

The USFWS logic in the 2013 Revised Recovery Plan to not include the downstream reservoirs, downstream of Keno Dam, under Critical Habitat designation for the Lost River Sucker and Shortnose Sucker are based on Primary Constituent Elements. However, data on the population status of the Lost River Sucker and Shortnose Sucker should be updated prior to assuming the sucker populations downstream of Keno Dam are part of a sink population. During sampling in 1998 and 1999, Desjardins and Markle (2000) found all developmental stages of Shortnose Sucker at J.C. Boyle and Copco Dams. The downstream reservoirs, while artificially created, currently provide some level of habitat for these sucker species. In a Joint Press Release dated February 20, 2014 between the USFWS and PacifiCorp (USFWS and PacifiCorp 2014), it is stated that "the majority of remaining affected suckers are not part of reproducing populations since they reside in downstream reservoirs, which are outside of their historic range." While these suckers may not have been present in these areas prior to dam installation, the installation of dams and the associated reservoirs now provide some level of habitat for these ESA sucker species.

Response to Comment LA9-22
Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Lost River and Shortnose Suckers* provides a comprehensive summary of the best available scientific information on sucker populations in the Lower Klamath Project hydroelectric reservoirs, including a detailed summary of the results of the sampling conducted by Desjardins and Markle (2000) in 1998 and 1999 that documented multiple life stages of suckers in the hydroelectric reservoirs. This section reflects the information used to inform the 2013 revised recovery plan. The federal agency responsible for the recovery of the Lost River and Shortnose suckers concluded in the recovery plan that the populations in Iron Gate and Copco No. 1 reservoirs are "sink populations" and are not likely to be self-sustaining, nor do they contribute to the recovery goals for the sucker populations. Low recruitment in the reservoir population is due to the lack of access to spawning habitats, as described in Moyle (2002) and NRC (2004), and as determined through extensive sampling conducted by Oregon State University, citing Desjardins and Markle (2000). Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources.*

Comments regarding USFWS's process of critical habitat designation are noted. Designation of critical habitat by USFWS is not under the purview of the State Water Board and is not part of the Proposed Project analyzed in this EIR.

Comment LA9-23
Similar to Impact 3.3-1, the DEIR concludes that there is no significant impact to EFH with implementation of AQR-1 and AQR-2. However, these mitigation measures (MMs) are directed at species rather than EFH. The impact to EFH occurs even with implementation of mitigation and should be considered significant.

Response to Comment LA9-23
In addition to addressing impacts to species, Klamath River Renewal Corporation's (KRRC's) proposed Aquatic Resource Measures AR-1 and AR-2 include components that directly alleviate impacts to fish habitat (including essential fish habitat; EFH), including spawning and migratory habitat. Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resources Impacts* describes potential impacts on Chinook and coho salmon EFH (and critical habitat) quality and quantity due to short-term sediment releases and long-term changes in habitat quality and quantity due to dam removal (see Potential Impact 3.3-4).

Proposed Aquatic Resource Measure AR-1 (Mainstem Spawning) would improve habitat connectivity from the Klamath River into tributaries by addressing sediment and debris obstructions that block volitional upstream passage, thereby increasing and improving access to fish habitat. Aquatic Resource Measure AR-1 also includes an evaluation and proposal of other actions to improve rearing and spawning habitat such as large woody material installation, riparian

plantings, or cattle exclusion fencing. Additional actions would be implemented if spawning habitat conditions following dam removal do not meet target metrics including gravel augmentation in the mainstem, with additional spawning habitat actions in tributaries, thereby directly improving EFH and critical habitat.

Proposed Aquatic Resource Measure AR-2 (Juvenile Outmigration) would require actions to maintain connectivity to EFH and critical habitat to ensure volitional fish passage between tributaries and the Klamath River, and it would provide for the development of a water quality monitoring network, trigger thresholds, and plan for relocating juvenile fish from tributary confluence areas to cold water tributaries or nearby off-channel ponds.

As described in Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resources Impacts*, in addition to the KRRC's proposed measures the EIR includes Mitigation Measures AQR-1 and AQR-2 to increase certainty of the effectiveness of the Aquatic Resource Measures AR-1 and AR-2. EIR Mitigation Measures AQR-1 and AQR-2 specify that monitoring shall also be conducted following a significant (5-year) flow event, even if that flow event occurs more than two years following dam removal. Implementation of Mitigation Measures AQR-1 and AQR-2 would increase the frequency of monitoring and extend the monitoring period for implementing proposed Aquatic Resource Measures AQ-1 and AQ-2. Increasing the frequency of monitoring and extending the monitoring period would improve EFH and critical habitat conditions for Chinook and coho salmon by ensuring that the actions specified under proposed Aquatic Resource Measures AR-1 and AR-2 are protective for a longer duration if necessary. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources.*

Comment LA9-24

The SWRCB relies on Mitigation Measure AQR-1 − Mainstem Spawning, and Mitigation Measure AQR-2 − Juvenile Outmigration, to reduce impacts to coho critical habitat to less than significant. These measures reduce impacts to the species. Also, the question remains as to why the SWRCB believes that the salvaging and relocation of a listed species that is both federally and state-listed as threatened (under the purview of NMFS and CDFW) is enforceable as part of the Water Quality Certification conditions but cannot do the same for other species or habitats (e.g. terrestrial special-status plants or species).

Response to Comment LA9-24

Please refer to response to comment LA9-23 for discussion of how AQR-1 and AQR-2 will protect habitat for fish species. Please also refer to Master Response CEQ-2 for discussion of the effect of federal preemption on the enforceability of mitigation measures and how mitigation for potential impacts to some terrestrial species can be accomplished pursuant to federal authorities.

Comment LA9-25
Similar to Impact 3.3-1, the DEIR concludes that there is no significant impact to EFH with implementation of AQR-1 and AQR-2. However, these mitigation measures (MMs) are directed at species rather than EFH. The impact to EFH occurs even with implementation of mitigation and should be considered significant.

Response to Comment LA9-25
The comment's assertion that Mitigation Measures AQR-1 and AQR-2 are not directed at fish habitat is incorrect. Please refer to response to comment LA9-23 for discussion of how potential impacts to Essential Fish Habitat (EFH) and critical habitat will be mitigated to less than significant levels.

Comment LA9-26
The SWRCB relies on Mitigation Measure AQR-1 − Mainstem Spawning, and Mitigation Measure AQR-2 − Juvenile Outmigration, to reduce impacts to coho critical habitat to less than significant. These measures reduce impacts to the species, and not the critical habitat.

Response to Comment LA9-26
Please refer to responses to comments LA9-23 and LA9-25.

Comment LA9-27
The DEIR states that "cool groundwater spring inputs in the Williamson River and the south side of Upper Klamath Lake would likely provide thermal refugia for the non-migratory juvenile salmonid rearing life stages." However, this statement overlooks the fact that juveniles will be forced into crowded conditions with many other species of native and non-native fishes and these crowded conditions would likely increase the potential for disease outbreaks. Furthermore, these spring inputs should be counted, identified, and quantified in a way that substantiates this conclusion.

Response to Comment LA9-27
Please refer to Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites* for a discussion of disease risk in the Williamson River following the Proposed Project. There is some concern regarding a disease zone in the lower Williamson River downstream from the confluence with the Sprague River, where there are currently high parasite densities observed (Hurst et al. 2012). However, maximum temperatures in the Williamson River do not exceed the disease threshold of 59°F in all years analyzed (Bartholomew and Foott 2010, Hamilton et al. 2011). Overall, the risk of a juvenile salmon disease response in the Williamson River would be lower than under existing conditions in the Middle Klamath River, but not negligible in all water years (S. Foott, USFWS, pers. comm., 2012). Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources.* Please also refer to

Master Response AQF-5 for a discussion of potential for conditions upstream of Iron Gate Dam to result in a new disease nidus.

Please refer to response to comment ORG46-235. Please also refer to Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-8 and Volume I Section 3.7.2.1 *Groundwater – Environmental Setting – Regional Groundwater Conditions* (page 3-641), which cite the work of Gannet et al. (2007), for the most recent and comprehensive attempt to estimate the groundwater level gradients and flow patterns within the vicinity of the Lower Klamath Project reservoirs.

Comment LA9-28

The statement regarding young salmon having the option to feed at night when water temperatures are cooler fails to recognize that the primary feeding times for juveniles is the crepuscular hours and they do not typically feed at night because of low light visibility (Schabetzberger, et al. 2003). Young salmon, not being able to consume adequate amounts of food on a daily basis, will compromise their ability to be fit for migration to the ocean and still experience average survival rates. This data is not taken into account and would conflict with the Proposed Project's purported benefits to salmonids due to reductions in minimum daily temperatures.

Response to Comment LA9-28

Section 3.3.5.4 *Aquatic Resources – Environmental Setting – Potential Impacts and Mitigation – Water Temperature* provides additional supporting information for the overall conclusion that reductions in minimum daily temperatures below those under existing conditions would benefit salmonids in the Klamath River mainstem, helping them to tolerate the warmer periods of the year when dwelling in the mainstem, but also allowing feeding excursions when confined to refugia during the warmer times of the day. NRC (2004) concludes that cooler temperatures at night may allow rearing fish to move out of temperature refugia to forage at night, allowing growth to occur even when ambient day time temperatures are above optimal. Foott et al. (2012) directly tested the effect of diurnal (including nighttime conditions) fluctuating water temperature profiles similar to what would be observed in the Klamath River under the Proposed Project, and the authors observed positive growth and no apparent effect of elevated temperature on immune function or fitness in Klamath River juvenile Chinook salmon held over a 23-day period under conditions in a laboratory. Feeding apparently did not decrease enough under nocturnal conditions to substantially affect growth. Salmonids in the Klamath River have been observed to use cooler hours to migrate between thermal refugia (Belchik 2003), and the decrease in minimum temperatures during the spring, summer, and fall under the Proposed Project would be beneficial for fish (Figure 3.3-3). Increased nighttime cooling of water temperatures is important to salmonids in warm systems, providing regular thermal relief, time for repair of proteins damaged by thermal stress, and significant bioenergetic benefits that help fish persist under marginal

conditions despite the potential for reduced nighttime feeding (Schrank et al. 2003, NRC 2004). In addition, Dunsmoor and Huntington (2006) suggest that lower nighttime temperatures with dam removal would allow fish to leave thermal refugia in the Klamath River to forage and thereby allow more effective use of the available refugia habitat. Overall, the Proposed Project reductions in minimum daily temperatures below those under existing conditions would benefit salmonids in the Klamath River mainstem, helping them to tolerate the warmer periods of the year when dwelling in the mainstem, but also allowing feeding excursions when confined to refugia during the warmer times of the day. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources.*

Comment LA9-29

Significant impacts associated with critical habitat are related to potential effects or impairment of the Primary Constituent Elements (PCEs) within the Action Area of the Proposed Project. The impact determination on critical habitat PCEs includes salvaging and relocating fish. Yet, the DEIR states that the Proposed Project would have no significant impact on coho salmon critical habitat in the short term. This is not accurate.

Response to Comment LA9-29

The comment appears to misunderstand the EIR analysis regarding coho salmon critical habitat. Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-1 concludes there would be no significant impact *with mitigation*. Primary Constituent Elements (PCEs) for Southern Oregon/Northern California Coast (SONCC) coho salmon are described in National Marine Fisheries Service [NMFS] (1999b) as follows: "In addition to these factors, NMFS also focuses on the known physical and biological features (PCEs) within the designated area that are essential to the conservation of the species and that may require special management considerations or protection. These essential features may include, but are not limited to, spawning sites, food resources, water quality and quantity, and riparian vegetation."

The effects on PCEs and critical habitat are analyzed in EIR Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation –Aquatic Resource Impacts* (Potential Impact 3.3-1). The EIR states that: "Based on the substantial short-term decrease in quality of the features of critical habitat and PCEs supporting SONCC coho salmon, there would be a significant impact to coho salmon critical habitat under the Proposed Project in the short term. However, the Proposed Project includes aquatic resource measures AR-1 (Mainstem Spawning) and AR-2 (Juvenile Outmigration) to reduce the short-term effects of SSCs on coho salmon PCEs of critical habitat."

With implementation of Mitigation Measures AR-1 and AR-2, the Proposed Project would have no significant impacts to coho salmon critical habitat in the short term.

Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment LA9-30

The SWRCB relies on Mitigation Measure AQR-1 − Mainstem Spawning, and Mitigation Measure AQR-2 − Juvenile Outmigration, to reduce impacts to coho critical habitat to less than significant. These measures reduce impacts to the species. Also, the question remains as to why the SWRCB believes that the salvaging and relocation of a listed species that is both federally and state-listed as threatened (under the purview of NMFS and CDFW) is enforceable as part of the Water Quality Certification conditions but cannot do the same for other species or habitats (e.g. terrestrial special-status plants or species).

Response to Comment LA9-30

Please refer to the responses to comments LA9-23 and LA9-24. Please also refer to Master Response CEQ-2.

Comment LA9-31

Dam removal and fish passage projects in Washington are used as examples of "rapid recolonization" following implementation. These examples are inapposite to the Proposed Project, however, because they included good water quality as a baseline condition. That is not the case here. To the contrary, it is unlikely the Klamath River will ever achieve the level of water quality that was achieved in those sample projects. This was recognized by the Chinook Salmon Expert Panel (page 3-301): "While the Chinook Salmon Expert Panel agreed that there was also evidence that potential dramatic increases in abundance associated with potential fish passage upstream of Keno Dam as well, they cautioned that achieving substantial gains in Chinook salmon abundance and distribution in the Klamath Basin is contingent upon successfully resolving key factors that would continue to affect the population, including water quality in Upper Klamath Lake and Keno Reservoir, disease, colonization of the Upper Klamath River Basin, harvest and escapement, hatchery interactions, predation by resident fish, climate change, instream flows, and impacts from dam removal."

Response to Comment LA9-31

As noted in the comment, Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* (Potential Impact 3.3-7) describes potential differences between the Proposed Project and examples of dam removal and fish passage projects that occurred elsewhere. Multiple examples of dam removals conducted elsewhere are provided in the Draft EIR as examples, not as the sole or primary evidence for recolonization in the Klamath Basin. Rather, the Draft EIR uses multiple lines of evidence, including the Evaluation of Dam Removal and Restoration of Anadromy (EDRRA) approach to inform and support the recolonization analysis.

Similarities and differences between the Proposed Project and examples of dam removal and fish passage projects from elsewhere are described and these comparisons provide valuable context. The differences between the Proposed Project and other project examples were considered when predicting potential outcomes of dam removal under the Proposed Project.

As noted by the Chinook Salmon Expert Panel, water quality is a concern under existing and dam removal conditions and was considered in assessing the effects of the Proposed Project. Section 3.3.5.3 *Aquatic Resources – Potential Impacts and Mitigation – Water Quality* describes potential impacts related to water quality conditions that were considered when analyzing the potential impacts of the Proposed Project on aquatic resources, and includes discussion of the water quality concerns raised by the Expert Panel. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment LA9-32

On February 8, 2019, the California Fish and Game Commission declared a finding of emergency and statement of proposed emergency regulation relating to the Upper Klamath-Trinity Spring Chinook Salmon. The proposed emergency regulations will make the Klamath River Basin Spring Chinook Salmon a candidate species under the California Endangered Species Act receiving full take protection while the Department of Fish and Wildlife considers a 'threatened' or 'endangered' listing. The DEIR should provide an update to the environmental setting and impact analysis assuming the spring-run Chinook Salmon would be listed under the California Endangered Species Act and provide any mitigation to limit impacts per presumed compliance with an Incidental Take Permit (California Fish and Game Code Section 2081).

Response to Comment LA9-32

Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species* has been revised to describe the recent decision by the California Fish and Game Commission to consider listing Upper Klamath Trinity River Spring Chinook. Please refer to Volume III Attachment 1 Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species* for the revisions.

Listing of spring-run Chinook by California Department of Fish and Wildlife (CDFW) would not change the existing physical conditions of the environmental setting or the conclusions of the analysis of potential impacts to spring-run Chinook that are set out in the EIR Section 3.3.2.1 *Aquatic Species – Spring-Run Chinook Salmon – Anadromous Fish Species*. The analysis of potential impacts of the Proposed Project on spring-run Chinook salmon is presented in Potential Impact 3.3-8. The EIR concludes no significant impact for spring-run Chinook salmon populations in the short term, and beneficial for spring-run Chinook salmon populations in the long term. Although the EIR finds no significant impact on spring-run Chinook salmon, the Klamath River Renewal Corporation (KRRC) proposes Aquatic Resource Measure AR-2 (Juvenile Outmigration), which would

further reduce the potential for short-term effects of suspended sediment concentrations (SSCs) on salmonid juveniles and smolts, including spring-run Chinook salmon. In addition, although CEQA Guidelines section 15126.4(a)(3) states that mitigation measures are not required for effects which are not found to be significant, Mitigation Measure AQR-2, which would be implemented as a result of significant adverse impacts described for Potential Impact 3.3-1 and Potential Impact 3.3-4, would further reduce the potential for short-term, less than significant effects of the Proposed Project on spring-run Chinook salmon.

Comment LA9-33

Citing other Klamath River documents, the authors of the DEIR accepts the statement that clams live in buried sediment and therefore are not affected by the sediment loads that will inundate the Klamath River bed. However, studies have shown that organisms like the razor clam can only tolerate single events of additional sediment (12 cm or less) for a short period (Vavrinec, et al. 2007) and events that introduce more than 26 cm of sediment over the top of an existing clam bed can result in greater than 70 percent mortality.

Response to Comment LA9-33

As described in Potential Impact 3.11-5, Sedimentation and River Hydraulics sediment transport model (SRH-1D) model simulations project up to approximately 1.7 feet of reach-averaged dam-released sediment deposition between Bogus Creek (river mile [RM] 192.68) and Willow Creek (RM 187.8) in the short-term (less than 2 years) and up to 0.9 feet between Willow Creek and Cottonwood Creek (RM 185.1). SRH-1D model simulations did not project any significant sediment deposition downstream of Cottonwood Creek. This deposition will occur during and following drawdown, with further remobilization and deposition in association with precipitation-driven flow events following dam removal, typically lasting for several hours and separated by several days or weeks. The results of Vavrinec et al. (2007) suggest that clams may not survive deposition over 0.9 feet in the reach between Bogus Creek (RM 192.68) and Willow Creek (RM 187.8), where Anodonta spp. populations closest to Iron Gate Dam are likely to be most affected (as described above). The results of Vavrinec et al. (2007) further suggest that for clams downstream of Willow Creek there is likely to be high survival following deposition of 0.9 feet or less, especially if there is at least 24 hours between burial events. Therefore, it is predicted that freshwater clams located downstream of Willow Creek (RM 187.8) can survive deposition events such as those predicted to occur following dam removal (Vavrinec et al. 2007) and are expected to avoid impacts from bed deposition. While the comment uses razor clams as an example species, razor clams are marine bivalves that are not found in the freshwater reaches of the Klamath River analyzed under Potential Impact 3.3-19.

Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-19 has been revised to incorporate the Vavrinec et al. (2007) results. Please refer to Volume III Attachment 1 Section

3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-19 for the revisions.

Comment LA9-34

Absent a wetland delineation, impacts to wetlands are unknown, avoidance cannot be assured and therefore impacts cannot be quantified.

Response to Comment LA9-34

As discussed in Volume I Section 3.5.5.1 *Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities* Potential Impact 3.5-1 (pages 3-518 and 3-519), a wetland delineation was anticipated within the limits of construction around the dams and facilities, access and haul roads, and disposal sites prior to the initiation of construction; this delineation was completed in July of 2019 (KRRC 2019c). The results of the wetland delineation will be incorporated into the Proposed Project design to avoid and minimize direct impacts on wetlands to the maximum extent feasible, and wetland areas adjacent to the construction Limits of Work (Volume I Section 2.2 *Proposed Project – Project Location* Figure 2.2-5 and Volume 1 Section 2.7.1 *Proposed Project – Proposed Project – Dam and Powerhouse Deconstruction* Figures 2.7-2, and 2.7-4) would be fenced to prevent inadvertent entry. Implementation of Mitigation Measure TER- 1 would require the use of sufficient buffers to ensure no significant environmental impacts to wetlands. Furthermore, for those wetlands that cannot be avoided, the Reservoir Area Management Plan includes details for the installation of native plants and aerial, barge, or hand seeding in appropriate areas to re-vegetate all areas disturbed during construction with a goal of no net loss of wetland or riparian habitat acreage and functions. Potential Impact 3.5-1 has been clarified to indicate that the amount of wetland and riparian habitat created through dam removal and revegetation efforts would far exceed the acreage of any existing, fully established wetlands and/or riparian vegetation for which a small portion of wetlands and/or riparian vegetation would not be avoided during construction activities. Please refer to Volume III Attachment 1 Section 3.5.5.1 *Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities* for the revisions.

Comment LA9-35

Potential Impact 3.5-1 is related to construction impacts however, the text goes back and forth between long- and short-term impacts and it is difficult to decipher what is being analyzed as an effect in this section. Discussing the Reservoir Area Management Plan and no net loss of wetlands in a construction impact is confusing.

Response to Comment LA9-35

Section 3.5.4 *Terrestrial Resources – Impact Analysis Approach* has been revised to clarify the definition of short-term effects. Please refer to Volume III Attachment 1 Section 3.5.4 *Terrestrial Resources – Impact Analysis Approach* for the revisions.

Potential Impact 3.5-1 in Volume I Section 3.5.5.1 *Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities* (pages 3-518 and 3-519) addresses potential short-term impacts due to construction; this impact analysis does not address potential long-term impacts due to the Proposed Project. Please refer to Volume III Attachment 1 Section 3.5.5.1 *Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities* for the revisions.

Comment LA9-36

Mitigation Measure TER-1 provides buffers for avoiding existing wetlands during construction. It is unclear if the SWRCB is relying on the Reservoir Area Management Plan as mitigation for this impact. This should be clarified.

Response to Comment LA9-36

If a wetland is identified and avoidable, implementation of Mitigation Measure TER-1 would ensure that there would be no significant impacts to wetlands; the wetland would be fenced with appropriate buffers to avoid inadvertent entry. The State Water Board has the authority to include this mitigation measure in its water quality certification for the project. Please see Volume III Attachment 1 Section 3.5.5.1 *Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities* for the final Mitigation Measure TER-1. If a wetland cannot be avoided, the Reservoir Area Management Plan, which is part of the Proposed Project rather than a mitigation measure, includes measures to revegetate all areas disturbed during construction. Potential Impact 3.5-1 has been clarified to indicate that the amount of wetland and riparian habitat created through dam removal and revegetation efforts would far exceed the acreage of any existing, fully established wetlands and/or riparian vegetation for which a small portion of wetlands and/or riparian vegetation would not be avoided during construction activities. Please refer to Volume III Attachment 1 Section 3.5.5.1 *Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities* for the revisions.

Comment LA9-37

Surveys for these species have not yet occurred so presence and quantification of these species is not known.

Response to Comment LA9-37

As discussed in Volume I Section 3.5.5.2 *Terrestrial Resources – Potential Impacts and Mitigation – Culturally Significant Species* Potential Impact 3.5-6 (page 3-524), as part of the Proposed Project, updated inventories of wetland and riparian vegetation around the reservoir perimeters were anticipated; these inventories were completed in 2019 (KRRC) Potential Impact 3.5-6 in Section 3.5.5.2 *Terrestrial Resources – Potential Impacts and Mitigation – Culturally Significant Species* (page 3-524) has been clarified in light of this data. Please

refer to Volume III Attachment 1 Section 3.5.5.1 *Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities* for the revisions.

Comment LA9-38
The mitigation includes several actions to survey for wetlands and encourage rapid revegetation with native riparian species in the reservoir footprints as defined in the Reservoir Area Management Plan (Appendix B: Definite Plan – Appendix H) to ensure no net loss of wetland or riparian habitat acreage and functions. These measures, however, only address long term impacts, and ignore short term impacts.

Response to Comment LA9-38
Potential Impact 3.5-6 in Section 3.5.5.2 *Terrestrial Resources – Potential Impacts and Mitigation – Culturally Significant Species* has been clarified. Please refer to Volume III Attachment 1 Section 3.5.5.1 *Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities* for the revisions.

Comment LA9-39
Surveys for special-status species and rare natural communities should be conducted prior to ground disturbance, but impacts cannot be quantified, or significance determinations made, absent a baseline.

Response to Comment LA9-39
The Draft EIR identified special-status plant species and rare natural communities with the potential to occur within the Primary Area of Analysis. The Draft EIR anticipated that comprehensive floristic surveys would be conducted prior to ground disturbance within the construction Limits of Work plus an established buffer.

Since the Draft EIR was released for public comment, those floristic surveys have been conducted. The mid-season (May) and part of the late season (July) floristic surveys were conducted in 2018 and the early-season (April) and follow-up late season surveys were completed in 2019. Additionally, vegetation surveys were completed in 2018 for upland areas and 2019 for wetland areas. Section 3.5.5.3 *Terrestrial Resources – Potential Impacts and Mitigation – Special status Species and Rare Natural Communities* Potential Impact 3.5-7 has been clarified in light of these surveys. Please refer to Volume III Attachment 1 Section 3.5.5.3 *Terrestrial Resources – Potential Impacts and Mitigation – Special status Species and Rare Natural Communities* for the revisions.

The survey results do not change the significance determinations in Volume I Section 3.5.5.3 *Terrestrial Resources – Potential Impacts and Mitigation – Special status Species and Rare Natural Communities* Potential Impact 3.5-7 (pages 3-524 and 3-525). As explained in the Draft EIR, where feasible the Proposed Project design would preserve any documented special-status plants in place. If avoidance is not feasible, a combination of relocation, propagation,

and establishment of new populations in designated conservation areas would be implemented, as determined in coordination with the resource agencies, and invasive plant species would be controlled by implementing measures such as routine washing of construction vehicles and equipment (Volume II Appendix B: *Definite Plan – Appendix J*). As noted in Potential Impact 3.5-7, there could be significant impacts on special-status plants in the short-term where avoidance is infeasible and if replanting does not succeed in re-establishment of new populations at a 1:1 ratio such that there is no net loss of individuals. If implemented as part of the Final Restoration Plan, Recommended Terrestrial Measure 1 would reduce impacts to less than significant. This conclusion remains the same.

Also, the Proposed Project includes avoidance and minimization measures as well as provisions for the establishment of wetland and riparian areas and other sensitive vegetation communities within the project area to result in no net loss of habitat acreage (Volume II Appendix B: *Definite Plan – Appendix J*); therefore, impacts to rare natural communities would not be significant.

Comment LA9-40

Resources within the construction envelope will be temporarily impacted even with establishment of revegetated areas. This should be considered a significant short-term impact based on the SWRCB's own significance criteria (up to 2 years of loss). The no net loss through re-establishment addresses long term impacts only.

Response to Comment LA9-40

Section 3.5.4 *Terrestrial Resources – Impact Analysis Approach* has been revised to clarify the definition of short-term effects. Please refer to Volume III Attachment 1 Section 3.5.4 *Terrestrial Resources – Impact Analysis Approach* for the revisions.

Section 3.5.5.1 *Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities* Potential Impact 3.5-1 has been clarified to indicate that the amount of wetland and riparian habitat created through revegetation efforts would far exceed the acreage of any wetlands and/or riparian vegetation that cannot be avoided during construction activities and that it is anticipated that at least 70 percent cover would achieved by post-dam removal year 1. Please refer to Volume III Attachment 1 Section 3.5.5.1 *Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities* for the revisions.

Comment LA9-41

The DEIR indicates that because the SWRCB cannot ensure implementation of the terrestrial aspects of the Final Restoration Plan, it is analyzing the impact in this DEIR as significant and unavoidable. This is improper. It is reasonable to expect implementation of, and compliance with, the plan. Oakland Heritage Alliance v. City of Oakland (2011) 195 Cal. App. 4th 884, 906 cited in Center for

Biological Diversity v. Department of Fish & Wildlife (2015) 234 Cal. App. 4th 214, 246. As such, the State Board is obligated under CEQA to require such implementation and compliance as a mitigation measure. Furthermore, a CDFW SAA could be reasonably expected to include conditions to address impacts to special-status plants and rare natural communities.

Response to Comment LA9-41
Please refer to Master Response CEQ-2, Effect of Federal Power Act preemption on mitigation measures.

Comment LA9-42
Flood frequency analysis for the 10-year to 100-year events was performed for seven USGS gages along the Klamath River. The analysis used a Log-person III distribution method consistent with USGS Bulletin 17B (USGS 1982). The Bulletin 17B methods have been updated to Bulletin 17C. The updated version (Bulletin 17C) replaces statements to acknowledge climate variability and climate change. The peak discharge frequency analysis is should be revised to utilize the updated methods in Bulletin 17C.

Response to Comment LA9-42
United States Geological Survey (USGS) Bulletin 17C acknowledges climate variability and climate change; however, the guidelines assume time invariance and do not evaluate methods to account for climate variability in flood frequency analyses. Bulletin 17C guidelines retain the same statistical framework used in Bulletin 17B, such that there would be consistency in results generated by the two methods. The main differences between Bulletin 17B and 17C are 1) incorporation of interval peak flow data and historical flood information, and 2) identification of potentially influential low floods in the gage record. These additions to Bulletin 17C would not impact the flood frequency analyses for the Klamath River gages because they possess continuous periods of record over many decades and thus do not require consideration of interval peak flow data, and because the Klamath River gage data are censored to remove low outlier peak flows that result from hydroelectric regulation. It is therefore not necessary to change the analysis in the EIR.

Comment LA9-43
The KRRC proposes to work with willing landowners to implement a plan to address the significant flood risk following dam removal for the 36 habitable structures (including permanent and temporary residences) located in the altered 100-yr floodplain between Iron Gate Dam and Humbug Creek. However, the potential impacts to environmental resources, or identification of potentially hazardous materials from relocating, elevating, or other methods to relocate, or remove these structures is not identified. The DEIR should be revised to identify these impacts.

Response to Comment LA9-43
Potential environmental impacts related to the Downstream Flood Control Project Component are analyzed throughout the EIR. The potential impact analyses and mitigation measures listed below consider the broad set of ground-disturbing activities associated with the Proposed Project – including moving or elevating habitable structures downstream of Iron Gate Dam, as needed, as part of the proposed Downstream Flood Control Project Component.

Impact analyses and mitigation measures in the EIR that consider the broad set of ground-disturbing activities associated with the Proposed Project are:

Volume III Attachment 1
Potential Impact 3.2-4 Increases in suspended material from stormwater runoff due to pre-construction, dam deconstruction and removal, and restoration activities in the Hydroelectric Reach and the Middle Klamath River immediately downstream of Iron Gate Dam.

Mitigation Measure WQ-1 Best Management Practices to reduce potential impacts to water quality due to pre-construction, dam removal, and restoration-related activities.

Volume III, Attachment 1 Section 3.6.4 *Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities*

Mitigation Measure TER-6 Gray Wolf.

Mitigation Measure TER-7 Bald and Golden Eagle.

Volume I
Potential Impact 3.5-1 (pages 3-518 to 3-519) Construction-related impacts on wetland and riparian vegetation communities.

Mitigation Measure TER-1 (page 3-519) Establish a 20-foot buffer around delineated wetlands.

Potential Impact 3.5-7 (page 3-524 to 3-525) Short-term impacts on special-status plants and rare natural communities from construction-related activities.

Recommended Terrestrial Measure 1 (page 3-525) Establish Mitigation Ratios for Special-Status Plants.

Potential Impact 3.5-9 (page 3-527) Short-term impacts on special-status terrestrial invertebrates from construction-related activities.

Potential Impact 3.5-10 (pages 3-527 to 3-535) Short-term impacts on special-status amphibian, reptiles, and mammals from construction activities.

Mitigation Measure TER-2 (page 3-530) Amphibian and Reptile Management.

Mitigation Measure TER-3 (pages 3-530 to 3-531) Western Pond Turtle Pre-Construction Surveys.

Recommended Terrestrial Measure 3 (pages 3-532 to 3-533) On-site Biologist/Construction Monitoring Plan.

Recommended Terrestrial Measure 4 (page 3-533) Biological Resources Education and Awareness Training.

Recommended Terrestrial Measure 5 (page 3-533 to 3-534) Requirements for Construction Personnel.

Recommended Terrestrial Measure 6 (pages 3-534 to 3-535) Wildlife Exclusion and Entrapment.

Recommended Terrestrial Measure 7 (page 3-535) General Special-status Wildlife Surveys and Pre-construction Surveys.

Potential Impact 3.5-11 (pages 3-536 to 3-540) Short-term impacts on nesting birds from construction-related noise and habitat alterations.

Recommended Terrestrial Measure 9 (pages 3-538 to 3-540) Nesting Birds.

Potential Impact 3.5-12 (pages 3-540 to 3-543) Effects on willow flycatcher from short-term construction-related noise and short-term and long-term habitat alterations.

Recommended Terrestrial Measure 10 (page 3-543) Willow Flycatcher

Potential Impact 3.5-13 (pages 3-543 to 3-547) Short-term impacts on bald and golden eagles from construction-related noise and nesting habitat alterations.

Potential Impact 3.5-14 (pages 3-547 to 3-553) Short- and long-term impacts on bats from construction noise and loss of roosting habitat.

Recommended Terrestrial Measure 12 (pages 3-551 to 3-553) Roosting Bats and Habitat.

Potential Impact 3.5-15 (pages 3-554 to 3-555) Impacts on northern spotted owl and critical habitat from construction-related noise and habitat alterations.

Potential Impact 3.21-1 (pages 3-1042 to 3-1045) Proposed construction-related activities could result in substantial exposure to hazardous materials through the routine transport, use, or disposal of hazardous materials.

Mitigation Measure HZ-1 (pages 3-1044 to 3-1045) Hazardous Materials Management. (See also Volume III Attachment 1 for modifications.)

Potential Impact 3.23-8 (page 3-1100) Construction activities associated with the Downstream Flood Control Project Component (moving or elevating legally established structures with flood risk) could produce noise and vibration associated with construction activities.

Please also note that, since issuance of the Draft EIR, the Klamath River Renewal Corporation (KRRC) has clarified that the Proposed Project "Limits of Work" include the following:

- 34 small areas ranging from 0.02 acres to 6.5 acres in size, with most parcels less than 0.03 acres, all of which are located within the altered 100-year floodplain of the Middle Klamath River between Iron Gate Dam (river mile [RM] 193) and Humbug Creek (RM 174) and have existing legally-established habitable structures that may require relocation or elevation prior to dam removal;
- 1,300 linear feet of the south shore of Copco No. 1 Reservoir inclusive of the adjacent twelve parcels that possess existing habitable structures, which potentially could be impacted by slope failure during or immediately following reservoir drawdown;
- 480 linear feet of Copco Road (unpaved) located on the north shore of Copco No. 1 Reservoir which has the potential to experience slope failure during or immediately following reservoir drawdown.

The EIR Project Boundary, which is inclusive of the Proposed Project's Limits of Work, as well as PacifiCorp owned and managed lands immediately surrounding the Lower Klamath Project ("Parcel B lands") that would be transferred as part of the Proposed Project, has been updated accordingly. The clarifications to the Limits of Work are relatively minor and are included in Volume III Attachment 1 *Executive Summary* Figure ES-2 *Proposed Project Boundary − California Portion*. The updated Proposed Project Boundary shown in Figure ES-2 applies to all figures in EIR Volume I that include the Project Boundary.

Comment LA9-44

It is unclear whether the proposed Federal Emergency Management Agency (FEMA) 100-year floodplain boundary impact potentially developable lands that would otherwise be outside of the FEMA 100-yr floodplain under existing conditions. Figure 7.7-1 displays structures in the 100-year floodplain following dam removal; sheets 1 of 8, and 3 of 8 show post-dam increases in flood depths that may be within areas with planned developments and may impact private property potential. The impact analysis should include impacts to habitable

structures, along with any planned development, private property, or land uses that would allow for future development (or use).

Response to Comment LA9-44
Please refer to Volume I Section 3.6.5.2 *Flood Hydrology – Potential Impacts and Mitigation – River Floodplain* Potential Impact 3.6-3 (pages 3-630 to 3-633) for discussion of potential flooding impacts to habitable structures. The analysis assesses the potential impacts of the Proposed Project and feasible alternatives against existing environmental conditions, consistent with CEQA Guidelines section 15125 (a). Additionally, please refer to Volume I Section 3.24.6 *Cumulative Effects – Flood Hydrology* (pages 3-1181 to 3-1182) for discussion of potential cumulative impacts related to development projects, including reasonably foreseeable projects (see Volume I Table 3.24-1), and flood hydrology. The comment mentions planned developments but provides no specific reference for the plans, therefore, it is unclear what potentially developable lands and planned development are being referred to. Note that Volume I Section 3.24.6 *Cumulative Effects – Flood Hydrology* (pages 3-1181 to 3-1182) does take approved and reasonably foreseeable projects into account. Potential future uses and development in floodplains in the existing Federal Emergency Management Agency (FEMA) 100-year floodplain or the altered floodplain following dam removal (USBR 2012a) would be speculative.

Comment LA9-45
The wells illustrated in Cross-Section A-A', B-B', C-C' (page 3-648+) show wells with water table below the Copco No. 1 reservoir level. This information indicates that the wells may still be recharged from water seepage from the base of the reservoir, not from lateral regional groundwater flow. Drawdown of the Copco No. 1 reservoir may decrease or eliminate the source of groundwater recharge for at least a dozen wells.

The data presented for wells near the Iron Gate reservoir suggest that the groundwater table is higher than the reservoir. Drawdown of the surface water within the reservoirs have the potential to impact adjacent groundwater levels, regardless of whether the groundwater water levels are higher or lower than the current reservoir levels. However, the wells with water levels below the reservoir level, i.e., the Copco No. 1 reservoir, may be more reliant on the reservoir as a source of groundwater recharge, and therefore these wells may be more affected by the reservoir drawdown.

As the wells are all drilled wells set within fractured bedrock, each well will have a unique response to the reservoir drawdowns, depending on the fracture orientation and hydraulic properties. Each well's sensitivity to the drawdown will also rely on the current well yield and availability of water-bearing fractures. For instance, a low yield well where the recharge is low may be more sensitive to the reservoir drawdown, especially if the well is hydraulically connected to the surface water in the reservoir.

Response to Comment LA9-45
The impact analysis associated with the comment's statements regarding existing groundwater wells in the vicinity of Copco No. 1 and Iron Gate reservoirs can be found on Volume I Section 3.7.5 *Groundwater – Potential Impacts and Mitigation* Potential Impact 3.7-1 (pages 3-663 to 3-665).

Comment LA9-46
"No significant impact" as asserted on Page 3-665, cannot be claimed until drilling occurs to remedy the loss of a well's capacity to serve its intended use.

Response to Comment LA9-46
Please refer to Master Response GRW-1.

Comment LA9-47
Page 3-665 "Potential Impact 3.7-2 The Proposed Project could interfere with groundwater recharge and adversely affect surface water conditions in the Klamath River" states no significant impact based on the findings of Gannett et al. (2007) where 92 cubic feet per second of groundwater is predicted to discharge to surface water within the reach between Iron Gate dam and the upper reservoirs. However, the well data presented within the DEIR demonstrates a large degree of variability with regard to vertical groundwater flow, where some areas with low water levels relative to the reservoir water level may be reliant on the reservoir as a groundwater recharge source. Any significant impact will be determined on a case-by-case basis and should be adequately addressed within the Groundwater Well Management Plan.

Response to Comment LA9-47
Volume I Section 3.7.5 Groundwater – *Potential Impacts and Mitigation* Potential Impact 3.7-2 (page 3-665) analyzes the potential for impacts to Klamath River surface flows to occur due to the Proposed Project. As described in Section 3.7.2 *Groundwater – Environmental Setting* (pages 3-641 to 3-661) and in Gannett et al. (2007), the Klamath River in the groundwater Area of Analysis is made up of 'gaining' reaches where natural groundwater flow moves *into* the river. Although there is localized site-specific variability in groundwater levels immediately adjacent to the reservoirs, as noted in Sections 3.7.2.1 *Groundwater – Environmental Setting Regional Groundwater Conditions* and 3.7.2.2 *Groundwater – Environmental Setting Regional Groundwater Conditions* (pages 3-641 to 3-661), removal of the Lower Klamath Project dams is not expected to alter the existing condition of groundwater moving into the Hydroelectric Reach because Lower Klamath Project reservoirs do not substantially alter regional and local groundwater conditions, and thus, surface flows would not be impacted in the Klamath River under the Proposed Project. Any significant impact to individual groundwater wells would be determined on a case-by-case basis, as described in the Groundwater Well Management Plan (see Volume II Appendix B: *Definite Plan*).

Comment LA9-48

The DEIR concludes that impacts to water supply and/or water rights are considered significant if they result in: (1) Causing unreasonable injury to existing water rights; or (2) Decreasing water supplies beyond what is needed for public health and safety (human consumption, cooking, and sanitation) for the current population.

These two criteria do not explicitly address resiliency or reliability, which could experience significant impacts, as indicated below.
The phrase "unreasonable injury" in the first criterion is not well explained. Under California law, the so-called "no-injury rule" (see Water Code, Sections 1702, 1706) can be triggered by almost any change in the point of diversion, place of use, or purpose of use of a water right that causes "injury" to, e.g., another water rights holder. The no-injury rule does not have any "reasonableness" threshold. Perhaps the word "unreasonable" is intended to reference the constitutional reasonable use doctrine (Cal. Const., art X, § 2), but if so, it's not clear why the two concepts should (or could) be combined together The second criterion, including the reference to "public health and safety," sets an extremely low bar for impacts to water supply/rights. This criterion is unusual, and does not appear to be based on typical or standard water rights principles. It sets much too low of a bar to protect vested property interests or to maintain statutory priorities/preferences for municipal and domestic uses (e.g., Water Code, Sections 106, 106.5) over, e.g., environmental or irrigation uses.

Response to Comment LA9-48

CEQA charges the lead agency with identifying and analyzing potentially significant impacts to the physical environment from a proposed project. A minor change in the exercise of a water right would not be a reasonable threshold to define a significant impact under CEQA. CEQA impacts are based on a physical change to the environment rather than on any potential legal infringement. Unreasonable interference with water right uses means that the extent of the interference would support a complaint made under Article 10 Section 2 of the California Constitution. All diversions and beneficial uses of water must be reasonable given all other needs of water, including instream and off-stream uses, and some level of minor inconvenience is acceptable in light of the constitutional policies promoting shared use of water. Such a minor change in water availability and usage would be unlikely to result in significant water-supply-related environmental impacts.

The significance criteria necessarily encompass potential impacts to resiliency and reliability of water rights because these aspects of a right to divert can be subject to unreasonable interference, and changes to resiliency and reliability can cause public health impacts. Volume I Section 3.8.5 *Water Supply/Water Rights – Potential Impacts and Mitigation* Potential Impacts 3.8-2, 3.8-1, and 3.8-

4 analyze potential reliability and resiliency effects from Proposed Project implementation.

The additional criterion regarding public health and safety is based on the human right to water, as expressed in Water Code section 106.3, and on the direct potential for public health impacts from a change in water supply. As noted above, significance criteria are set to evaluate environmental impacts and, as such, setting forth a water supply criterion related to public health and safety is appropriate.

Comment LA9-49

There is inadequate consideration of supply system resiliency or reliability, both of which might experience significant impacts. For example, even if the Lower Klamath Project reservoirs were not designed or operated as seasonal storage reservoirs to maintain downstream flows (page 3-674), these facilities undoubtedly provide some level of physical capability to store water and control/time releases, which will be lost with dam removal. The DEIR's discussion of coordinated releases during the "extreme drought" of 2014-2015 illustrates this capability (pages 3-678–3-680).

Response to Comment LA9-49

Please refer to Volume I Section 3.8.2.1 *Water Supply/Water Rights – Environmental Setting – Upper Klamath Basin* regarding the Lower Klamath Project for a discussion of the available active surface water storage of the Lower Klamath Project reservoirs. Please also refer to Volume I Section 3.8.5 *Water Supply/Water Rights – Potential Impacts and Mitigation* Potential Impacts 3.8-1 and 3.8-2 (pages 3-676 to 3-680) for discussion of surface water flow available for diversion along the Klamath River under the Proposed Project, including consideration of the United States Bureau of Reclamation's (USBR's) Klamath Irrigation Project located in the Upper Klamath Basin. Please also refer to Master Response WSWR-1 for additional discussion of potential effects on agricultural water supply and coordinated releases and Master Response WSWR-3 for additional discussion of potential effects on water supply downstream of Iron Gate Dam. Additionally, note that Keno Dam possesses the ability to coordinate timed releases in rare cases such as the 2014 – 2015 drought.

Further, the reliability of the City of Yreka's water supply is evaluated in Volume I Section 3.8.5 *Water Supply/Water Rights – Potential Impacts and Mitigation* Potential Impact 3.8-4 (pages 3-682 to 3-683). Please also refer to Master Responses WSWR-5 and WSWR-6 and responses to the City of Yreka's comments on future water availability (i.e., comments LA8-6, LA8-7, LA8-9, LA8-10, LA8-11, LA8-14, LA8-15, LA8-19, LA8-24, LA8-28, LA8-30, LA8-31, LA8-32, LA8-33, LA8-35, LA8-36, LA8-40, LA8-44, and LA8-45).

Comment LA9-50

The impacts analysis is not sufficiently detailed to show that Yreka's water rights will not be injured or otherwise impaired in dry or drought conditions. In particular, the analysis does not discuss the total downstream demands with legal priority and/or seniority ahead of Yreka's rights versus the anticipated flows.

Response to Comment LA9-50

It is possible that drought conditions could impact any water right holder on Fall Creek. However, water demands associated with the Proposed Project would not impact water availability for the City of Yreka's water right. California Department of Fish and Wildlife's (CDFW's) non-consumptive water right on Fall Creek diverts water primarily downstream from the City of Yreka's diversion point with an optional 0.33 cubic feet per second (cfs) diversion upstream of the City of Yreka's Dam B. After passing through the hatchery, all diverted water (less evaporative losses) would be returned to Fall Creek upstream of the City of Yreka's bypass flow compliance point (i.e., location of United States Geological Survey (USGS) Gage No. 11512000 approximately 1,000 feet upstream of Daggett Road). Please refer to Volume I Section 2.7.6.2 *Proposed Project – Proposed Project – Hatchery Operations – Fall Creek Hatchery* (pages 2-81 to 2-84) for further discussion.

PacifiCorp's water diversions on Spring and Fall creeks and hydropower generation at the Fall Creek powerhouse are part of the Klamath Hydroelectric Project (KHP) and are not part of the Proposed Project. PacifiCorp's ownership and operation of the portions of the KHP that are not part of the four dams and the associated facilities proposed for removal (i.e., the Lower Klamath Project), or part of Parcel B lands, are not being changed under the Proposed Project. Whether the Federal Energy Regulatory Commission (FERC) would alter PacifiCorp's Spring Creek diversion in the future, as related to the KHP, is speculative and is not analyzed in this EIR.

For additional details refer to Master Responses WSWR-5, WSWR-6, and WSWR-7.

Comment LA9-51

The project is potentially subject to 17 CCR 93105, but lack of detail in the Environmental Setting section makes it difficult to ascertain if the project is subject to this requirement. This should be analyzed and discussed. Additionally, the project must comply with California Health and Safety Code §41700 and §41701 regarding nuisance discharges and opacity limitations. It is unclear whether the project would violate these standards The DEIR should be revised to address this issue.

Response to Comment LA9-51

This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Air Quality*).

Comment LA9-52

A significant and unavoidable impact was identified for Potential Impact 3.9-2, Section 3.9.5. Page 3-704 states that "the analysis in this section does not include mitigation to minimize impacts from construction emissions generated by the Proposed Project activities. Since similar minimization measures may be implemented during project construction…" This is in direct conflict with the CEQA Guidelines. A few mitigation measures are proposed in the Air Quality Appendix in Section N.4 (Page N-21 of the air quality Appendix – Appendix N). Additionally, there are numerous dust control measures discussed in 17 CCR 93105 (CARB 2011) and there are other feasible and reasonably achievable dust control measures that could be implemented and should therefore be discussed. Since the project must comply with the requirements of California Health and Safety Code §41700 and §41701 and is potentially subject to 17 CCR 93105 as well as SCAPCD Rule 4.1 and 4.2, it is reasonable to assume that any mitigation measures proposed would be enforceable under these regulations. See Oakland Heritage Alliance v. City of Oakland (2011) 195 Cal. App. 4th 884, 906 cited in Center for Biological Diversity v. Department of Fish & Wildlife (2015) 234 Cal. App. 4th 214, 246.

Response to Comment LA9-52

This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Air Quality*).

Comment LA9-53

Impact 3.9-2 was found to be significant and unavoidable, but the analysis does not specify whether the impacts would be cumulatively considerable and does not address whether cumulative impacts would result from the project. Discussion of cumulative impacts of a project is required as stated in section 15130 in the CEQA Guidelines.

Response to Comment LA9-53

This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Air Quality*).

Comment LA9-54

Regional haze is discussed generally in a broader context in Section 3.9.3, then in the Potential Impacts and Mitigation Section (section 3.9.5), conformance with the California Regional Haze Plan is evaluated and there was a finding of no significant impact since the project would be in conformance with the regional haze plan. CEQA Guidelines state in Section 15125(e) that where a Proposed Project is compared with an adopted plan, the Environmental Setting shall contain an examination of the existing physical conditions as well as potential future conditions discussed in the plan. The DEIR should give a more thorough description of the Regional Haze Plan to provide context for the reader, and inform the impact analysis.

Response to Comment LA9-54
This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Air Quality*).

Comment LA9-55
Note that Section 3.9.1 of the DEIR states that the Area of Analysis includes Siskiyou County as a whole and there are two Class I areas within Siskiyou County as well as two associated IMPROVE monitoring stations (TRIN1 and LABE1). Discussion of the IMPROVE monitoring station data should be included in discussion of the Environmental Setting Section for regional haze. Sources that may be used as a basis for discussion of monitoring include the Western Regional Air Partnership (WRAP) Regional Haze Rule Reasonable Progress Summary Report (WRAP 2013), the California Regional Haze Plan (CARB 2009), and California Regional Haze Plan 2014 Progress Report (CARB 2014). Additionally, visibility trends by year and various summaries of light extinction and haze distributions can also be located on the Federal Land Manager Environmental Database (2019) Website under Air Quality Related Values (AQRV) Summaries, Visibility (Colorado State University 2019). Including this information would inform the analysis and how the Proposed Project could affect haze.

Response to Comment LA9-55
This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Air Quality*).

Comment LA9-56
The Air Quality impact section discusses the justification of using stationary source operational emissions "significance thresholds" to assess impacts from the project's construction emissions. These values are taken from Siskiyou County Air Pollution Control District (SCAPCD) Rule 6.1. This rule applies to the levels of emissions above which stationary sources would be subject to implementation of Best Available Control Technology (BACT) and emission offsets. This rule does not apply to construction emissions, but the DEIR states that use of these values is conservative when used to assess construction impacts and then asserts that if emissions from construction were to exceed these thresholds, "an air quality standard" would be violated and a significant air quality impact would result. This creates several uncertainties regarding the analysis. The analysis should be revised to address the following:

What precisely is the impact of exceeding these thresholds and what is the "air quality standard" that would be violated? Has this been quantified? The SWRCB should explain why the stationary source "thresholds" are used to assess impacts and what exceedance of these thresholds means in terms of impacts, not just that exceedance of these thresholds results in significant impacts without further explanation. CEQA Guidelines state in Section 15064.7

that "a threshold of significance is an identifiable quantitative, qualitative or performance level of a particular environmental effect, non-compliance with which means the effect will normally be determined to be significant by the agency" and, that thresholds of significance must be adopted by ordinance, resolution, rule, or regulation and be supported by substantial evidence. The "thresholds" used to assess significance in the DEIR document are air permitting thresholds which were not developed for purposes of CEQA's environmental review process, and do not meet the definition of a threshold of significance. In other words, exceeding this air permitting threshold does not necessarily indicate that a project would cause an air quality standard to be violated and conversely, meeting the air permitting threshold does not guarantee compliance with air quality standards. In addition, the current version of the document clearly does not meet the requirements in Section 15126.2 of the CEQA Guidelines that "direct and indirect significant effects of the project on the environment shall be clearly identified and described, giving due consideration to both the short-term and long-term effects." Since it is unclear to a reader what precisely the impacts are, the DEIR documentation obviously falls short of the requirement to clearly identify and describe the significant effects of the project on the environment.

The language throughout the document and technical appendix refer to these levels of emissions as "significance thresholds," implying that these values are CEQA significance thresholds developed by the Air District, which is not the case—these are air permitting thresholds. This should be clarified throughout the relevant documentation.

Response to Comment LA9-56
This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Air Quality*).

Comment LA9-57
The impact section needs to specify whether fugitive dust is likely to exceed 40% opacity for a period or periods aggregating more than three minutes in any one hour. If so, the project would be out of compliance with SCAPCD Rule 4.1 and would likely require mitigation of construction emissions to reduce the impact of the construction project to comply with this rule.

Further, it is unclear whether the emissions will (1) cause injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public, (2) endanger the comfort, repose, health or safety of any such persons or the public, (3) cause or have a natural tendency to cause injury or damage to a business or property? If so, the project would be out of compliance with SCAPCD Rule 4.2 and would likely require mitigation of construction emissions to comply with this rule.

Response to Comment LA9-57
This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Air Quality*).

Comment LA9-58
Section 3.9.4 describes the impact analysis approach and indicates that emissions have not been quantified since the 2012 EIR/EIS analysis, despite changes to the project. Despite the assertion that a quantitative assessment was made for the analysis, there was by necessity, some qualitative assessment of the likely similarity of impacts from the originally Proposed Project. The approach itself is not necessarily problematic. However, the fact that there were significant impacts found, there was not originally adequate mitigation proposed, and there are several instances where emission calculation software has been updated since the original analysis was completed, makes the original emission quantifications and the impacts determination invalid for assessing the potential impacts of the project in the context of the current environmental and regulatory setting.

Response to Comment LA9-58
This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Air Quality*).

Comment LA9-59
The determination of significant and unavoidable impacts necessitates a more substantial investigation of potential project emissions and mitigation measures. It appears that impact 3.9-2 discussed in Section 3.9.5 was deemed significant and unavoidable based on violation of a quantitative threshold, but quantification of changes to emission rates were admittedly not completed. Additionally, the original emissions quantifications were done in part using CARB's OFFROAD 2007 software and CAPCOA's CALEEMOD version 2011.1.1. There have been updates to these programs (OFFROAD 2017 and CALEEMOD version 2016.3.2, respectively) which include changes to vehicle emission factors. It is possible that these software updates could substantially change the outcome of the significance determination. This analysis should be performed, or the State Board should explain why it has not performed it. See Cleveland Nat'l Forest Found. v. San Diego Assn. of Governments (2017) 3 Cal. 5th 497, 515-516.

Response to Comment LA9-59
This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Air Quality*).

Comment LA9-60
The DEIR states that "the current proposal for the Proposed Project lacks sufficient detail concerning construction activities and it is too speculative to determine whether the mitigation measures proposed in the 2012 KHSA EIS/EIR are feasible and enforceable." Therefore, the analysis assumes that no mitigation

would be implemented. At the very least, mitigation measures should be discussed given the finding of a significant and unavoidable impact, it is reasonable to interpret that the project should implement mitigation measures to comply with California Health and Safety Code §41700 and §41701.

Response to Comment LA9-60
This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Air Quality*).

Comment LA9-61
There are some obvious flaws and invalid assumptions that were noted in Appendix N, which is based on the quantification of emissions from the 2012 analysis. The text of Appendix N, section N.2.1.5 regarding unpaved road dust states that "natural mitigation" from rainfall occurs but this would only be true over the course of an entire year. It is unclear if this was applied to daily emission rates, but it is safe to assume that the answer is yes, since this is included in the methods section and results are only presented in pounds per day. Applying a "natural mitigation" percentage based on annual rainfall information is not appropriate for assessing impacts on a pound-per-day basis which is the basis for the significance determination. The section also claims that "natural mitigation" from rainfall is 76–77%whereas an accurate value would be more like 24 or 23% and, as previously noted, that would only be on an annual basis. Since background documentation and calculations were not available for the purposes of this review, it is difficult to see if there are errors in the calculations and results, or if this is just a misstatement in the text of Appendix N. It would be prudent to redo the analysis based on the new project details and reevaluate some of the faulty assumptions made concerning road dust and verify that the original assumptions in the 2012 analysis are accurate, up-to-date, and appropriate.

Response to Comment LA9-61
This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Air Quality*).

Comment LA9-62
In Section 3.9.2 – the Environmental Setting, Naturally Occurring Asbestos should be discussed in more detail. CEQA Guidelines Section 15125(a) states that the Environmental Setting Section should include a description of the physical environmental conditions in the vicinity of the project, which would include whether any portion of the disturbed area will be located in an area where the provisions of California Air Resources Board Airborne Toxic Control Measure under 17 California Code of Regulations (CCR) 93105 (California Air Resources Board [CARB] 2011) are potentially applicable. This regulation is designed to mitigate emissions of naturally occurring asbestos which may be emitted when the disturbed area contains naturally-occurring asbestos, serpentine, or ultramafic rock. Siskiyou County has several areas where ultramafic rock and

naturally occurring asbestos have been discovered (Van Gosen and Clinkenbeard 2011), so enough information needs to be included in the Environmental Setting to determine if this rule is applicable.

Response to Comment LA9-62
This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Air Quality*).

Comment LA9-63
If the project is found to be subject to the requirements of 17 CCR 93105 and does not obtain an exemption under paragraph (c) 93105, then requirements for road construction and maintenance in paragraph (d) and requirements for construction and grading operations in paragraph (e) apply. These potentially applicable dust control measures are not included as mitigation measures. The DEIR needs to discuss section 93105, including whether an exemption applies, and, if needed, include measures to control fugitive dust emissions from construction activities. This is particularly important because potential impact 3.9-2, discussed in Section 3.9.5 regarding project impacts was determined to be significant and unavoidable due in part to emissions of particulate matter (PM)10 and PM2.5. The CEQA Guidelines clearly state in Section 15126.4(a)(1)(B) that each measure available to mitigate an impact should be discussed and the basis for selecting a particular measure should be identified. Note that, if the requirements of 17 CCR 93105 apply, these mitigation measures would be enforceable as described in Section 15126.4(a)(2) of the CEQA Guidelines.

In Section 3.9.2.2 of the Environmental Setting regarding Criteria Air Pollutants, National Ambient Air Quality Standards (NAAQSs) are mentioned, but California Ambient Air Quality Standards (CAAQS), which are more stringent for certain pollutants, are not discussed. CAAQS should be added to the discussion.

Response to Comment LA9-63
This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Air Quality*).

Comment LA9-64
Section 3.10.4 describes the impact analysis approach and indicates that emissions have not been quantified since the 2012 EIR/EIS analysis, despite changes to the Proposed Project. The State Board should either perform a new analysis to quantify emissions or explain why it has not performed such an analysis. See Cleveland Nat'l Forest Found. v. San Diego Assn. of Governments (2017) 3 Cal. 5th 497, 515-516. Furthermore, in addition to the deficiencies in the GHG emission quantification methodologies discussed above, it seems strange that only the direct construction emissions are assessed based on a quantitative threshold, but the ongoing indirect impacts are only assessed qualitatively. It would be more appropriate to use the 10,000 MT threshold of significance to evaluate the indirect impacts since those are likely to occur over a

longer timescale. The 10,000 MT CO2e threshold was developed to assess operational impacts (ongoing sources of emissions) so use of this threshold is more conducive to evaluate the lasting impacts of non-renewable power generation than construction emissions. Typically, construction emissions are amortized over the life of the project in order to assess impacts, or some other qualitative means of assessment are used.

Additionally, the original emissions quantifications were done in part using CARB's OFFROAD 2007 software and CAPCOA's CALEEMOD version 2011.1.1. There have been updates to these programs (OFFROAD 2017 and CALEEMOD version 2016.3.2, respectively) which include changes to vehicle emission factors. It is possible that these software updates could impact the significance determination since impacts for these emission sources are being assessed quantitatively in the DEIR.

It would be prudent to redo the analysis based on the new project details and make a good-faith effort to quantify all direct and indirect emissions of GHGs resulting from the project in accordance with the CEQA Guidelines.

Response to Comment LA9-64
This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Greenhouse Gas Emissions and Energy*).

Comment LA9-65
The impact being evaluated is whether the GHG emissions from the project, direct or indirect, would exceed 10,000 MT CO2e. Yet, this question is simply not answered with respect to indirect emissions. Instead, on page 3-727 the replacement of the hydroelectric energy is discussed, and it is stated that 65 MW of electricity, 52% of the Lower Klamath electricity production, would be replaced with electricity generated from a resource mix which would be majority non-renewable. It is then stated that over the next 20 years this would be offset by PacifiCorp (which provides power to multiple states) increasing the renewable source electricity generation. Though it is true that generally, PacifiCorp will be replacing non-renewable sources with renewable sources in coming years, this is not an impact of the Proposed Project. Therefore, it is inappropriate to frame the impacts assessment of the Proposed Project within the context of PacifiCorp's long term, broad goals, which have no bearing on the impacts of this individual project. The fact is that the Proposed Project will likely result in 65 MW of 100% renewable energy being replaced with 65 MW of some mixture of non-renewable and renewable energy and the impacts of this must be assessed based on likely power generation portfolios over the short and long term.

PacifiCorp's Integrated Resource Plan is cited in the DEIR and therefore, it follows that a good faith effort could be made to determine what mixture of resources would be representative for the replacement of the hydroelectric power

generation (or reasonable assumptions could also be made based on the Renewable Portfolio Standard goals) over the short and long term. To adequately convey the impacts of this project to the public, an attempt to quantify the increase in GHG emissions from non-renewable sources that would be required to replace the 100% renewable energy source of the dams must be made.

Response to Comment LA9-65
This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Greenhouse Gas Emissions and Energy*).

Comment LA9-66
In the Impacts Analysis Approach Section 3.10.4, it is specified that there were "minor" changes between the 2012 EIS/EIR analysis and the Proposed Project, primarily due to timing. However, there are no statements specifying whether the emissions of greenhouse gases will increase, decrease, or stay the same. This analysis should be added.

Response to Comment LA9-66
This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Greenhouse Gas Emissions and Energy*).

Comment LA9-67
In Section 3.10.4, page 3-722, it is stated that "It is likely that sulfur hexafluoride (SF6) would be released during deconstruction because the circuit breakers from the power facilities would be emptied. Although SF6 has a relatively high GWP, sufficient data was not available at the time of this writing to quantify emissions".

Not only does SF6 have a "relatively high GWP", it has the highest global warming potential (GWP) of any compound quantified by human-kind. SF6 has a lifetime of 3,200 years in the atmosphere (Blackman, Averyt, and Taylor 2016), and a GWP of 23,500 over a 100-year time horizon (IPCC 2014). Based on this GWP value, just one pound of SF6 released is equivalent to over 10.7 metric tons of carbon dioxide equivalent (CO2e). Therefore, a good-faith effort must be made to quantify these emissions particularly since charge sizes for gas insulated switchgear equipment rated 50 kV or more can range from hundreds to thousands of kg per installation, and low voltage switches contain 1-2 kg per installation (IPCC 1997) depending on the model year. In addition to the 9,455 MT CO2e already quantified, the emissions from SF6, depending on the type and quantity of circuit breakers, could easily be exceeded. There is no information provided on the type of equipment in Appendix O or DEIR section 3.10.4.

Response to Comment LA9-67
This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Greenhouse Gas Emissions and Energy*).

Comment LA9-68
One source of emissions mentioned was that currently sequestered organic carbon would be released when sediments including biological material are released from their current anoxic environment upon the commencement of the Proposed Project activities. This was mentioned in the environmental setting, but never mentioned again and the magnitude of emissions were not described or quantified. It should be. Additionally, changes in vegetation associated with construction activities, revegetation efforts, and changes in recreational area extents and locations were not assessed with respect to climate impacts. The impacts due to net vegetation changes and associated changes to carbon sequestration should be described or quantified as deemed appropriate based on a good-faith effort.

Response to Comment LA9-68
This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Greenhouse Gas Emissions and Energy*).

Comment LA9-69
Sediment transport modeling was performed from 2002 survey data (USBR 2012), and the volume of sediment transport is assumed to be explicit of sediment volume, as it relies on the rate of drawdown dictated by the hydrology (dry/normal/wet). The volume and spatial extent of sediment transported for the project is based on the USBR 2012 model results. The DEIR proposes to perform sediment jetting to maximize erosion of reservoir deposits; anticipated to mobilize an additional 13–41% of the sediment volume expected to erode during dam removal (DEIR Table 3.2-12). Although the estimated volume (USBR 2012) is predicted through year 2020 based on sediment trapping/sampling for accumulated sediments between the time of survey and proposed actions, inputs from sediment jetting are not considered in the model. The spatial and temporal extents in the USBR 2012 may not adequately describe the additional input of fine sediment.

Response to Comment LA9-69
Comment noted. For information on sediment transport modeling and associated sensitivity and uncertainty, please refer to Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 (pages 3-765 to 3-775) and revisions to this section in Volume III Attachment 1, as well as to Master Response GEO-1, and response to comment ORG46-8. Sediment volumes presented in the EIR are sourced from USBR (2012a) model results. Lower Klamath Project reservoir sediment cores

collected in 2006 (Shannon & Wilson, Inc. 2006) and 2009 and 2010 (USBR 2011), and used to estimate reservoir sediment thickness and volumes, are described in Section 5.6.1.2 of USBR (2012a, pages 5-18 to 5-28). Additionally, development of the hydraulic model is described in detail in Section 4.1 of USBR (2012a, pages 4-1 to 4-7), including use of 2001 and 2009 bathymetric survey data and 2010 Light Detection and Ranging (LiDAR) data.

With respect to the potential for additional mobilization of sediment due to the proposed sediment jetting during reservoir drawdown, please refer to response to comment ORG46-132. As stated in ORG46-132, Section 3.2.5.2 *Water Quality Potential Impacts and Mitigation – Suspended Sediments* Potential Impact 3.2-3 – Table 3.2-12 summarizes the range of reservoir sediment volume estimated to be potentially transported by sediment jetting during drawdown and compares this sediment volume with the USBR (2012a) sediment transport model estimate of the potential range of total 2020 sediment volume anticipated to erode under dam removal without sediment jetting. The maximum and minimum sediment volume transported by sediment jetting is based on maximum and minimum potential sediment depths measured in the areas where sediment jetting would occur. Sediment is anticipated to erode from these reservoir areas under drawdown without sediment jetting (UBSR 2012), so sediment jetting would primarily transport reservoir sediments that are already anticipated to be eroded during drawdown; the maximum and minimum sediment volume estimated to be transported by sediment jetting during drawdown in Table 3.2-12 is not in addition to the sediment volume estimated to be transported by drawdown alone. The column in Table 3.2-12 titled “Percentage of 2020 Sediment Volume Transported by Sediment Jetting (%)” presents the amount of sediment that would be potentially mobilized via sediment jetting as a fraction of the total reservoir sediment deposits anticipated to be eroded. While sediment jetting would primarily transport reservoir sediments that are already anticipated to be eroded during drawdown, some additional reservoir sediments may be transported by the combination of drawdown and sediment jetting flows compared to only drawdown flows. Potential increases in the total reservoir sediment estimated to erode under the Proposed Project due to the combination of reservoir drawdown and sediment jetting flows would likely be small compared to the total reservoir sediment volume estimated to erode due to drawdown alone by USBR (2012a). As such, the assessment in Potential Impact 3.11-5 in Volume 1 Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* (pages 3-765 to 3-775), and modified in Volume III Attachment 1, is accurate. The analysis in Potential Impact 3.11-5 is consistent with both USBR (2012a) and Section 3.2 *Water Quality*. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Comment LA9-70

The DEIR acknowledges fine sedimentation as a short-term impact to aquatic resources, anticipating impacts to occur within the first year following the proposed drawdown and dam decommissioning. The DEIR proposes to release

flows up to the 10-year recurrence interval flood. Flows of this magnitude are likely to deposit fine sediment at diversion head gates, tributaries, in side channels, and overbank floodplain habitats, potentially causing vertical and oblique accretion of the floodplain and point bars. Vertical accretion has potential to raise the elevation of backwater habitats causing for a higher flow to reactivate them. Oblique accretion has potential to enlarge point bars. Vertical accretion may occur at the floodplain fringe where low velocities and backwater areas exist. The DEIR proposes to survey the river bed downstream of Iron Gate to Humbug Creek, and adaptively manage aggradation and tributary barriers by mechanical removal outside of the main channel. The reach between Iron Gate and Humbug Creek is within a narrow and confined valley, the reach exhibits long riffle-runs and deep pools in a canyon section with little to no floodplain that would accrete fine sediments. Reaches downstream of Humbug Creek are in a much less confined valley and the morphology of the channel is an alluvial meandering channel dominated by riffle-pools, point bars, and an active floodplain. The upstream canyon reach has a higher transport capacity and fine sediment is anticipated to transport out of this reach to downstream reaches. The DEIR does not describe the potential short-term impacts to stream morphology of the lower reaches of the Klamath River. The downstream reaches are more sensitive to changes in sediment loading and flow, and have higher potential for vertical, lateral and oblique accretion of fine sediments. Accretion of sediments may cause short-term impacts to stream morphology, which could potentially lead to long-term impacts. For example, oblique accretion of lateral bars downstream of the Humbug Creek Confluence, has potential to adversely direct the lower stage flows towards the opposite bank, and repositioning of the thalweg. During successional high seasonal flow periods, the channel may take this new thalweg position and exacerbate the erosional forces along the opposite bank. Lateral accretion may also exacerbate the situation, as excessive deposition of fine sediment deposits near the floodplain fridge could grow in with vegetation. Impacts to stream morphology associated with fine sediment accretion downstream of Humbug Creek are recommended to be evaluated and adaptively managed. The downstream reaches have an active floodplain, where excessive fine sediment would deposit onto the floodplain and channel bars and have potential to cause impacts to stream morphology.

The reservoir drawdown analysis should be revisited to justify the specified rate of 2 feet to no greater than 5 feet per day for the drawdown. A slower drawdown would likely decrease the episodic nature of the reservoir sediment erosion, pending further analyses on the sediment slope stability Landslides may be promoted by the drawdown by virtue of the ground water levels within adjacent hillside being out of equilibrium with the lower hydraulic heads produced during the reservoir lowering. The elevated pore pressures produced by the negative stress of the proposed rapid drawdown will create a lower coefficient of internal friction within the soil/sediment, which will enhance the potential for slope failure within the reservoir sediment and adjacent hillside.

Response to Comment LA9-70
Regarding fine sediment erosion, transport, and deposition, as well as potential stream morphological change, please refer to Master Response GEO-1. For potential related impacts to aquatic resources, please refer to Master Responses AQF-7 and AQF-10. In the reaches where significant sediment deposition is most likely to occur (Bogus Creek to Cottonwood Creek), vertical and/or oblique accretion of channel bars may occur, resulting in changes to channel morphology. The potential for morphological change associated with sediment deposition in this reach is disclosed in Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* – Potential Impact 3.11-5 as *significant and unavoidable*. Please refer to Volume III Attachment 1 for the final Potential Impact 3.11-5. Downstream of Cottonwood Creek, the potential for impacts due to spatially discrete fine sediment deposition, including accretion of bars, would not be significant because the predicted sedimentation is sufficiently small and any sedimentation that does occur would be expected to mobilize during subsequent flood events.

Please refer to Volume I Section 2.7.2 *Proposed Project – Proposed Project – Reservoir Drawdown* (pages 2-54 to 2-60), as well as to Volume II Appendix B: *Definite Plan*, for explanations of reservoir drawdown periods and rates. Please also refer to Section 3.2.4.2 *Water Quality – Impact Analysis and Approach – Suspended Sediments* for a discussion of the reservoir drawdown rate in relation to sediment discharge and to Volume III Attachment 1 for the final Section 3.2 *Water Quality*. Faster reservoir drawdown would reduce the period of elevated sediment load and the duration of elevated suspended sediment concentrations (SSCs) in the Klamath River during and following dam removal. A slower drawdown rate is unlikely to decrease the episodic nature of sediment erosion, as the comment suggests, because there will be episodic sedimentation at any of the identified rates (2-5 feet per day) and the nature of sediment erosion, transfer, and deposition would be more dependent on the water year type than the rate of drawdown.

Regarding potential hillslope instability, including landslides, please refer to Volume III Attachment 1 Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* – Potential Impact 3.11-3, as well as to Master Response GEO-2.

Comment LA9-71
Potential Impact 3.11.3 notes that reservoir drawdown could result in hillslope instability in reservoir rim area. The geologic assessment and slope stability analysis conducted by KRRC indicated that certain segments along the Copco No. 1 Reservoir rim have a potential for slope failure that could impact existing roads and/or private property. These areas included 3700 linear feet of slopes along Copco Road and approximately 2800 linear feet of slope adjacent to private property. Up to eight parcels in these areas have existing habitable structures that could potentially be impacted. However, KRRC has only

proposed to complete additional field geologic investigation and laboratory testing of material properties to better understand the potential for slope instability in these areas. A future study is not adequate to define the impact and associated mitigation that would be necessary for the project.

Response to Comment LA9-71

Please refer to Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-3 (pages 3-761 to 3-765) and modifications to this impact in Volume III Attachment 1, and to Master Response GEO-2, relating to hillslope stability around the reservoirs during drawdown. In the Draft EIR, Mitigation Measure GEO-1 was not limited to investigations and testing and included monitoring and mitigation for slope failure. Since the Draft EIR, Volume III Attachment 1 Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-3 Mitigation Measure GEO-1 has been updated. Revised Mitigation Measure GEO-1 includes monitoring and mitigation for slope failure. The mitigation covers any slope failure related to Project activities that adversely impacts a structure or public facility, or impacts or has a material potential to impact water quality or volitional fish passage. The Klamath River Renewal Corporation (KRRC) will fund or implement actions listed in Mitigation Measure GEO-1, including structure repair, relocation, or purchase; road repair and/ or re-alignment; engineering of structural slope improvements; and revegetation of affected areas to the extent feasible and appropriate. The monitoring and mitigation for Project-related slope failures specified in final Mitigation Measure GEO-1 (see paragraphs 2 and 3) are required regardless of the outcome of potential future studies. Please refer to Volume III Attachment 1 Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-3 Mitigation Measure GEO-1 for the revisions.

Comment LA9-72

As a result Mitigation Measure GEO-1 Slope Stabilization was recommended, which consists of the following (from Page 3-765): "For any large slope failure that occurs during drawdown or the year following drawdown, KRRC will offset potential impacts by implementing the following actions: 1.Move affected structures or purchase affected property, 2.Re-align affected road segments, 3.Engineer structural slope improvements (e.g., drilled shafts or other structural elements that could be installed to resist slope movement), and 4.Revegetate affected areas. The monitoring period of "only during drawdown or the year following" for potential mass-wasting impacts is not adequate. The potential for landslides will continue beyond that time, until potential stabilization by natural vegetative growth will require longer period of time. Depending on climate and weather events, the period could be extended to five (5) years after the drawdown. The planned monitoring period should be extended, that the slopes at risk in other reservoirs be monitored, and that the engineering solutions could be more aggressive.

Response to Comment LA9-72
Please refer to Master Response GEO-2, relating to slope stabilization and the period of monitoring and mitigation for potentially unstable slopes surrounding Copco No. 1 Reservoir.

Comment LA9-73
The DEIR cultural resources section relies upon records searches conducted as part of the Klamath Hydroelectric Project Relicensing (FERC 2007) and 2012 EIR/EIS studies (PacifiCorp 2004 and Cardno Entrix 2012), with an updated records search in 2017 by KRRC which included the study area from the Oregon-California state line downstream to Humbug Creek. In addition, KRRC conducted a heritage search at the Klamath National Forest in 2017. However, the DEIR does not indicate whether archaeological surveys have been conducted as part of this project to identify resources within the Area of Analysis which may not be previously recorded. In section 3.12.2.3, the DEIR states "The majority of the past surveys involve pedestrian field survey and cultural resources monitoring. Overall, an estimated 8,189 acres of federal, state, and/or private lands have been previously surveyed within the records search area and except for some proposed disposal sites, encompasses the current boundaries of the Proposed Project." This language is not clear on the extent to which the study area has been subject to intensive pedestrian survey or how recently those surveys were conducted. Generally accepted professional practice is that areas that have not been surveyed within the past 5-10 years should be resurveyed to ensure adequate identification efforts. Site records should be updated to record current conditions and integrity of previously recorded resources. Changes in environmental conditions over time can lead to changes in visibility allowing for the identification of resources; the same environmental factors can change the condition and integrity of known cultural resources as well. The Cultural Resources Plan (attached to the Definite Plan but not to the DEIR) suggests that a survey was conducted in 2004; such survey is now 15 years old and should be updated. The DEIR should be revised to include detailed information on the timing, coverage, and results of the pedestrian survey to identify archaeological resources.

Response to Comment LA9-73
Section 3.12.2.3 *Historical Resources and Tribal Cultural Resources – Environmental Setting – Known Tribal and Historical Resources in the Vicinity of the Proposed Project* has been revised to clarify complete versus incomplete inventory efforts.

Additionally, although previously stated in various locations throughout the EIR, the introductory text of Section 3.12 *Historical Resources and Tribal Cultural Resources* has been clarified to acknowledge that not all of the cultural resources inventories and evaluations required pursuant to section 106 of the National Historic Preservation Act (NHPA) will be completed prior to certification of the Final EIR.

The decision regarding whether to update surveys would be made during pre-survey record searches and outreach with local tribes. Mitigation Measure TCR-1 states that the Tribal Cultural Resources Management Plan (TCRMP) shall include an inventory of known and potential Tribal Cultural Resources (TCRs) that could be affected by the Project. Appendix B: *Definite Plan – Appendix L* includes a preliminary inventory of such resources. Klamath River Renewal Corporation (KRRC) will continue to develop the inventory through the consultation process for the license surrender application.

Please refer to Volume III Attachment 1 Section 3.12.2.3 *Historical Resources and Tribal Cultural Resources – Environmental Setting – Known Tribal and Historical Resources in the Vicinity of the Proposed Project* for the revisions.

Comment LA9-74

The DEIR discussed KRRC's updated records search at the Northeast Information Center of the California Historical Resources Information System (CHRIS) which was conducted in 2017. This 2017 updated records search included the study area from the Oregon-California state line downstream to Humbug Creek. Appendix L of the Definite Plan indicates that an expanded records search was conducted in 2018 for an area encompassing a 0.5-mile wide zone on either side of the Klamath River from below Humbug Creek to the mouth of the river at the Pacific Ocean. Appendix L of the Definite Plan indicates that the results of that 2018 expanded records search would be incorporated into future reports. If downstream cultural resources in that zone have the potential to be affected by the Proposed Project, then those records search results should be incorporated into the DEIR and that area should be considered part of the Area of Analysis for the DEIR. Some of those records would be on file with the Northwest Information Center at Sonoma State University which houses records for Del Norte and Humboldt Counties. Consideration of potential project impacts to downstream historical resources and tribal cultural resources is critical.

Response to Comment LA9-74

Volume I Section 3.12.1 *Historical Resources and Tribal Cultural Resources – Area of Analysis* does consider the area 0.5 miles on either side of the river from downstream of Humbug Creek to the mouth of the Klamath River. Please refer to Figure 3.12-5, which defines Subarea 4. Section 3.12.5 *Historical Resources and Tribal Cultural Resources – Potential Impacts and Mitigation* has been revised to clarify the area's consideration in the analysis of Potential Impact 3.12-3. Please refer to Volume III Attachment 1 Section 3.12.5 *Historical Resources and Tribal Cultural Resources – Potential Impacts and Mitigation* for the revisions. Notwithstanding the 2018 expanded records search, the determination that drawdown and dam removal are unlikely to increase erosion or flood-related risk of damage to cultural resources downstream from Humbug Creek remains unchanged.

Comment LA9-75

The document does not include any discussion of whether resources might qualify as "unique archaeological resource" under PRC § 21083.2. It should be revised to do so. It only mentions archaeological resources as California Register of Historical Resources (CRHR)-eligible historical resources or as tribal cultural resources.

Response to Comment LA9-75

The introductory text of Section 3.12 *Historical Resources and Tribal Cultural Resources;* Section 3.12.2.3 *Historical Resources and Tribal Cultural Resources – Environmental Setting – Known Tribal and Historical Resources in the Vicinity of the Proposed Project*; and Section 3.12.3 *Historical Resources and Tribal Cultural Resources – Significance Criteria* have been revised to address unique archaeological resources. These revisions clarify that for the purposes of this analysis, all known and unknown prehistoric archaeological sites in the Proposed Project area, including those that may meet the criteria for unique archaeological resources, are considered Tribal Cultural Resources (TCRs). Please refer to Volume III Attachment 1 Section 3.12 *Historical Resources and Tribal Cultural Resources* for the revisions.

Comment LA9-76

In the section labeled "Historical Landscape Analysis" on page 3-813, it is not clear whether a historical landscape has been identified which warrants consideration as a historical resource under CEQA. The DEIR needs to be clear if the project area is considered a historical landscape, which should then potentially be considered as a historical resource under CEQA.

Response to Comment LA9-76

The Historical Landscape Analysis has been completed and no Historical Landscapes have been defined in the project area. The EIR has been clarified by including a statement regarding the results of the historical landscape analysis. Please find the revision in Volume III Attachment 1 Section 3.12.2.3 *Historical Resources and Tribal Cultural Resources – Environmental Setting – Known Tribal and Historical Resources in the Vicinity of the Proposed Project.* This revision does not constitute significant new information (CEQA Guidelines Section 15088.5(a)).

Comment LA9-77

Table 3.5-3 in Appendix W lists previously recorded archaeological sites and built environment resources and indicates their National Register of Historic Places (NRHP) eligibility status. Under CEQA, resources that are eligible for listing in the CRHR are also historical resources for which impacts must be analyzed. The DEIR needs to describe whether there are resources which are CRHR eligible or eligible for local listing but not NRHP eligible (also known as "CEQA only" resources). If so, these would not be addressed in the Historic Properties Management Plan (HPMP) under development by KRRC for FERC to comply

with Section 106 (because such resources would not be historic properties under Section 106). The DEIR does not identify such resources or address mitigation of impacts related to those resources.

Response to Comment LA9-77
The introductory text in Section 3.12 *Historical Resources and Tribal Cultural Resources* has been revised to clarify that (1) for the purposes of the EIR analysis, all known and unknown built environment and historic archaeological resources are assumed to be significant historical resources under CEQA and (2) some of these resources may not be National Register of Historic Places (NRHP)-eligible. Please refer to Volume III Attachment 1 Section 3.12 *Historical Resources and Tribal Cultural Resources* for these revisions. Please note that some historical resources may not be identified on Table 3.5-3 in Volume II Appendix W, which addresses only NRHP-eligible resources. As stated in Section 3.12.5.2 *Historical Resources and Tribal Cultural Resources – Potential Impacts and Mitigation – Potential Impacts to Built Environment and Historic-period archaeological Resources*, the Klamath River Renewal Corporation (KRRC) has initiated a process through the Cultural Resources Working Group and Federal Energy Regulatory Commission (FERC) to develop and implement a Historic Properties Management Plan (HPMP) and a Programmatic Agreement. KRRC has committed to including protection of both National and California-eligible cultural resources (i.e., historic properties and historical resources) in the Historic Properties Management Plan (KRRC 2019a). At this time, however, the Historic Properties Management Plan and the Programmatic Agreement are not finalized and the State Water Board cannot require their implementation. In addition, the EIR analysis concludes that even with inclusion of the KRRC's proposed protection measures, some impacts to historical resources would be significant and unavoidable.

Comment LA9-78
Mitigation Measures TCR-1 through TCR-3 refer to development of an HPMP which will include a Tribal Cultural Resources Management Plan (TCRMP), a Looting and Vandalism Prevention Program (LVPP), and an Inadvertent Discovery Plan (IDP). However, as disclosed under discussion of Impact 3.12.5.2, FERC and KRRC are initiating the development of these plans under the Section 106 process and "the State Water Board cannot require their implementation." It's not acceptable to defer mitigation during future consultation processes under CEQA (CEQA Guidelines Section 15126.4(a)(1)(B)). Mitigation measures, and their effect on the impacts of the project, should be clearly stated in the DEIR for consideration by stakeholders, the public, Native American Tribes, and others.

Response to Comment LA9-78
Please refer to Master Response CEQ-2 and ORG46-302.

The State Water Board developed tribal cultural resources mitigation measures in formal Assembly Bill 52 (AB 52) government-to-government consultation with Native American Tribes that have tribal cultural resources which could be impacted by the Proposed Project. To ensure implementation of the mitigation measures, the Klamath River Renewal Corporation (KRRC) was included in AB 52 consultations for development of tribal cultural resources mitigation measures. On October 17, 2018 and November 30, 2018 the KRRC confirmed their agreement with the mitigation measures, thus ensuring feasibility for implementation under CEQA.

Please note that although Section 106 requirements are not required to extend to non-federally recognized Native American Tribes, CEQA does not require that Tribal Cultural Resource (TCR) impacts be dependent on a Native American Tribe's federal recognition status as such, and TCR mitigation measures identified in the EIR apply to both federal and non-federally recognized tribes. Efforts currently occurring in the Section 106 process are separate and complementary to the TCR mitigation measures developed and committed to by the KRRC.

Mitigation Measures TCR-1, TCR-2, and TCR-3, which require development and implementation of a Historic Properties Management Plan (HPMP) that includes a Tribal Cultural Resources Management Plan (TCRMP), a Looting and Vandalism Prevention Program (LVPP), and an Inadvertent Discovery Plan (IDP), respectively, do not improperly defer formulation of mitigation measures. For this project, formulation of the precise means of mitigating project impacts to all potentially affected historic and cultural resources before the EIR is certified is infeasible and impractical for a number of reasons, including the nature and magnitude of the project, the quantity of cultural resources that could be impacted, the current inaccessibility of many of those resources, and the need for the State Water Board to issue or deny water quality certification for the project within the statutory time limit.

Numerous surveys and studies have been conducted, compiled, and evaluated, and the State Water Board has engaged in an extensive and productive consultation process with affected Native American tribes pursuant to AB 52, which resulted in the development of detailed mitigation measures. The consultation process pursuant to section 106 of the National Historic Preservation Act is ongoing, and may result in additional cultural resource surveys and evaluations. In particular, the KRRC has agreed to conduct intensive surveys to identify Tribal Cultural Resources (TCRs), archaeological, and other historical resources following reservoir drawdown, and to conduct a data gap analysis to ensure that all of the areas within the limits of work are surveyed to the extent feasible. The KRRC has committed to develop and implement a HPMP for protection of both federally and California-eligible historical properties (KRRC 2019a). The additional information developed

through the section 106 consultation process will be incorporated into the HPMP and TCRMP.

Under CEQA, deferral of the specifics of mitigation is permissible where a commitment exists to implement the mitigation, specific performance standards are identified, and the types of actions that will be considered and potentially incorporated into a mitigation plan are identified. (*Sacramento Old City Assn. v. City Council* (1991) 229 Cal.App.3d 1011, 1028-1030; Cal. Code Regs., tit. 14, § 15126.4, subd. (a)(1)(B).) Those requirements are satisfied here. First, the KRRC has committed to implementing Mitigation Measures TCR-1, TCR-2, and TCR-3. The TCRMP (which will include the LVPP and IDP) will be developed in consultation with affected tribes and submitted to Federal Energy Regulatory Commission (FERC) as part of the HPMP for approval.

Specific performance standards for the mitigation of significant impacts to historic and cultural resources are established by applicable federal and state laws and guidelines, which are identified in the EIR and Appendix L to the Definite Plan. These include Public Resources Code section 21084.3, section 106 of the National Historic Preservation Act, the Advisory Council on Historic Preservation's Section 106 Archaeology Guidance, and the Native American Graves Protection and Repatriation Act. The purpose of the HPMP, TCRMP, LVPP, and IDP is to ensure that potential significant impacts to historic and cultural resources are mitigated in accordance with those legal standards.

The types of actions that will be considered and potentially incorporated into the TCRMP, LVPP, and IDP are identified in TCR-1, TCR-2, and TCR-3. Those mitigation measures list the elements that must be included in the respective plans, and identify specific measures that must be implemented or considered, including field worker training, limits to worker and public access, tribal monitors, and surveys. The plans must identify protocols and best practices to be followed upon discovery or disturbance of TCR's during project implementation. Consistent with Public Resources Code section 21084.3, subdivision (a) and as specified in section 8.3.2 of Appendix L to the Definite Plan, avoidance and preservation in place will be the preferred treatment method for historic properties and TCR's.

The parameters summarized above support the conclusion that TCR-1, TCR-2, and TCR-3 do not improperly defer the formulation of mitigation measures, and would reduce or avoid potential impacts to many TCR's, although the potential for some significant impacts would remain, for the reasons explained in Section 3.12.5.1 *Historical Resources and Tribal Cultural Resources – Potential Impacts and Mitigation – Potential Impacts to Tribal Cultural Resources*. Please refer to Volume III Attachment 1 for the final Section 3.12 *Historical Resources and Tribal Cultural Resources*.

Comment LA9-79

The impacts analysis considers impacts to tribal cultural resources, built environment historical resources, and historic-period archaeological resources. There is no discussion relevant to prehistoric archaeological sites which may be CRHR eligible (and therefore historical resources under CEQA) but which may not qualify as tribal cultural resources. The DEIR should be revised to include this discussion. Not all prehistoric sites are Tribal Cultural Resources (TCRs).

Response to Comment LA9-79

The introductory text of Section 3.12 *Historical Resources and Tribal Cultural Resources* and Section 3.12.4 *Historical Resources and Tribal Cultural Resources – Impact Analysis Approach* has been revised to clarify that with the exception of isolated occurrences of cultural material, all known and unknown prehistoric archaeological sites within the Project area are considered to be tribal cultural resources for purposes of the EIR analysis. Please refer to Volume III Attachment 1 Section 3.12 *Historical Resources and Tribal Cultural Resources* and Section 3.12.4 *Historical Resources and Tribal Cultural Resources – Impact Analysis Approach* for the revisions.

Potential impacts to Tribal Cultural Resources (TCRs) are analyzed in Section 3.12.5.1 *Historical Resources and Tribal Cultural Resources – Potential Impacts and Mitigation – Potential Impacts to Tribal Cultural Resources*. Please refer to Volume III Attachment 1 for the final Section 3.12 *Historical Resources and Tribal Cultural Resources.*

Comment LA9-80

There is no mitigation measure that outlines what the HPMP will include. It is referenced somewhat under MM TCR-1, but it should be described in greater detail in an MM of its own and should be referenced under Potential Impacts 3.12-13, 3.12-14, 3.12-15, and 3.12-16 (as well as others). For example, it is not clear whether pre-construction data recovery would be implemented for eligible historic archaeological sites that cannot be avoided by the project. Under CEQA, avoidance and preservation in place are the preferred forms of mitigation for archaeological sites. When avoidance is infeasible, a data recovery plan should be prepared to provide for the systematic recovery of scientifically consequential information from the site (CEQA Guidelines, Section 15126.4). There is no mention of data recovery in the entire DEIR document.

Response to Comment LA9-80

As described in Section 3.12.5.1 *Historical Resources and Tribal Cultural Resources – Potential Impacts and Mitigation – Potential Impacts to Tribal Cultural Resources*, Mitigation Measure TCR-1 requires Klamath River Renewal Corporation (KRRC) to develop a Historic Properties Management Plan (HPMP); KRRC would also propose the HPMP for Federal Energy Regulatory Commission's (FERC's) approval as a term of the license surrender order. Per Mitigation Measure TCR-1, the HPMP must contain a Tribal Cultural Resources

Management Program (TCRMP) that addresses how the Project will avoid, minimize, or mitigate adverse impacts to Tribal Cultural Resources (TCRs), consistent with California Public Resources Code section 21084.3(a). The mitigation measure specifies that in developing the HPMP, the KRRC will consider measures listed in California Public Resources Code Section 21084.3(b) that, if feasible, may be appropriate to avoid, minimize, or mitigate adverse impacts. The required content of the HPMP is also specified in Volume II Section 8.3 of Appendix L – *Cultural Resources Plan* to Appendix B of the Definite Plan, including mitigation measures. In regards to data recovery Volume II Appendix L Section 8.3.2; page 62 of the *Cultural Resources Plan* identifies data recovery as a potential mitigation measure when impacts cannot be avoided, as follows: *For effects to archaeological sites that will be mitigated through data recovery, mitigation protocols will include but not be limited to a research design that articulates research questions; data needed to address research questions; methods to be employed to collect data; laboratory methods employed to examine collected materials; and proposed disposition and curation of collected materials and records*.

Comment LA9-81

Under Potential Impact 3.12-11, the DEIR discusses impacts to Copco No. 1 Dam, Copco No. 2 Dam, Iron Gate Dam, and their associated hydroelectric facilities, as well as the Klamath River Hydroelectric Project District as a whole. No mitigation measures are listed relative to this impact in Section 3.12.5.2 or in Table ES-1. The text of the impact discussion mentions that restoration, adaptive re-use, and relocation are all not feasible. It references "inclusion of documentation measures in conformance with the Secretary of the Interior's guidance" but does not specify what this would entail. The text references "KRRC's proposed mitigation measure" but no MM for this impact is included. Typical mitigation for demolition of an eligible resource includes documentation according to Historic American Buildings Survey (HABS) or Historic American Engineering Record (HAER) standards. While such documentation typically does not reduce impacts to less than significant, additional MM can also be crafted. In fact, CEQA requires that all feasible mitigation be undertaken even if it does not mitigate below a level of significance. Such measures might include preparation of interpretive signage, development of public school curriculum related to the historic themes specific to the resource in question, preparation of a historic context document for the county or region in question or related to historic themes specific to the resource, preparation or funding of museum exhibits, or other appropriate strategies.

Response to Comment LA9-81

Please refer to Master Response CEQ-2 for a discussion of federal preemption. Please note that the referenced section discusses measures including documentation that the KRRC has proposed, including documentation. Please refer to Volume III Attachment I for the final version of Section 3.12.5.2 –

Historical Resources and Tribal Cultural Resources – Potential Impacts and Mitigation – Potential Impacts to the Build Environment Potential Impact 3.12-11.

Comment LA9-82

Potential Impact 3.8-2 in the Water Supply/Water Rights section describes the potential for less water to be available to users (including for irrigation of agricultural lands) as a result of the Proposed Project, as some Klamath Irrigation Project deliveries are made to California users. These same users turn to groundwater pumping when there are surface water shortages; however, there are ground water management plans that must be implemented by 2022 and may adjust sustainable pumping levels. Some farms may not be able to afford, or have the ability, to pump groundwater during dry years, which could result in the indirect conversion of Farmland to a non-agricultural use.

Response to Comment LA9-82

As explained in Volume I Section 3.8.5 *Water Supply/Water Rights – Potential Impacts and Mitigation* Potential Impact 3.8-1 (pages 3-676 to 3-679) and Potential Impact 3.8-2 (pages 3-679 to 3-680), water deliveries to farmers that rely upon the United States Bureau of Reclamation's (USBR's) Klamath Irrigation Project are not sourced from the Lower Klamath Project reservoirs. The USBR is required to release water from the Klamath Irrigation Project into the Klamath River upstream of Keno Dam to comply with the flow requirements in the applicable National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS) biological opinion(s). The Proposed Project does not include any changes to the amount of flow released by the Klamath Irrigation Project and the applicable biological opinion(s). Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project* summarizes how the applicable biological opinion(s) have changed separately and independently of the Proposed Project from the NMFS and United States Geological Survey (USGS) Joint 2013 Biological Opinion (2013 BiOp) that was the applicable biological opinion at the time of the Notice of Preparation (NOP) for the Lower Klamath Project (i.e., December 22, 2016) to the biological opinions issued by NMFS and USFWS in March 2019 (2019 BiOps) after the Lower Klamath Project Draft EIR had been issued on December 28, 2018. Please refer to Volume III Attachment 1 for the final Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*.

As discussed in Volume I Section 3.8.5 –*Water Supply/Water Rights – Potential Impacts and Mitigation* Potential Impact 3.8-2 (pages 3-679 to 3-680), twice in recent years, PacifiCorp has agreed to operate its hydropower projects in a manner that supported increased irrigation deliveries to the Klamath Irrigation Project and assist USBR in meeting requirements of the 2013 BiOp (i.e., the applicable biological opinion at that time). This water was subsequently replaced by the Klamath Irrigation Project. The agreement by PacifiCorp to adjust its operations was not a legal requirement. If PacifiCorp had not released the flows from Iron Gate and Copco No. 1 reservoirs in those years, then USBR would

have released flows at Keno Dam and the water would have traveled downstream, regardless.

The Proposed Project would preclude the potential option (not requirement) of utilizing the Lower Klamath Project reservoir water supply to help the USBR meet the applicable biological opinion(s) flow requirements and thereby extend the available water supply to the USBR Klamath Irrigation Project. However, there would be no legal injury to the Klamath Irrigation Project users because the Lower Klamath Project operators are not required to temporarily supplement water deliveries, per the 2013 BiOp that was the applicable biological opinion when the Notice of Preparation for the Lower Klamath Project was issued on December 22, 2016, or per the currently applicable 2019 BiOp. USBR is still required to release water from the Klamath Irrigation Project into the Klamath River upstream of Keno Dam to comply with the flow requirements in the currently applicable biological opinion(s) (i.e., 2019 BiOp). Additionally, there is no indication that water would not be available for public health purposes, absent supplementation of Klamath Irrigation Project available water.

As discussed in Volume I Section 3.8.5 *Water Supply/Water Rights – Potential Impacts and Mitigation* Potential Impact 3.8-2 (pages 3-679 to 3-680), the Tulelake Basin is designated a medium priority basin under the Sustainable Groundwater Management Act (SGMA), in part because of declining groundwater levels and high-volume groundwater extractions, which have been occurring despite the Lower Klamath Project being operational. It can be expected that there will be some adjustment by basin farmers as they comply with future sustainable groundwater extraction requirements, which they would need to do regardless of whether the Lower Klamath Project was in place. The need to comply with future sustainable groundwater extraction requirements may result in indirect conversion of farmland to a non-agricultural use, similar to what could be experienced in other groundwater basins throughout the State. However, this is not a consequence of the Lower Klamath Project. As stated above, there is no legal requirement for the Lower Klamath Project operators to temporarily supplement water deliveries to Klamath Irrigation Project farmers and the USBR. There is no indication that such an optional supply is or should be used as a future planning tool by the USBR or farmers.

Comment LA9-83

As provided in Section 3.11.5 on page 3-762 of the Geology, Soils, and Mineral Resources section of the DEIR and described in Appendix B: Definite Plan, the geologic assessment and slope stability analysis conducted by KRRC indicated that certain segments along the Copco No. 1 Reservoir rim have a potential for slope failure that could impact existing roads and/or private property. These areas include approximately 3,700 linear feet of slopes along Copco Road and approximately 2,800 linear feet of slope adjacent to private property. Up to eight parcels in these areas have existing habitable structures that could potentially be

impacted. The Population and Housing section of the DEIR neglects to consider potential impacts to these residences.

Response to Comment LA9-83
Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-3, including Mitigation Measure GEO-1, has been revised following review of public comments and revisions to Volume II Appendix B: *Definite Plan* – Appendix E. Please refer to Volume III Attachment 1 Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-3 for the revisions. Note that Section 3.11.3 *Geology, Soils, and Mineral Resources – Significance Criteria*, as modified in Volume III Attachment 1, includes the exposure of people or structures to adverse effects resulting from slope instability as a relevant consideration; therefore, Mitigation Measure GEO-1 mitigates for significant impacts to people and structures associated with potential slope failures during and immediately following drawdown on potentially unstable slopes. Section 3.16.1 *Population and Housing – Area of Analysis* and Section 3.16.2 *Population and Housing – Environmental Setting* has been revised to clarify that the slope failure impacts on habitable structures are addressed in Section 3.11.5 *Geology, Soils, and Mineral Resources*, and that the combined consideration of potential impacts from slope failure and floodplain changes does not require further consideration for effects on population and housing. Please refer to Volume III Attachment 1 Section 3.16.1 *Population and Housing – Area of Analysis* and Section 3.16.2 *Population and Housing – Environmental Setting* for the revisions.

Comment LA9-84
MMs need to be included when this impact analysis is remedied.

Response to Comment LA9-84
Please refer to response to comment LA9-83. The clarifications discussed in LA9-83 did not result in a need for mitigation.

Comment LA9-85
Section 3.16.2 of the Population and Housing section of the DEIR note that 36 residences would be affected by changes in the FEMA 100-year flood elevations resulting from the removal of Iron Gate Dam. As described on page 3-632 in Section 3.6.5.2 of the Flood Hydrology section of the DEIR, the change to the 100-year floodplain inundation area would pose significant flood risk to these 36 residences, resulting in the possibility that these structures would be relocated. The Population and Housing Section should consider the Proposed Project's effect on these 36 structures together with the 8 residences vulnerable to landslide as a result of reservoir drawdown.

Response to Comment LA9-85
The potential for impacts on 36 residences due to flooding as a result of the Proposed Project is referenced in Volume I Section 3.16.1 *Population and*

Housing – Area of Analysis (page 3-903), which states that the effects of flood elevations upon these residences are analyzed in more detail in Volume I Section 3.6 *Flood Hydrology*. The analysis in the EIR determines that the loss of structures that are not feasible to move or elevate would be a significant impact. In addition, Volume I Section 3.6.5.2 *Flood Hydrology – Potential Impacts and Mitigation – River Floodplain* (page 3-631) notes that a total of 34 legally-established habitable structures are already located within the existing 100-year floodplain and an estimated 2 additional legally-established habitable structures would be within the altered 100-year floodplain in the same reach following dam removal, for a total of 36 legally established habitable structures within the altered 100-year floodplain following dam removal (Appendix B: *Definite Plan*).

Please also refer to response to comment LA9-83.

Comment LA9-86
MMs need to be included when this impact analysis is remedied.

Response to Comment LA9-86
Please refer to response to comment LA9-85.

Comment LA9-87
Property owners with residences in locations that have views and/or recreational access to the reservoirs could feel discontented by the change from a flatwater aquatic environment to a riverine environment. As a result, the Proposed Project could cause population in the area to decrease, as property owners could conceivably decide to relocate to another location that supports a more favorable perceived aquatic environment. Additionally, the loss of dam operating revenue that would result from the removal of the dams, and loss of tax revenue, could impact the quality of education in the long run. A decline in the quality of education could cause current households to relocate outside the County in search of better educational opportunities. The Population and Housing section of the DEIR should discuss the potential fiscal effects associated with a declining population and loss of tax revenue and the implications this may have for public school enrollment and the quality of education. In addition, the DEIR should consider the relocation of these households, and the need for replacement housing elsewhere, which may be associated with indirect displacement as a result of discontent.

Response to Comment LA9-87
Please note that CEQA documents analyze significant effects on the physical environment; CEQA does not address potential social or economic effects from implementing a project. (CEQA Guidelines, section 15131(a).) However, to inform the public and decisionmakers regarding the potential economic consequences of the proposed project, the EIR includes Section 5.4.1 *Other Required CEQA Discussion and Consideration of Social and Economic Factors – Consideration of Economic Information for Resources Potentially Affected by*

Dam Removal (pages 5-4 to 5-11) which summarizes the results of prior economic studies conducted by the U.S. Department of the Interior (DOI) to characterize potential effects on property value. An evaluation of potential population changes as described in the comment would be speculative.

Comment LA9-88
This analysis should be revised to include a discussion of impacts to emergency services due to an increased work force.

Response to Comment LA9-88
Emergency services, which includes a discussion of impacts to services due to an increased work force, is discussed in Volume I Section 3.17.5 *Public Services – Potential Impacts and Mitigation* Potential Impact 3.17.5 (starting on page 3-913) and Potential Impact 3.22-4 (pages 3-1075 to 3-1076). Please also refer to response to comment ORG47-56.

Comment LA9-89
The Proposed Project would result in the removal of three readily available water sources, not one as is stated. This should be corrected.

It states, "The removal of the reservoirs could increase the turn-around time for helicopters or ground crews refilling with water for fire abatement purposes." Yet, the next two sentences conflict with this statement saying that it would not be changed, because the river will still be there, and other reservoirs are available. These sentences need to be made consistent with each other.

In addition, the impact analysis fails to quantify the increase in turnaround time for helicopters due to the loss of reservoirs (e.g., two minutes is very different than 30 minutes). Furthermore, although the impacts is determined to be significant and unavoidable, given the potential devastating wildfire implications of implementing the Proposed Project, some quantification of the impacts should be made for the public and wildfire fighting agencies.

Response to Comment LA9-89
The Klamath River, as a whole, represents a single source of water although it contains numerous pools from which water could be drawn to fight fires. The Lower Klamath Project reservoirs represent a portion of this water source, although there are three individual reservoirs in California that are proposed for removal. The EIR project description and impact discussion are clear that three individual reservoirs would be impacted by the Proposed Project. No correction is necessary.

With respect to the comment regarding helicopter turn-around time, please refer to Master Response HAZ-2.

Comment LA9-90

The Definite Plan, Appendix C-01, Fire Management Plan should identify additional permanent water sources that emergency services (specifically, helicopter water tankers) could use for wildland fire fighting, readiness, and prevention. Stating the Klamath River, where it flows freely within the former reservoir footprints could be used for as source of water to fight wildland fire is far too speculative. Topography and river flow patterns/fluctuations will prevent many locations of the River from ever being used by helicopter. The Fire Management Plan should identify areas where man-made structures are located in areas that are safe and reliable for helicopter water tankers to extract water. Man-made structures such as dip tanks provide a reliable, safe and permanent water source, and could be installed/designed integrated with the proposed dry hydrants.

Response to Comment LA9-90

The issue raised in the comment is considered in Appendix O-1 Fire Management Plan. Please also refer to Master Response HAZ-2.

Comment LA9-91

The impact discussion should analyze the potential for the loss of school-aged children due to residential relocation as a result of lower quality of life for areas around the reservoirs. Also, the loss of dam operating revenue that would result from the removal of the dams could impact the quality of education in the long run. A decline in the quality of education could cause current households to relocate outside the County in search of better educational opportunities for their children.

Response to Comment LA9-91

Please note that CEQA documents analyze significant effects on the physical environment; CEQA does not address potential social or economic effects from implementing a project (CEQA Guidelines, section 15131(a). Please also refer to Volume I Section 5.4 *Other Required CEQA Discussion and Consideration of Social and Economic Factors – Social and Economic Factors Under CEQA*.

However, to inform the public and decisionmakers regarding the potential consequences of the proposed project, Volume I Section 3.17.5 *Public Services – Potential Impacts and Mitigation* Potential Impact 3.17-3 (page 3-922) addresses the potential long-term physical impacts of the project on school facilities and services. The additional concern raised in the comment regarding changing demographics as a result of reservoir removal is too speculative for evaluation in the EIR.

Comment LA9-92

Data used to estimate facility and reservoir use was collected in 2001 and 2002 by PacifiCorp (PacifiCorp 2004) and is approximately 18 years old. It is likely that use levels of these facilities and reservoirs have changed since 2002, as

shifts in participation in outdoor recreation has occurred. For example, freshwater fishing across the United States has declined from 43.1 million participants in 2006 to 38.3 million participants in 2017 (RBFF and OF 2018) while boat ownership increased from 20.5 million in 2009 to 21.2 million in 2012 (RBFF and OF 2013) and overall outdoor participation increased from 41.9% of all Americans in 2006 to 49.0% in 2017 (OF 2018). The State Board should address these shifts in the DEIR; otherwise, it is possible that any impact analysis that relies on this information may not be accurate.

Response to Comment LA9-92
Section 3.20.2 *Recreation – Environmental Setting* has been revised to incorporate more recent recreational data, where possible. Please refer to Volume III Attachment 1 Section 3.20.2 *Recreation – Environmental Setting* for the revisions.

Comment LA9-93
The Significance Criteria for Recreation (Section 3.20.3) include "Changes to or loss of rare or unique recreational facilities affecting a large area or substantial number of people" and "Significant increase in the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facilities would occur or be accelerated" (page 3-1002). Because the data used to establish baseline use of the facilities and reservoirs associated with the Proposed Project is approximately 18 years old and outdoor recreation participation has changed in the meantime, meaningful analysis of a "substantial number of people" and/or the current and projected levels of use of regional facilities is unlikely.

For example, the impact analysis for Potential Impact 3.20-1 states, "Overall, the impacts of construction and restoration activities are limited in temporal and geographic scope and so would not result in changes to or loss of rare or unique recreational facilities affecting a large area or substantial number of people. Nor would they result in a significant temporary increase in the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facilities would occur or be accelerated. Tables 3.20-2, 3.20-3, and 3.20-4 show that there are numerous alternative recreational facilities and access outside the area of effect, but within the vicinity. Most of these facilities experience low to moderate use levels and they can accommodate additional users. Recreational users who are temporarily displaced would be able to use these other areas, but they are unlikely to overload the other areas because those areas have sufficient capacity to accept them. Therefore, impacts will be less than significant" (page 3-1006). Without updated facility and reservoir use data, the degree to which displaced reservoir recreationists would affect facilities and reservoirs in the region cannot be accurately estimated.

Response to Comment LA9-93
Section 3.20.2 *Recreation – Environmental Setting* has been revised to incorporate more recent recreational data, where possible. The significance criteria noted have also been changed. Please refer to Volume III Attachment 1 Section 3.20.2 *Recreation – Environmental Setting* and Section 3.20.3 *Recreation – Significance Criteria* for the revisions.

Comment LA9-94
Citing from the 2004 PacifiCorp report, the DEIR states "When surveyed on their perception of crowding at the reservoirs, the mean score of respondents was 3.2 (on a 9-point scale from 1—not crowded to 9—extremely crowded), indicating that visitors did not feel overly crowded while participating in recreation activities. Further, approximately 39 percent of respondents had changed their visits to the Lower Klamath Project reservoirs from other lakes in the area to avoid crowding" (page 3-994). The impact analysis for Potential Impact 3.20-2 states "As indicated in the responses to visitor use surveys conducted by PacifiCorp (2004), the reservoirs are popular recreation areas in part because they are uncrowded relative to other lakes in the area and do not require user fees"(page 3-1007), and "…Given that a number of other lakes and reservoirs in the vicinity of the Lower Klamath Project provide similar opportunities for reservoir-based recreation in an uncrowded setting, KRRC's proposal to retain and enhance most existing river access facilities within the Area of Analysis for recreation, and Parcel B land transfer under the Proposed Project that would potentially allow for additional future river-based recreation opportunities, the Proposed Project would be highly unlikely to result in a loss of rare or unique recreational facilities affecting a large area or substantial number of people. In addition, the KRRC has prepared a Draft Recreation Plan (Appendix B: Definite Plan – Appendix Q) that includes stakeholder outreach, identification of potentially new or modified recreational facilities as well as evaluation and screening criteria, which will further reduce any potential impacts" (page 2-1009).

As described in Comment 1, "Changes to or loss of rare or unique recreational facilities affecting a large area or substantial number of people" is one of the criteria for the determination of significance. Because visitor surveys have identified the Iron Gate and Copco No. 1 Reservoirs as uncrowded relative to other lakes in the region, these reservoirs could be interpreted as rare within the region for their low use and uncrowded setting. The analysis focuses on the redistribution of these users to other existing lakes in the region, yet the data and analysis explicitly states that conditions at these lakes were unsatisfactory due to perceived overcrowding under current conditions. It can be anticipated that the loss of reservoir-based recreation on Iron Gate and Copco No. 1 Reservoirs would result in the perception of increased levels of overcrowding at other lakes in the region, despite the reported use of these other lakes being low or moderate. Additionally, as there are few reservoirs within Siskiyou County, California that are of similar size and setting, the Iron Gate and Copco 1 reservoirs could be considered rare within the California region.

Response to Comment LA9-94
Section 3.20.3 *Recreation – Significance Criteria* Potential Impact 3.20-1, Potential Impact 3.20-2, and Potential Impact 3.20-6 have been revised to clarify that the analysis considers the potential for adverse changes to recreational facilities, regardless of whether the facilities may be considered rare or unique. Please refer to Volume III Attachment 1 Section 3.20.3 *Recreation – Significance Criteria* and Section 3.20.5 *Recreation – Potential Impacts and Mitigation* for the revisions.

Comment LA9-95
The Draft Recreation Plan is included in the impact analysis as contributing to the "no significant impact" determination for reservoir-based recreation. The impact analysis for Potential Impact 3.20-2 states "The Proposed Project includes a Recreation Plan (see Appendix B: Definite Plan – Appendix Q for the Draft Recreation Plan) that would be used to identify new recreation opportunities that offset the proposed removal of reservoir recreation sites as well as the reduction in whitewater boating days resulting from the Proposed Project. KRRC has started an ongoing stakeholder outreach process seeking input from potentially impacted recreation users, operators, managers and administrators, including tribes, state and federal agencies, county agencies and chambers of commerce, local residents, recreation businesses, and public interest groups. The stakeholder outreach process would continue through the development of the Final Recreation Plan, which is scheduled for completion by KRRC in June 2019. The Draft Recreation Plan includes potential recreation opportunities identified in the USBR (2012) Detailed Plan as well as those identified through recent stakeholder outreach efforts. The Draft Recreation Plan also outlines preliminary criteria for screening opportunities, including whether each recreation opportunity would: "directly address the recreation impacts generated by the KHSA;" and "directly address or offset changes in the localized reservoir recreation or Hells Corner boating near where the impacts are occurring." In addition, the Proposed Project includes the transfer of approximately 8,000 acres of real property (Parcel B lands; see also Section 2.7.10 Land Disposition and Transfer) located in Klamath County, Oregon, and Siskiyou County, California, to the respective states (or a designated third party) for public interest purposes, including river-based recreation, open space, active wetland and riverine restoration, and public education (Page 3-1008)" and "Given that a number of other lakes and reservoirs in the vicinity of the Lower Klamath Project provide similar opportunities for reservoir-based recreation in an uncrowded setting, KRRC's proposal to retain and enhance most existing river access facilities within the Area of Analysis for recreation, and Parcel B land transfer under the Proposed Project that would potentially allow for additional future river-based recreation opportunities, the Proposed Project would be highly unlikely to result in a loss of rare or unique recreational facilities affecting a large area or substantial number of people." The Recreation Plan Update webinar (hosted by KRRC on January 30, 2019) presented an updated Recreation Plan, which consists of eight new or upgraded

river access points (four in Oregon and four in California) including (Americans with Disabilities Act (ADA)-accessible facilities where feasible, and recreational access to existing sites during construction where feasible. As stated in the screening criteria, the opportunities presented in the Recreation Plan will "directly address or offset changes in the localized reservoir recreation…near where impacts are occurring." Restricting the Recreation Plan to eight new or upgraded river access points fail to directly address the loss of flatwater recreation, particularly as reservoir-based recreation opportunities could be considered rare within Siskiyou County, California. For this reason, it is inappropriate to assume that the Recreation Plan would address or offset any impacts to reservoir-based recreation.

Additionally, the impact analysis for Potential Impact 3.20-4 states As described previously, the Proposed Project involves the development and implementation of a plan to construct new recreational facilities and river access points along the restored river channel between the California-Oregon border and Iron Gate Dam following dam removal activities. Replacement of recreation facilities would not necessarily be "like for like", but rather would be designed to accommodate similar levels, if different types of use. This would require the creation of new gravel roads and other improvements for vehicle and visitor access to and use of the new river-based recreation sites, which could result in construction-related impacts to the environment, including potential impacts to water quality and historical and/or tribal cultural resources. While new recreation facilities are part of the Proposed Project, the final location, size, and design of the facilities are still under development and will be the subject of subsequent approvals. It is thus too soon to conduct a meaningful environmental analysis of the replacement facilities. However, construction and operation of new recreational facilities would undergo any environmental review necessary for the subsequent approvals, and any impacts of the construction and operation of the facilities would be mitigated, if feasible, to levels that comply with all applicable laws, regulations, and environmental standards. Because this component of the Proposed Project would not be approved until a later date, for the purposes of this EIR the impacts of this component are not significant." (page 3-1010).

Specific mitigation measures regarding recreation would be determined by FERC through a separate project permitting process. Therefore, it is inappropriate to assume that impacts to recreation would be less than significant without determining what the mitigation measures would consist of.

Response to Comment LA9-95

With respect to the comment's assertion regarding rare or unique recreational facilities, please refer to response to comment LA9-94.

The State Water Board does not agree that it is inappropriate for the EIR analysis to consider the potential for new recreation opportunities designed to offset the proposed removal of reservoir recreation sites and the reduction in whitewater

boating days resulting from the Proposed Project. As stated in Section 3.20.5 *Recreation – Potential Impacts and Mitigation* Potential Impact 3.20-2, the Klamath River Renewal Corporation's (KRRC's) Draft Recreation Plan involves identifying these new recreation opportunities as well as retaining and enhancing most existing river access facilities within the Area of Analysis for recreation. The analysis goes on to acknowledge that a number of other lakes and reservoirs in the vicinity of the Lower Klamath Project provide similar opportunities for reservoir-based recreation in an uncrowded setting and states that Parcel B land transfer under the Proposed Project would potentially allow for additional future river-based recreation opportunities. The analysis considers each of these contributing factors and determines that the Proposed Project would not result in a long-term loss in regional lake-based recreational activities that would affect a large area or a substantial number of people. Please refer to Volume III Attachment 1 for the final Section 3.20.5 *Recreation.* For additional discussion of how the EIR considers the level of detail in KRRC's Draft Recreation Plan, please refer to Master Response REC-2.

Comment LA9-96

The government records database searches, consistent with American Society for Testing and Materials (ASTM) E1527 – 13 or ASTM E2247 – 08 should be conducted.

Additionally, review of available sediment quality data (Bureau of Reclamation Klamath Sediment Chemistry Report [BOR 2011]) suggests that additional assessment may be warranted to include additional deep-sediment samples, additional Total polychlorinated biphenyls (PCB) analyses (especially from deeper sediments), and additional Polycyclic Aromatic Hydrocarbons (PAH) analyses so that the detection level, at a minimum, falls between the threshold effect concentration (TEC) and probable effect concentration (PEC) values, instead of greater than the PEC levels.

Response to Comment LA9-96

The Phase I Environmental Assessment for the Lower Klamath Project was performed by the Klamath River Renewal Corporation (KRRC) in 2018, in general accordance with the American Society for Testing and Materials (ASTM) Practice E-1527-13 for conducting Phase I ESAs (KRRC 2019f,g,h). The assessment was conducted at the J.C. Boyle Development, Copco No. 1 Development, Copco No. 2 Development, Iron Gate Development, and the Iron Gate Fish Hatchery. Phase II investigations were performed by KRRC in 2018 and 2019 (KRRC 2019i,j,k,l,m,n,o). For additional information regarding the Phase I and Phase II Environmental Assessments, please refer to Master Response HAZ-1.

Please refer to Section 3.2.2.8 *Water Quality – Inorganic and Organic Contaminants, Sediment Contaminants* for a discussion of how on-site geologists verified that reservoir sediment cores collected during 2009 and 2010 reached

the reservoir-deposited/pre-reservoir sediment boundary to characterize the inorganic and organic contaminants throughout the entire depth of the existing reservoir sediments. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Additional total polychlorinated biphenyls (total PCBs) measurements in reservoir sediments are not necessary to assess the potential adverse effects from short-term and long-term exposure to reservoir sediments since the method reporting limit (MRL) for total PCBs in reservoir sediment was greater than the most stringent screening level for total PCBs. The MRL for total PCBs in reservoir sediment samples was 33,500 picogram per gram (pg/g), but the most stringent screening level for total PCBs was 89,000 pg/g for human health (i.e., California Environmental Protection Agency [CalEPA] California Human Health Screening Level [CHHSL], Residential), 60,000 pg/g for freshwater (i.e., 2009 Pacific Northwest Sediment Evaluation Framework [SEF] Screening Level 1 [SL1]; total PCBs was replaced in the 2018 Pacific Northwest SEF with total Aroclors), and 38,000 pg/g for marine (i.e., Puget Sound Dredged Material Management Program [DMMP]). Furthermore, there are no freshwater threshold effect concentration (TEC) or probable effect concentration (PEC) or the approximately equivalent marine threshold effect level (TEL) or probable effect level (PEL) for total PCBs included in the National Oceanic and Atmospheric Administration (NOAA) screening quick reference tables (SQuiRTs).

As discussed in Section 3.2.5 *Water Quality – Potential Impacts and Mitigation – Inorganic and Organic Contaminants* Potential Impact 3.2-13 and Potential Impact 3.2-14, some analytes, including six Aroclor PCB compounds, had laboratory MRLs that were greater than the applicable screening levels, so it is not possible to directly confirm that these analytes were above or below the applicable screening levels. However, any undetected analytes would be unlikely to result in substantial adverse impacts on human health since the potential exposure in the short and long-term to these compounds would be limited (e.g., less than the long-term residential levels of exposure considered in the human health screening levels).

Additionally, as discussed in Potential Impact 3.2-13, total PCBs were detected in elutriate reservoir sediment samples above Basin Plan, national priority water quality criteria, so previous measurements sufficiently characterize the total PCBs in elutriate reservoir sediment samples. While the detected elutriate total PCBs concentrations would be less than the most stringent human health drinking water standards upstream of Copco No. 1 once the dilution expected during reservoir drawdown was considered, total PCBs concentrations would be greater than the most stringent human health drinking water standards downstream of Iron Gate Dam even with dilution considered and this would be a significant impact. As explained in Potential Impact 3.2-13, implementation of Mitigation Measure WQ-2 would reduce this impact to a less than significant

level. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Seventeen polycyclic aromatic hydrocarbons (PAHs) had laboratory MRLs that were greater than the applicable screening levels, so it is not possible to directly confirm that these analytes were above or below the applicable screening levels in reservoir sediments, as discussed in Potential Impact 3.2-13 and Potential Impact 3.2-14. However, any of these PAHs would be unlikely to result in substantial adverse impacts on human health since the potential exposure in the short and long-term to these compounds would be limited (e.g., less than the long-term residential levels of exposure considered in the human health screening levels). If it was assumed the reservoir sediment concentrations of those seventeen PAHs with MRLs less than the most stringent screening levels were equal to the maximum MRL (i.e., 1,200 micrograms per kilogram [ug/kg]), all seventeen PAHs would be less than the applicable PEC or PEL throughout the Klamath River and fourteen of the seventeen PAHs would meet the most stringent sediment screening level including consideration of dilution during reservoir drawdown. The remaining three of those seventeen PAHs (i.e., acenaphthene, dibenz(a,h)anthracene, fluorene) would meet the most stringent reservoir sediment screening level upstream of Copco No. 1 Reservoir considering dilution during drawdown, but those three PAHs would not meet the most stringent sediment screening level in the Klamath River downstream of Iron Gate Dam until additional tributary inflows sufficiently increased dilution (i.e., approximately Klamath River at Orleans for all three based on modeled decreases in suspended sediment concentration [SSCs]). While the seventeen PAHs with MRLs greater than the most stringent sediment screening levels would be unlikely to result in substantial adverse impacts on human health due to limited opportunities for exposure, implementation of Mitigation Measure WQ-2 for other inorganic and organic contaminants also would further reduce potential exposure and result in these PAHs having a less than significant impact.

Additionally, if it was assumed the elutriate sediment concentrations of PAHs with MRLs less than the most stringent water quality standards were equal to the maximum MRL (i.e., 0.02 to 0.1 micrograms per liter [ug/L] depending on the PAH compound), all PAHs, including acenaphthene, dibenz(a,h)anthracene, and fluorene, would be less than the most stringent human health drinking water standards throughout the Klamath River once the expected dilution during reservoir drawdown was considered. Thus, additional PAHs analyses are not necessary to assess the potential adverse effects from short-term and long-term exposure to reservoir sediments.

Comment LA9-97

Recommended Measure TR-1 (Section 3.22) should be implemented as an MM, as mentioned previous comments. TR-1 should assess:

The use of selective transportation scheduling to identify the least-traveled times on Copco Road for materials transportation;

The use of guide vehicles for transporting hazardous materials/wastes;
The use of busses to transport construction personnel to and from a central location to the construction sites; and,

Development of construction crew housing at a location nearer to the construction sites to reduce traffic volume on Copco Road.

Response to Comment LA9-97
Please refer to Master Response CEQ-2 and note that Recommended Measure TR-1 has been changed to be Mitigation Measure TR-1. Please note that the suite of measures described in the comment are the type of management measures that can be assessed with others for feasibility and effectiveness in the development of a Traffic Management Plan (TMP), as described in Mitigation Measure TR-1. The mitigation measure specifically contemplates consultation with local agencies.

Comment LA9-98
Similarly, Recommended Measure PS-1 – Fire Management Plan should be implemented as an MM, and should appropriately assess the feasibility of identifying, improving, constructing, and maintaining an adequate number of pools in the river and restoration areas for use as helicopter water tank filling locations and water sources for ground crews in order to fully mitigate the impact of wildland fire.

Response to Comment LA9-98
Please refer to Master Response HAZ-2. For a discussion of preemption under the Federal Power Act, please refer to Master Response CEQ-2.

Comment LA9-99
Section 3.22.5 of the Transportation and Traffic section of the DEIR states that the Proposed Project would include the import and export of construction equipment. Section 3.22.2.2 states that the Proposed Project would include the provision of off-road construction equipment such as cranes, excavators, loaders, and large capacity dump trucks, which would be delivered by tractor trailer vehicles. However, Table 3.22-6 and the analysis of proposed construction-related traffic do not consider vehicle trips associated with equipment delivery. Therefore, the analysis of construction-related vehicle traffic is incomplete and should be revised to consider vehicles trips associated with equipment delivery.

Response to Comment LA9-99
Please refer to Volume I Section 3.22.5 *Transportation and Traffic – Potential Impacts and Mitigation* (starting on page 3-1069) for a discussion of transportation-related impacts. Equipment hauling is discussed in this section

(e.g., pages 3-1063, 3-1070, and 3-1074) and is part of the analysis. Potential Impacts 3.22-1 and 3.22-2 (starting on page 3-1069) determined that the level of proposed traffic would be less than the Level of Service (LOS) design of the roadways. Volume II Appendix B: *Definite Plan – Appendix O2 Traffic Management Plan* (TMP) (page 9 to page 12), which is part of the Proposed Project, provides a framework for addressing equipment hauling. Please refer to Master Response CEQ-2 for a discussion of why the text of the Final EIR has been revised to reflect that Recommended Measure TR-1 is now Mitigation Measure TR-1. Please also refer to Volume III Attachment 1 Section 3.22.5 *Transportation and Traffic – Potential Impacts and Mitigation* Potential Impacts 3.22-1 through 3.22-5 for the revisions.

Comment LA9-100

Section 3.22-5 states that non-reservoir-based recreation within the Area of Analysis would still occur but would be dispersed away from the immediate vicinity of Copco No. 1 and Iron Gate and therefore would not overlap with construction traffic. Page 3-986 of the Recreation section of the DEIR indicates that two privately-owned recreation facilities are located within 2.5 miles downstream of the Iron Gate Dam along Copco Road: The R Ranch Klamath River Campground and the Klamath Ranch Resort Blue Heron RV Park. It is reasonable to assume that non-reservoir-based recreation activities associated with these facilities would still occur during Proposed Project construction and would peak during summer months, thereby overlapping with peak construction traffic, contrary to statements in the DEIR. The DEIR should be revised to reflect the fact that these recreational facilities attract large recreational vehicles (RVs) and other recreational motorists that would share Copco Road with construction vehicles hauling exported demolition materials and oversized equipment during peak construction season.

Response to Comment LA9-100

Traffic from the two referenced facilities in the comment was included as part of the existing conditions average daily traffic (ADT) and the LOS (Level of Service) considered in the EIR. Potential conflicts with recreational uses within the traffic and transportation Area of Analysis are indicated in both Volume II Appendix B: *Definite Plan – Appendix O2 Traffic Management Plan* (TMP), which is part of the Proposed Project, and in Volume I Section 3.22.5 *Transportation and Traffic – Potential Impacts and Mitigation*. Please refer to Master Response CEQ-2 for a discussion of why the text of the Final EIR has been revised to reflect that Recommended Measure TR-1 is now Mitigation Measure TR-1. Please also refer to Volume III Attachment 1 Section 3.22.5 *Transportation and Traffic – Potential Impacts and Mitigation* Potential Impacts 3.22-1 through 3.22-5 for the revisions.

Section 3.22.5 *Traffic and Transportation – Potential Impacts and Mitigation* Potential Impact 3.22-1 has been revised to clarify that non-reservoir-related traffic could still occur within the Area of Analysis. Please refer to Volume III

Attachment 1 Section 3.22.5 *Traffic and Transportation – Potential Impacts and Mitigation* for the revisions.

Comment LA9-101

The Traffic Management Plan lacks a strategy to address potential conflicts arising from encounters between construction vehicles hauling oversized equipment, RVs, and vehicles pulling trailers. Recommended Measure TR-1 A-1 also neglects consideration of potential oversized construction vehicle/equipment conflicts. While the DEIR states that construction vehicles hauling oversized equipment would operate under wide load restrictions, no detail was provided about what such restrictions would entail. Accordingly, the final version of the Traffic Management Plan and/or mitigation measures should include a strategy for minimizing potential oversize equipment hazards to recreational motorists. Additionally, the DEIR should clarify what the wide load restrictions entail and elaborate on how these restrictions would reduce safety concerns.

Response to Comment LA9-101

Please refer to responses to comments LA9-99, LA9-100, and LA9-102. In addition, the California Vehicle Code, starting with Section 35780 (State of California 1993) and California Department of Transportation (Caltrans) Transportation Permits Manual (e.g., Section 1003.5 Construction Equipment [Caltrans 1990]) are examples of existing regulations that apply to oversized equipment hauling and would inform Klamath River Renewal Corporation (KRRC's) Final Traffic Management Plan (TMP), which it has committed to in its most recent water quality certification application (KRRC 2019a).

Please also refer to Master Response CEQ-2.

Comment LA9-102

Section 3.23.5 of the Noise Section of the DEIR states that construction activities associated with dam deconstruction would occur during daytime and nighttime hours. The DEIR does not discuss potential hazards from construction related traffic operating during nighttime hours. Further, Recommended Measure TR-1 A-1 and the Traffic Management Plan do not include any traffic control devices and safety features to mitigate potential traffic safety hazards from truck hauling during nighttime hours. The DEIR should discuss potential safety hazards resulting from construction vehicle travel during nighttime hours. In addition, Recommended Measure TR-1 A-1 and/or the Traffic Management Plan should incorporate nighttime traffic control devices and safety features such as warning lights and markings on construction vehicles.

Response to Comment LA9-102

Please note that Klamath River Renewal Corporation (KRRC) has clarified that there will be no off-site nighttime hauling (Pers. comm. Seth Gentzler, AECOM on behalf of KRRC, to Parker Thaler, State Water Resources Control Board, 07/26/2019). Volume III Attachment 1 Section 3.22.5 *Transportation and Traffic*

– *Potential Impacts and Mitigation* Mitigation Measure TR-1 provides for traffic control and safety implementation details consistent with all applicable regulatory requirements including the latest version of the Caltrans California Manual on Uniform Traffic Control Devices (Caltrans 2019a) and coordination with the noted agencies (Caltrans, Siskiyou County Public Works and Sheriff's Departments, California Highway Patrol, California Department of Forestry and Fire Protection (CALFIRE), and other emergency response agencies) as part of the detailed design phase and prior to start of construction. These requirements address the concerns expressed in the comment related to construction-related traffic during nighttime hours. For instance, the Caltrans California Manual on Uniform Traffic Control Devices references standards for both daytime and nighttime illumination and traffic control (Caltrans 2019a). Construction is usually accomplished at night because conditions are safer (i.e., less traffic and more noticeable activity); however, regardless of when construction occurs, Caltrans requires that standard traffic control measures are implemented to result in a safe transportation environment. Please refer to Master Response CEQ-2 for a discussion of why the text of the Final EIR has been revised to reflect that Recommended Measure TR-1 is now Mitigation Measure TR-1. Please also refer to Volume III Attachment 1 Section 3.22.5 *Transportation and Traffic – Potential Impacts and Mitigation* Potential Impacts 3.22-1 through 3.22-5 for the revisions.

Section 3.1.5 *Aesthetics – Potential Impacts and Mitigation* Potential Impact 3.19-7 states that the Proposed Project's construction lighting could result in new sources of substantial light or glare that would adversely affect nighttime views in the area. This potential impact was determined to be significant and unavoidable. Please refer to Volume III Attachment 1 for the final Section 3.1 *Aesthetics*.

Comment LA9-103

The Traffic Management Plan is a series of "Recommended Measures" as it was deemed unenforceable by the SWRCB; therefore, the Proposed Project will result in significant and unavoidable impacts. As the lead CEQA agency, the SWRCB can require the preparation of a Traffic Management Plan as a condition of approval of the Proposed Project, in order to mitigate significant effects. The SWRCB should use its authority to require, and ensure, the preparation of the Traffic Management Plan in order to reduce the known significant impacts on the transportation system.

Response to Comment LA9-103

Please refer to Master Response CEQ-2.

Comment LA9-104

Section 3.23.5 of the Noise section of the DEIR states that construction activities associated with the removal of the dams would involve two shifts: a daytime shift and nighttime shift. Presumably, construction vehicles would be required during both shifts for transporting waste to off-site landfills and worker commutes.

However, construction related peak traffic noise was only evaluated against existing noise levels estimated for the daytime, as provided in Table 3.23-2. Because construction activities are scheduled to occur during nighttime, the DEIR should also evaluate peak construction related traffic noise against existing nighttime noise levels.

Response to Comment LA9-104

The Yreka Transfer Station (also known as the Pelletier Transfer Station), where offsite waste disposal would be hauled, is a daytime facility (i.e., it is open from 8 a.m. to 4 p.m.). Driving time between the Yreka Transfer Station, Copco No. 1, Copco No. 2, and Iron Gate dams would be approximately 1 hour or less based on the distances between these locations (Google Maps 2019). Including driving time, offsite waste hauling trips would be limited to the daytime, defined as 7 a.m. to 10 p.m. (USEPA 1974) and considered in the EIR. It is unnecessary to assess levels of peak construction-related traffic noise due to offsite hauling during nighttime hours. Additionally, since issuance of the Draft EIR in December 2018, the Klamath River Renewal Corporation (KRRC) has clarified that there will be no off-site nighttime hauling (Pers. Comm. Seth Gentzler, AECOM on behalf of KRRC, to Parker Thaler, State Water Resources Control Board, 7/26/2019). Regarding assessment of peak construction-related traffic noise due to worker commutes during nighttime hours, Volume I Section 3.22.5 *Transportation and Traffic – Potential Impacts and Mitigation* (page 3-1070) states the following: "Because recreational facilities at the reservoirs would be closed during the construction period, this analysis assumes that traffic associated with recreational use of the reservoirs would cease during the construction period. When the additional traffic flow from the short-term concurrent activities associated with dam removal is compared to the current traffic flow for recreational use of the reservoirs, the workforce traffic is similar to the current recreational use traffic." Therefore, it is unnecessary to assess levels of peak construction-related traffic noise due to worker commutes during nighttime hours.

Comment LA9-105

As described in the Transportation and Traffic section of the DEIR, the Proposed Project involves road, bridge, and culvert improvements. As provided in Appendix K of the 2018 Definite Plan, some of these improvement projects would occur within the vicinity of sensitive receptors. For example, construction access improvements consisting of the installation of a temporary bridge would be established adjacent to the Klamath Ranch Resort Blue Heron RV Park and within 3,400 feet of residences along Tarpon Drive. Construction access improvements consisting of the replacement of the Lakeview Road bridge would be established within 2,600 feet of residences along Tarpon road. Other construction access improvements such as pavement rehabilitation that would occur prior to and/or following dam removal activities would also occur in locations near sensitive receptors. The DEIR should evaluate whether construction noise associated with road, bridge, and culvert improvements would result in short-term increases in noise levels affecting nearby residences.

Response to Comment LA9-105
Section 3.23.4 *Noise – Impact Analysis Approach* and Section 3.23.5 *Noise – Potential Impacts and Mitigation* have been revised to clarify the nature and timing of certain project elements and reference particular aspects of the Proposed Project that would be likely to use construction equipment that would exceed Siskiyou County General Plan noise thresholds.

Del Norte County Board of Supervisors, Taylor Carsley, Lori L. Cowan

Comment LA6-1
The Del Norte County Board of Supervisors (Board) wishes to provide comment on the Lower Klamath Project License Surrender (Project) and the Draft EIR released by the State Water Resources Control Board (SWRCB).

Response to Comment LA6-1
Thank you for your comment.

Comment LA6-2
The Klamath River is a key part of the economy, culture, and natural environment of Del Norte County; where the river meets the Pacific Ocean. The Board is responsible for ensuring projects affecting the County contribute to the health and welfare of the community and the local economy.

Response to Comment LA6-2
Thank you for your comment. Please refer to Master Response GEN-2. Please note that CEQA documents analyze significant effects on the physical environment; CEQA does not address potential social or economic effects from implementing a project (CEQA Guidelines, section 15131(a). Please also refer to Volume I Section 5.4 *Other Required CEQA Discussion and Consideration of Social and Economic Factors – Social and Economic Factors Under CEQA*.

Comment LA6-3
While the Board supports the recovery of Klamath River and Pacific Ocean commercial and recreational fisheries, we do have significant concerns with regard to how the Project may exacerbate the issue of siltation and sedimentation at the Crescent City Harbor, located 15 miles north of the river mouth. Also concerning are the known unavoidable and significant impacts to oceanic and riverine fisheries resources that are so essential to our local commercial and sport-fishing industries.

Response to Comment LA6-3
Section 3.3.5.1 *Aquatic Resources – Potential Impacts and Mitigation – Suspended Sediment* provides a summary of the detailed analysis of anticipated suspended sediment effects on aquatic resources that is presented in Potential Impact 3.2-3 and Appendix E. Section 3.3.5.2 *Aquatic Resources – Potential Impacts and Mitigation – Bed Elevation and Grain Size Distribution* provides a

summary of the detailed analysis of anticipated bedload sediment effects on aquatic resources that is presented in Appendix F. Appendix E and F, and Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* include detailed assessments of the anticipated effects of sediment on focal aquatic species under the Proposed Project. As reflected in Section 3.3.5.9, the EIR finds no unavoidable and significant impacts to riverine or ocean fisheries resources. In addition, Section 3.3.5.9 describes aquatic resource measures proposed by Klamath River Renewal Corporation (KRRC) (i.e., AR-1, AR-2) and mitigation measures included in the EIR (i.e., AQR-1, AQR-2). As explained in Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation*, those aquatic resource measures and mitigation measures would ensure no significant impacts to riverine or oceans fisheries resources. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment LA6-4

The Draft EIR (DEIR) is clear that the proposed project will increase suspended materials to a high degree following the drawdown and dam removal phases. For example, suspended sediment concentrations (SSCs} would potentially increase 220 times the threshold of significance downstream of Copco No. 1 Dam upon drawdown with similar numbers projected for the drawdown of the other dams in California. The Board is concerned with the fact that the quantity of sediment delivered to the Pacific Ocean is still not known with certainty, and more importantly, how the material will react once delivered to the ocean. Conservative estimates place the amount of sediment discharge to the ocean as a result of drawdown and dam removal at about 5.8 million tons (4 million tons of fine sediment and 1.8 million tons of sand and larger sediment). While the DEIR estimates that the quantity released would be similar to that transported by the river to the ocean in a year with average flow, this quantity would be in addition to what is transported naturally by the river, whether it be a dry, average, or wet year. On the year of dam removal and drawdown, a significant amount of sediment will be delivered to the ocean, relative to any year without the project. Recognizing the uncertainty on where the material will settle in the ocean, it is known that normal ocean currents transport material north and there is certainty that our Harbor already has issues with dredging and dredge spoils management.

The Crescent City Harbor District is designated a "harbor of safe refuge" by the California Harbors and Navigation Code. The Harbor supports a U.S. Coast Guard cutter, commercial and sport fishing, waterfront industry, and recreational activities. A study titled "Coastal Geomorphology of the Smith River Plain" (Roberts and Dolan, 1968) found that the littoral current pattern south of Crescent City transports sediment northwestward and contributes to a continued seaward growth of sand south of the breakwater at the mouth of the Harbor. Sediment accumulating at the entrance of the Harbor travels inward and requires regular dredging to maintain a safe navigation depth of recreational and commercial vessels in the federal channels and inner boat

basins. Fine sediment accumulation is particularly problematic because is typically unsuitable for use as beach replenishment and thus more difficult to dispose of. The Harbor District's dredge materials holding site is currently at capacity and a feasible replacement site has not yet been established; complicated by the permitting hurdles between the U.S. Army Corps of Engineers and the California Coastal Commission which are less than amenable toward achieving maintenance dredging in the first place. The Harbor faces incredible challenges with managing the current amount of siltation experienced in and around its facilities, let alone potentially more as a result of the Project. Even if a very small percentage of project sedimentation impacts the Harbor, the issue could be compounded in a way that severely hampers the essential marine operations of the County. It follows that the Board needs the guarantee from the Project coalition that we will be actively supported in our efforts to acquire the necessary permits to dredge our Harbor, as these are probable future projects whose impacts must be considered cumulatively. (14 C.C.R. 15064(g).) Only by assisting the County in our ability to dredge the Harbor will the potential for impacts as a result of the Project be mitigated.

Response to Comment LA6-4

As specified in Section 3.2.3.1 *Water Quality – Significance Criteria – Thresholds of Significance*, the significance threshold for short-term suspended sediment concentration (SSC) impacts to salmonids is 100 milligrams per liter (mg/L) over a continuous two-week exposure period. SSCs are modeled to reach maximums (i.e., peaks at one point in time) of up to 2,000-3,000 mg/L downstream of J.C. Boyle Reservoir, 7,000-8,000 mg/L downstream of Copco No. 1 Reservoir, and 7,000-14,000 mg/L downstream of Iron Gate Dam, with potential for SSCs in excess of 1,000 mg/L downstream of Iron Gate Dam on a timescale of weeks to months. Components of the Proposed Project, including increasing the drawdown rate and sediment jetting, would preferentially reduce the duration of the modeled suspended sediment impacts, although these components could also increase the modeled SSC maximums, and suspended sediments are still expected to exceed 100 mg/L for durations of over two weeks at all locations, resulting in a significant and unavoidable short-term impact (see Section 3.2.5.2 *Water Quality – Potential Impacts and Mitigation – Suspended Sediments* Potential Impact 3.2-3). Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Sedimentation and River Hydraulics sediment transport model (SRH-1D) model simulations (USBR 2012a) estimate that between 5.4 and 8.6 million yd^3 [1.2 to 2.3 million tons], or 36 to 57 percent of the total reservoir sediment volume, is expected to be eroded and transported downstream during the drawdown period (see Table 3.11-7 in Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 [pages 3-765 to 3-775]). For a discussion of how this amount compares to

background annual sediment loads, please refer to the response to comment ORG46-31.

As described throughout the EIR and in Master Response GEO-1, the majority of eroded reservoir sediments are predicted to be transported to the Pacific Ocean as particles that remain suspended in the water during drawdown and in the short-term following drawdown. Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 (pages 3-769 to 3-770 and 3-775) describes that there would be no significant impact to the Pacific Ocean Nearshore Environment in the short- or long-term, given the relatively small amount of total sediment input from reservoir sediment release in comparison to the total annual naturally occurring sediment inputs to the nearshore environment, and because any sedimentation of the nearshore seafloor resulting from the Proposed Project would likely be transported farther offshore to the mid-shelf and into deeper water off-shelf. Furthermore, no cumulatively considerable sediment impacts have been identified (see Volume I Section 3.24.11 *Cumulative Effects – Geology, Soils, and Mineral Resources* [pages 3-1191 to 3-1194]). As discussed in Section 3.2.5.2 *Water Quality – Potential Impacts and Mitigation – Suspended Sediments* Potential Impact 3.2-3, while the direction of suspended sediment transport would be generally northward from the mouth of the Klamath River, the plume carrying reservoir sediments would likely be influenced by a range of meteorological and ocean conditions (e.g., storm and non-storm periods, differing storm directions) during the weeks to months of elevated suspended sediment concentrations. Some of the time the plume would likely be constrained to shallower nearshore waters, while at other times it would likely extend further offshore and spread more widely, before depositing along the continental shelf seaward of the mouth of the Klamath River. Overall, the total sediment input from reservoir sediment release would be well within the range of natural sediment release conditions from the Klamath River, such that any associated sediment transport and deposition in the Pacific Nearshore Ocean Environment would also be within the range of natural conditions.

Given that the sediment input will be within the natural existing range, there is no evidence to suggest that dam removal would increase the need for dredging of Crescent City Harbor. Note that the existing shoaling and dredging rate for the Entrance, Inner Harbor Basin, and Marina Access Channels is approximately 20,000 cubic yards per year, or approximately 100,000 cubic yards every 5 years [HydroPlan and Anchor QEA 2015 cited in USACE 2019]. Additionally, Crescent City Harbor is located approximately 15 miles north of the Klamath River Estuary. Due to this distance, and the fact that most of the sediment released from the reservoirs is anticipated to be fine sediment (not coarse sediments such as sand), which is easily transported, it is unlikely that significant sediment deposition will occur in the Crescent City Harbor as a result of the Project.

The comment does not provide an explanation for how the process for obtaining future permits from responsible agencies for ongoing dredging operations at the Crescent City Harbor would be affected by sediment deposition that occurs in the Pacific Ocean Nearshore Environment due to the Proposed Project. Based on the above paragraphs, there is no evidence that the Proposed Project would impinge future permits for Crescent City Harbor.

Comment LA6-5

Recreational and commercial fishing is an economic lifeline for many members of Del Norte County, where the per capita median income is below state average. Guided recreational fishing and the tourism dollars that this fishery supports make meaningful and significant impacts to our local economy. For example, we estimate that the spring-run fishery, most likely to be affected by the Project, generates close to $521,000 in revenue to our communities.

Losses in revenue of our local hospitality, restaurant, hotel, and service sector industries, not to mention licensed river guides as a result of impacts from the Project is unacceptable. The DEIR paints an optimistic picture of limited short-term impacts to anadromous fisheries as a result of the Project, and predicts significant long-term beneficial economic impacts on the coastal commercial fishing industry. But the DEIR fails to consider the short-term economic impacts that a lost year will have on the county's half-million dollar industry. Indeed, the DEIR acknowledges the short term impact that increased turbidity will have on recreators-and dismisses these impacts as temporary-but fails to consider the associated economic impacts that decreased recreation will have on tourism. (14 C.C.R. §15131.) Those impacts, even if temporary, should be considered significant to Del Norte County's economy, and specific funding mechanisms to mitigate those impacts should be included in the project. (14C.C.R §15123.4.) It is understood that substantial funding is available for the offset of unavoidable impacts to spring- and fall-run fisheries. The Board requests that a portion of funding be set aside and made available to our community that relies on these dwindling fisheries, already under pressure for special status listing from resource agencies. We simply cannot afford to mitigate the impacts associated with increased pressure on commercial and sport fisheries without financial assistance from the Project's coalition.

Response to Comment LA6-5

Please refer to Section 5.4.1 *Other Required CEQA Discussion and Consideration of Social and Economic Factors – Social and Economic Factors Under CEQA – Consideration of Economic Information for Resources Potentially Affected by Dam Removal* (pages 5-4 to 5-11), which summarizes the results of prior economic studies conducted by the U.S. Department of the Interior (DOI) to characterize potential commercial fishing effects due to dam removal. The results of DOI's prior economic analysis of ocean sport fishing are also

summarized in the EIR to provide broader context for possible increased recreational fishing opportunities given dam removal.

Comment LA6-6

While this Board can recognize certain long-term benefits of the Project, and a recent meeting with representatives from both the Klamath River Renewal Corporation (KRRC) and the Pacific Coast Federation of Fishermen's Associations (PCFFA) was reassuring, the potential impacts of siltation and sedimentation still exist and could have real impacts on the economy and livelihood of the County. Impact assessment for sedimentation on the nearshore ocean environment is lacking in the DEIR, and the results of the modelling lead to much uncertainty. The Board would be much more at ease should the project contain a plan that provides for the potential negative contingencies. If assurances could be made that impacts to our County would be directly mitigated, a more thorough level of support would be provided. One solution could be provided in the form of a fund established for monitoring and remediation of short and long-term impacts resulting from Project implementation. It has been acknowledged that KRRC has ample resources assist with these necessary contingencies through PacifiCorp customer surcharges and California Proposition 1 water bonds. Funding for the mitigation of impacts is worth very little, however, if they are not made readily available as needed. An efficient mechanism to distribute resources that alleviate the adverse effects of the project needs to be included in the DEIR. This would ensure that the SWRCB truly has a worst case scenario in mind and is willing to address the impacts of this scenario if it does indeed affect our local community in the short or long-term.

Response to Comment LA6-6

Contrary to the comment's assertion, an impact assessment for sedimentation in the Pacific Ocean Nearshore Environment is provided in Section 3.2.5 *Water Quality – Potential Impacts and Mitigation – Suspended Sediments* Potential Impact 3.2-3 and Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5, which are revised in Volume III Attachment 1. Please also refer to the response to comment LA6-5 above. Given that the EIR does not identify significant individual or cumulative sedimentation impacts from the Proposed Project on the Pacific Ocean Nearshore Environment in the vicinity of the Klamath River mouth and Crescent City Harbor, other than potential *significant and unavoidable* short-term elevated suspended sediment concentrations (SSCs), mitigation is not required for short- or long-term sediment deposition.

Please also refer to response to comment ORG47-51.1.

Comment LA6-7

We hope that our Board's concerns are considered seriously in the evaluation of and response to DEIR comments. Further, we press that in the

process of preparing findings on the feasibility of reducing and limiting potential significant environmental impacts, appropriate mitigation and monitoring is examined that addresses the issues that have been raised. It is with enthusiasm that we would support this Project if the proper mitigation funding, resources, and access to them were made available in the event that future impacts to the Crescent City Harbor and our commercial and sport-fishing industries are more severe than the DEIR makes them out to be. Thank you for the consideration of our comments.

Response to Comment LA6-7
Thank you for your comment.

Humboldt County Board of Supervisors, Rex Bohn, Hank Seemann

Comment LA4-1
The draft Environmental Impact Report ("Draft EIR") released by the State Water Resources Control Board on December 27, 2018, for the proposed Section 401 water quality certification concludes that dam removal is the best option for improving fisheries and water quality. The Draft EIR concludes that removal of the lower four dams is superior to six alternatives and will result in many significant, long- term benefits. The data and analysis presented in the Draft EIR demonstrate that removal of the lower four Klamath River dams will improve water quality and increase runs of anadromous fish in the Klamath River. In particular, the Draft EIR concludes that dam removal will curtail blue green algae blooms and fish disease problems below the dams. This issue is critically important for Humboldt County residents who fish and recreate in the Klamath River.

Response to Comment LA4-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment LA4-2
Most negative impacts are short-term and/or can be avoided or reduced through mitigation measures. The Draft EIR concludes that sediment impacts will be temporary. Humboldt County understands that for an initial period of time the river will experience weeks and potentially months with heavy loads of suspended sediment, and we agree that these temporary impacts are worth the long-term gains in water quality and fish production.

Response to Comment LA4-2
Please refer to Master Response GEN-1.

Comment LA4-3
The Draft EIR describes loss of reservoirs for wildland fire fighting as a significant and unavoidable impact. We encourage continued discussions with the Klamath River Renewal Corporation and other parties to better define this impact and identify alternative water supply and preparedness measures.

Response to Comment LA4-3
Please refer to Master Response HAZ-2.

Comment LA4-4
Humboldt County continues to support decommissioning the lower four Klamath River dams through implementation of the Amended KHSA. Humboldt County looks forward to continuing our participation in the Clean Water Action section 401 certification process and seeing the Amended KHSA fully implemented. We appreciate the State Water Resources Control Board's consideration of our comments.

Response to Comment LA4-4
Please also refer to Master Response GEN-1.

Humboldt County Department of Health, John H. Moseman IV

Comment LA10-1
I am writing to express my full support of removal all of the dams on the Klamath River Hydroelectric Project and to have my opinion counted as part of the comment period. After I graduated HSU with a degree in Natural Resource Planning and Recreation, I worked for a planning agency (EDAW) on the Klamath River to assess Pacific Corps relicensing project at the time. I had the ability to survey folks about their opinions about the hydro-electric project there and learned a lot from the locals and users of this portion of the river.

It is my assessment that one of the greatest salmon rivers of our country is currently in an unhealthy state due to the dams on the Klamath River. Removal of the dams will benefit the people that live there as well as the ecosystems that depend on a healthy river. It took millions of years for it to evolve to its healthy state and needs the ability to return to an undammed state.

Response to Comment LA10-1
Thank you for your comment. Please refer to Master Response GEN-1.

2.3.3 Native American Tribes

This section presents written comments received on the Draft EIR from Native American Tribes and the State Water Board's responses to those comments. Written comments and responses in this section are organized alphabetically by tribe name. To determine whether your comment is associated with an affiliation type other than Native American Tribes, please refer to Table 2-1 or Table 2-2.

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Hoopa Valley Tribe, Tom Schlosser

Comment TR17-1

Technical staff of the Hoopa Valley Tribal Fisheries Department have reviewed the subject document produced by staff of the State Water Resources Control Board (Board), and provide the comments below. The Hoopa Valley Tribe (Tribe) is strongly supportive of dam removal by Klamath River Renewal Corporation, as the impacts are expected to include substantial improvements to water quality in areas downstream of the Oregon-California border, while affording anadromous fish access to habitat in both California and Oregon long blocked by hydropower facilities.

Response to Comment TR17-1

Thank you for your comment. Please refer to Master Response GEN-2.

Comment TR17-2

Members of the Tribe exercise fishing rights in Trinity River and Klamath River portions of the Reservation. Terms of the Water Quality Certification include some with far-reaching implications for salmon and other fishes in both rivers, and therefore we are concerned that the states of California and Oregon as well as the federal government discharge throughout the certification process their respective responsibilities for restoration and protection of anadromous fish.

Response to Comment TR17-2

The State Water Board notes the Hoopa Valley Tribe's concern that the water quality certification should protect salmon. Comments related to Oregon and federal permit terms and conditions should be submitted to the respective agencies. For information on Proposed Project impacts to Aquatic Resources (including coho and Chinook salmon), please refer to Section 3.3 *Aquatic Resources*.

Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*. Hoopa Valley Tribe's fishing rights are noted in the EIR – for example, please see Volume I Section 3.8.2.2 *Water Supply/Water Rights* –

Environmental Setting – Mid and Lower Klamath Basins – Federal Reserved Rights for Native American Tribes – Hoopa Valley Tribe and Yurok Tribe (pages 3-673 to 3-674) and Section 5.4.1.1 *Social and Economic Factors Under CEQA – Consideration of Economic Information for Resource Potentially Affected by Dam Removal – Commercial Fishing* (pages 5-5 to 5-7).

Comment TR17-3

The Tribe has established "treatment-as-a-state" under the Clean Water Act, is recognized by the federal government as having fully-vetted property rights to annual harvest of salmon and other fishes, and views its authorities as extending to active participation with the State of California as a co-manager alongside the various federal and tribal resource agencies involved. The Tribe is to be consulted with in regards to plans, investigations and reports dealing with dam removal and impacts of recovery efforts. We are committed to a collaborative effort leading to successful restoration.

Response to Comment TR17-3

This comment relates to Hoopa Valley Tribe's commitment to successful restoration and desired role in developing dam removal and restoration plans. Comment noted.

Comment TR17-4

The current document contemplates that Iron Gate Hatchery (IGH) will be transferred to the State of California and funded by Pacific Corp for eight years after 4 lower dams are removed on Klamath River. We have concerns with regard to CDFW's Technical Staff Recommendations for hatchery operations in the post-dam era which were provided to the State Board. First, establishing a sunset of eight years post dam removal for operations is arbitrary and appears to be based upon the assumption that recolonization and robust production will occur within two brood cycles of Chinook or three brood cycles of Coho. Instead, the term of operation of the hatchery should extend until verification of successful recolonization and robust production. Second, the scale of mitigation programs at the facility should not be dictated by the availability of a water source, rather clear mitigation goals need to be developed and then the facility tailored to meet the need. Third, experimental lots of fish should be trucked to just above the Trinity River confluence to evaluate improved survival and potential for straying. Finally, the significant reduction in fall Chinook yearling production presented in the technical recommendation will have immediate consequences for dependent Tribal fisheries.

With regard to an arbitrary eight-year period for post dam mitigation, we are concerned that the modified KHSA failed to define metrics which would evaluate the implied hypothesis that both fall Chinook and Coho populations would rebound in the post-dam removal era to a level equal to or exceeding contemporary mitigation at IGH (900,000 yearling, 5,100,000 smolt fall Chinook and 75,000 Coho salmon). Full IGH mitigation should instead continue until such

time that it can be demonstrated that natural production, as measured at the present location of Irongate Dam, has on average matched or exceeded an approximate 6,000,000 outmigrant fall Chinook and 75,000 Coho outmigrants. Dam removal, while implemented by the KRRC, will still be pursuant to authority of the federal government and by extension would itself be a federal action. Current levels of mitigation result in significant contributions to dependent Tribal fisheries and we do not agree that this harvest opportunity should be compromised by limited action within an arbitrary set of years (8) and should rather be supported by data showing that naturally produced fish populations have increased to levels approximating the mitigation targets today. According to the CDFW's technical recommendation, it appears that hatchery production will be scaled to availability of water. We instead would advise that production not waiver from contemporary mitigation levels, and that instead of scaling production to water availability, recirculating systems be developed to sustain contemporary mitigation. The intention would be to use as much available cold-water inflow as may be gathered from Bogus Creek or other sources and extending its usefulness through repurposing and filtration of effluent. To address concerns of the role hatchery fish may play in disease transmission to natural juvenile salmonids, we would advocate that an experimental group of marked IGH fingerlings (400,000 individuals), be trucked to immediately above the Trinity River confluence and released. Future recovery of these fish would enable scientists to evaluate the risks and benefits of off-site releases of fingerlings. The State Technical Recommendations advise that yearling fall Chinook production be reduced to just 13% of current mitigation levels during the post-dam era. Given that IGH yearlings historically outperformed fingerlings three- to six-fold, this dramatic reduction is likely to have an immediate and profound impact to Tribal fisheries. Again, our requirement would be that mitigation remain at current levels for both fall Chinook and Coho Salmon until there is compelling evidence that natural fish production would provide comparable benefits to fisheries.

Response to Comment TR17-4

The Hoopa Valley Tribe's comment expresses concerns with the proposed eight-year term operation of hatcheries under the Proposed Project. The Hoopa Valley Tribe's comment recommends that hatchery operations should extend until verification that natural salmonid production has on average matched or exceeded 6,000,000 outmigrant fall Chinook and 75,000 coho salmon (the current hatchery production goal). Further, the Hoopa Valley Tribe suggests that the scale of mitigation programs should be tailored to meet specific production goals rather than setting hatchery targets based on available water supply, and expresses concern for potential fisheries impacts due to the reduction of the yearling production. Finally, the comment recommends a test-release of hatchery smolts just above the Trinity River, to evaluate the impacts of such an operational change on straying, disease, and escapement.

The Klamath River Renewal Corporation's (KRRC's) Proposed Project includes hatchery modifications and operations for up to eight years following dam removal. The EIR evaluates the potential environmental impacts associated with implementation of the KRRC's Proposed Project and project alternatives (including a No Hatchery Alternative).

The EIR finds that the Proposed Project would not result in a significant impact on salmonid populations, or on the tribal or commercial fisheries (see specific sections referenced below).

Section 3.3.5.6 *Aquatic Resources – Potential Impacts and Mitigation – Fish Hatcheries* discusses the likely effects of eight years of hatchery production following dam removal, including an analysis of the sources of hatchery and natural production likely to occur each year of dam removal and post-dam removal through post-dam removal year 10. The potential for natural production of salmon smolts upstream of the current location of Iron Gate Dam is discussed for each species in Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-7 (fall-run Chinook salmon), Potential Impact 3.3-8 (spring-run Chinook salmon), and Potential Impact 3.3-9 (coho salmon). The analysis is based on scientific literature, and in the case of fall-run Chinook salmon (Potential Impact 3.3-7), a quantitative life-cycle model (Hendrix 2011). This analysis concludes that successful fall-run Chinook salmon recolonization and robust production following dam removal and eight years of hatchery operations is likely to occur under the Proposed Project. Please refer to Volume III Attachment 1 for the final Section 3.3. *Aquatic Resources*. Please also refer to Master Response AQF-2 regarding the suggestion to increase and/or extend hatchery production.

Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-7, analyzes the anticipated effects of a reduction in hatchery production on the escapement of fall-run Chinook salmon, and Potential Impact 3.12-9 analyzes the potential impacts of reduced hatchery production on tribal fisheries. Please refer to Volume III Attachment 1 for the final Section 3.3. *Aquatic Resources*. Please also refer to Master Response AQF-3 regarding the concern regarding salmon abundance available for harvest.

Additionally, the Hoopa Tribe noted that under the Proposed Project the reduction in yearling production is far greater than the reduction in smolt production. Based on coded wire tagging between 1990 and 2015, adult hatchery returns of smolts has averaged 0.178 percent, and returns of hatchery yearlings has averaged 0.352 percent (Giudice and Knechtle 2018). Despite higher survival of yearling releases, the substantially higher number of smolt releases results in most hatchery adult returns being fish released as age-0 smolts. Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-7 has been revised to include this information.

Karuk Tribe, Alex Watts-Tobin

Comment TR22-1
As the Karuk THPO, I appreciate the opportunity to comment on the State Water Board's draft EIR for the Water Quality 401 Certification of the Lower Klamath Hydroelectric Project. The project was discussed at the February 5th, 2019 Karuk Resources Advisory Board Meeting. The THPO attended the Public Meeting on this issue in Yreka in the evening of February 5th, together with one staff member. Both of these staff members and Karuk Vice-Chair Robert Super made comments on the project at that meeting. Other staff members attended the meeting in Orleans on February 7th.

Response to Comment TR22-1
Thank you for your comment. Oral comments provided during public scoping meeting are also considered in this Final EIR. Please refer to Volume III Section 2.4.1 *Yreka Public Meeting—February 5, 2019* and 2.4.3 *Orleans Public Meeting—February 7, 2019* for comment responses to oral comments provided during the Yreka and Orleans public meetings.

Comment TR22-2
The Karuk THPO office concurs with the comments of Karuk Chairman Attebery filed February 26, 2019.

Response to Comment TR22-2
Please refer to responses to comments TR18-1 through TR18-67.

Comment TR22-3
Overall, the Karuk Tribe and the THPO office strongly support the Board's findings and conclusions – namely that that the proposed project (removal of lower four dams) is superior to the six alternatives analyzed.

Response to Comment TR22-3
Please also refer to Master Response GEN-1.

Comment TR22-4
I would like to make some detailed comments on the dEIR, especially with respect to section 3.12, the Cultural Resources section.

The Ethnography section for Karuk draws substantially on the section on Karuk by William Bright in Heizer's Handbook of North American Indians, vol 8. This is, by common consent, not Bright's best work. The work by John Salter and Craig Tucker, which is referenced by Chair Attebery in his comment letter, is a much more up-to-date and accurate account of Tribal practices,, river conditions, and environment. Likewise, Thomas King's work on the Klamath Riverscape is also superior to Bright's summary. Both of these works draw directly on considerable anthropological research and ethnographic testimony from Karuk Tribal members.

Response to Comment TR22-4
Section 3.12.2.1 *Historical Resources and Tribal Cultural Resources – Environmental Setting – Tribal Cultural Chronology and Ethnography – Northwest California Culture Area – Ethnography – Karuk* has been updated based on the comment provided by Chair Attebery. Please refer to Volume III Attachment 1 Section 3.12.2.1 *Historical Resources and Tribal Cultural Resources – Environmental Setting – Tribal Cultural Chronology and Ethnography – Northwest California Culture Area – Ethnography – Karuk* for the revisions. Please also refer to response to comment TR18-19.

Please note that the Bright (1978) citations referenced in this comment are carried over from the Karuk ethnography sections of the 2012 KHSA EIS/EIR. Additionally, the State Water Board appreciates that the Karuk Tribe has provided the Salter and Tucker (2010) summary of history and ethnography, thus including the associated information in the record for the Lower Klamath Project EIR.

Comment TR22-5
The THPO concurs with the other comments provided by Chair Attebery on Section 3.12 of the Draft EIR.

Response to Comment TR22-5
Comment noted. Please refer to responses to comments TR18-1 through TR18-67.

Karuk Tribe, Chairman Attebery

Comment TR18-1
Please accept the attached comment letter and associated document from Karuk Tribe as our comments on the dEIR on the Lower Klamath Project.

Response to Comment TR18-1
Thank you for your comment.

Comment TR18-2
On September 23, 2016, PacifiCorp and the Klamath River Renewal Corporation (KRRC) filed a joint license transfer application with the Federal Energy Regulatory Commission (FERC). Pursuant to the amended KHSA, PacifiCorp and the KRRC seek to transfer the lower four dams (J.C. Boyle; Copco No. 1; Copco No. 2; and Iron Gate) to the KRRC for the purpose of decommissioning and removal. Before FERC can accept a license surrender application, PacifiCorp and the Klamath River Renewal Corporation must obtain water quality certification under Section 401 of the Clean Water Act (33 U.S.C. § 1341) from the State Water Board. Under Section 401 conditions of a water quality certification become conditions of any federal license or permit for the project. The State Water Board is the agency authorized to issue certification of any

potential discharge from an activity that requires a FERC license or amendment. The State Water Board adopted the Water Quality Control Plan for the North Coast Region (Basin Plan). The Basin Plan includes the Beneficial Uses and Water Quality Objectives necessary to protect the Beneficial Uses. Together these constitute the Water Quality Standards that must be met before the State Water Board can issue Water Quality Certification. Issuance of a water quality certification is a discretionary action subject to CEQA compliance. The State Water Board has correctly chosen to prepare an Environmental Impact Report (EIR) because there are potentially significant impacts associated with dam transfer and removal. On December 27, 2018 the California State Water Resources Control Board issued a draft Environmental Impact Report for the surrender of the Lower Klamath Hydroelectric Project (LKHP). Under the California Environmental Quality Act (CEQA) a Lead Agency is required to solicit comments from interested parties and the public. The Karuk Tribe is submitting comments as a long-term participant in the Klamath Hydroelectric Project decommissioning process and a signatory to the amended Klamath Hydroelectric Settlement Agreement (KHSA). Our participation in this process is driven by the unequivocal fact that reduced fish populations and poor water quality are a direct result of the operation of the Klamath Hydroelectric Project. Furthermore, operation of the Klamath Hydroelectric Project has had profound negative impacts on the traditional cultural practices and the health of Karuk Tribal members.

Response to Comment TR18-2

Thank you for your comment. In addition to the potential impact analyses presented in Section 3.2 *Water Quality* and Section 3.3 *Aquatic Resources*, the potential for impacts to tribal cultural resources due to the Proposed Project is analyzed in Section 3.12 *Historical Resources and Tribal Cultural Resources*, including Potential Impact 3.12-10, which discusses the ability of tribes to use the Middle and Lower Klamath River for ceremonial and other purposes given seasonal adverse water quality and nuisance and/or noxious blue-green algae blooms. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*, Section 3.3 *Aquatic Resources*, and Section 3.12 *Historical Resources and Tribal Cultural Resources*.

Comment TR18-3

CEQA requires a lead agency to analyze the impacts of a project as defined in the CEQA Guidelines. In the case of an existing hydroelectric project that has been in operation before the adoption of the Clean Water Act and Endangered Species Act the ongoing impacts of the project will not register as significant. While CEQA considers the existing conditions as the baseline for analysis of project impacts, the State Water Board must analyze the existing operations to determine compliance with the Clean Water Act. We assert that the LKHP has been operating in violation of the Clean Water Act, and potentially other State and Federal Laws, for decades and this must be disclosed in a discussion of the baseline conditions. We assert that the LKHP cannot be brought into

compliance with State and Federal Laws without being removed. Clearly, dam removal and the expected discharge of sediments will have an immediate negative impact on water quality downstream of the LKHP. However, the expected long-term benefits are enormous and have been thoroughly researched and described in the 2012 EIR/EIS on Klamath Facilities Removal and further expanded on in the Klamath Dam Removal Overview Report for the Secretary of Interior (October 2012). We are pleased that in their own analysis the Board correctly concludes that the proposed project (removal of lower four dams) is superior to the six alternatives analyzed.

Response to Comment TR18-3
Comment noted. Please refer to Master Response GEN-1. For the Proposed Project, the CEQA document analyzes the impacts of the Proposed Project to existing conditions and this evaluation does not take into consideration ongoing impacts of continued operations of the Lower Klamath Project. The water quality certification process analyzes the Proposed Project impacts from the context of water quality standards which is different from the existing conditions (baseline) evaluated in CEQA. Please note, the No Project Alternative (Volume I Section 4.2) does acknowledge that it is not clear that if the Lower Klamath Project dams and reservoirs remained in place, if they would be able to comply with California water quality standards. Additionally, the Continued Operations with Fish Passage Alternative (Volume I Section 4.4) also acknowledges that in 2007 FERC's EIS found that PacifiCorp's proposal for relicensing of the Klamath Hydroelectric Project (KHP) failed to address the project's water quality impairments within and downstream of the Hydroelectric Reach (FERC 2007), and since 2007, PacifiCorp has developed several iterations of a Reservoir Management Plan to address water quality impairments associated with operations of Lower Klamath Project facilities. While study results indicate the actions listed its Reservoir Management Plan can improve some of the project's impacts to water quality, it has not demonstrated compliance with all water quality impacts associated with the project.

Please also note that the EIR uses the phrase "existing adverse conditions" instead of "existing conditions" in situations where the environmental resource under consideration is impaired or can result in adverse impacts on an environmental receptor(s). Use of this phrase is intended to provide appropriate and helpful context for the general reader to understand the nature of the existing condition in light of the CEQA requirement to consider the baseline condition as existing conditions (CEQA Guidelines Section 15125(a)).

Comment TR18-4
We appreciate the hard work of the California Water Board, Board staff, and consultants on developing this document.

Response to Comment TR18-4
Comment noted.

Comment TR18-5
In general, we find that fisheries and aquatic resources were adequately addressed and therefore we have very few comments. There is very good coverage of fisheries issues and impacts to fish to the point where there is almost too much information and redundancy.

Response to Comment TR18-5
Comment noted.

Comment TR18-6
General Comment on Sediment Concentrations--The largest threat to fish described under the proposed action is suspended sediment concentrations (SSC) downstream of the dams. The document does a good job in laying out the time frames of the treat (year 1 and year 2) and scenarios base on water year types ranging from dry to wet years and the longitudinal effects from upstream reaches to downstream reaches. Given the project is located below upper Klamath Lake where water is stored and could be released to increase the flushing rate of sediments, we suggest that this could be included as an alternative. Could some volume of water be stored in UKL to be later used as a flushing flow during reservoir drawdown to increase the rate of flushing and lessen the impact to fish and decrease the duration of fish exposures to high SSC?

Response to Comment TR18-6
Upper Klamath Lake is operated by the United State Bureau of Reclamation (USBR) as part of the Klamath Irrigation Project and is not part of either the Klamath Hydroelectric Project (KHP) or the Lower Klamath Project.

Lake level elevations and flow releases from Upper Klamath Lake are currently dictated by a 2019 Biological Opinion for the protection of listed lost river sucker, shortnose sucker, and coho salmon. Any flow changes in the Klamath River would be from the Biological Opinion revision process, rather than implementation of the Proposed Project. As such, use of Upper Klamath Lake for additional flushing flows during drawdown of Lower Klamath Project reservoirs is not a feasible alternative to consider in CEQA.

Please note, four sediment transport modeling scenarios were analyzed by Stillwater Sciences (2008) to examine the potential for using Upper Klamath Lake or an upstream reservoir to alter inflows to downstream reservoirs in order to reduce downstream suspended sediment concentration's (SSCs) during drawdown.

The exact flow conditions in the four modeled scenarios are slightly different from flow conditions proposed by the comment (i.e., typical Klamath River inflow for the water year type plus an additional flushing flow release from Upper Klamath

Lake), but model results from the four scenarios quantify the relative change in the magnitude and duration of SSCs resulting from an increase in Klamath River flow into the reservoirs during drawdown.

In the four modeled scenarios, an increase in the flow to the reservoirs during drawdown did not result in an overall decrease in the potential impacts from SSCs. In one modeled scenario, SSCs initially decreased during the increase in flow to the reservoirs, but a second spike in SSCs followed the flow increase and resulted in SSCs exceeding the threshold of significance (i.e., 100 milligrams per liter [mg/L]) during a period that otherwise would not have occurred under typical Klamath River flow conditions. Additionally, the flow increase produced minimal to no benefit in reducing SSCs during subsequent flow increases (e.g., spring storm events) and the duration SSCs exceeded the threshold of significance (i.e., 100 mg/L) slightly increased in the spring. In the other three modeled scenarios, the increase in Klamath River flow also had minimal to no benefit in reducing SSCs (Stillwater Sciences 2008). As such, a flushing flow during reservoir drawdown using water from Upper Klamath Lake would potentially increase the amount of reservoir sediments transported during drawdown, but it was not evaluated as an alternative or adopted as a potential mitigation measure to reduce the potential impacts to SSCs and fish exposure to high SSCs due to the infeasibility of such action, and to the potential for flushing flows to increase the duration SSCs exceed the threshold of significance (i.e., 100 mg/L) or to generate a minimal to negligible decrease in SSCs. Therefore, even if adjustments to flow releases from Upper Klamath Lake were feasible, modeling evidence does not indicate that this would reduce the potential impacts of the Proposed Project.

The issue raised in the comment does not introduce a feasible project alternative or mitigation measure considerably different from others previously analyzed that would clearly lessen the environmental impacts of the project (CEQA Guidelines Section 15088.5(a)(3)).

Comment TR18-7

The document does a good job in describing fish species and utilization under current and proposed conditions and impacts. We found a few minor inaccuracies in descriptions of the Pacific Lamprey life cycle where there was no mention of the "transformer" stage or metamorphosis from ammocoetes to adults. There an assumption that lamprey juvenile out migration occurs in the spring (like salmon smolts) when SSC would be high following reservoir drawdown. This may not be accurate because outmigration trapping in the Klamath during the fall months shows that seaward migration of juvenile "transformers" occurs during the late summer and fall months. Thus, the impact to lamprey may be over stated.

Response to Comment TR18-7
Volume I Section 3.3.2.1 *Aquatic Species – Environmental Setting – Aquatic Species – Fish – Anadromous Fish Species – Pacific Lamprey* has been modified to clarify the "transformer" stage; please refer to Volume III Attachment 1 Section 3.3.2.1 *Aquatic Species – Environmental Setting – Aquatic Species – Fish – Anadromous Fish Species – Pacific Lamprey* for the revision.

Please refer to revised Section 3.3 in Volume III Attachment 1, specifically, Table 3.3-8 for a summary of available data on outmigration timing of Pacific lamprey in the Klamath River Basin. Table 3.3-8 illustrates that juvenile outmigration does occur during late summer and fall months as explained by the commenter.

Comment TR18-8
Section 2.6.1 Water Conflicts Timeline Page 2-21. Despite being the topic of at least 3 feature films and receiving extensive national and international media coverage, there is no mention of the coalition of Tribes, fishermen, and conservationists that protested 3 Scottish Power Shareholder meetings in Scotland (2004-2006) follow by the disruption and protest of 3 Berkshire Hathaway Meetings in Omaha NE (2008-2010). These events were clearly more influential and significant than many of the other items included in the timeline. Additionally, despite being extensively covered by national and international media and being led in part by California Governors Schwarzenegger and Brown, there is no mention of the Klamath Hydroelectric Settlement Agreement and the Klamath Basin Restoration Agreement signed by over 40 parties in 2010. The Agreements were unprecedented in scale, scope, and bipartisan support for a Western water conflict resolution and although the agreements were not ratified by congress, they clearly led the current project under consideration.

Response to Comment TR18-8
The events described in the comment are noted and included in the record for consideration. The introduction to the timeline in Volume I Section 2.6.1 *Project Background – Water Conflicts in the Klamath River Basin* has been modified to further clarify that it is not intended to be a comprehensive history. Additionally, the title for Section 2.6.1 of the EIR has been revised for clarity in Volume III. Please refer to Volume III Attachment 1 Section 2.6.1 *Project Background – Water History* for this revision.

Please note that Volume I Section 2.6.3 *Proposed Project – Project Background – Klamath Settlement Agreements* (pages 2-23 to 2-24) discusses the Klamath Hydroelectric Settlement Agreement (KHSA) and the Klamath Basin Restoration Agreement (KBRA).

Comment TR18-9
Timeline should also include dates of dam construction and FERC license expiration.

Response to Comment TR18-9
The events described in the comment are noted and included in the record for consideration. The introduction to the timeline in Volume I Section 2.6.1 *Project Background – Water Conflicts in the Klamath River Basin* has been modified to further clarify that it is not intended to be a comprehensive history. Please also note that the title for Section 2.6.1 of the EIR has been revised for clarity in Volume III. Please refer to Volume III Attachment 1 Section 2.6.1 *Project Background – Water History in the Klamath River Basin* for the revisions.

Please note that the term of the Federal Energy Regulatory Commission (FERC) annual license is included in Volume I Section 2.6.2 *Proposed Project – Project Background – Relationship with Klamath Hydroelectric Project* (page 2-22). The dam construction dates are provided at the beginning of each of the facility-specific sections: Volume I Section 2.3.1 *Proposed Project – Existing Lower Klamath Project Features – J.C. Boyle Dam and Associated Facilities* (page 2-8), Volume I Section 2.3.2 *Proposed Project – Existing Lower Klamath Project Features – Copco No. 1 Dam and Associated Facilities* (page 2-11), Volume I Section 2.3.3 *Proposed Project – Existing Lower Klamath Project Features – Copco No. 2 Dam and Associated Facilities* (page 2-13), and Volume I Section 2.3.4 *Proposed Project – Existing Lower Klamath Project Features – Iron Gate Dam and Associated Facilities* (page 2-13).

Comment TR18-10
The "Major fish die-off" of 2002 should be referred to directly as a "fish kill." The fish did not die of old age – they were killed by anthropogenic factors including operation of the Lower Klamath Project. The CDFG report referenced here is not included in the references at end of section. Although initial reports put the body count at 33,000, later reports included the one referenced here suggest the actual total was twice that amount.

Response to Comment TR18-10
The phrases "fish kill" and "fish die-off" are both used to describe the 2002 event in reports authored by responsible agencies referenced in this EIR, and both phrases are likewise used in this EIR. The primary reference for the 2002 fish kill (CDFG 2004) is included as a full reference in Section 3.3.6 *Aquatic Resources – References*.

Section 3.3.2.3 *Aquatic Resources – Habitat Attributes Expected to be Affected by the Proposed Project – Disease and Parasites* has been revised to clarify that the California Department of Fish and Game (CDFG) analysis indicates the total fish kill may have been twice the conservative estimate of 34,056. Please refer to Volume III Attachment 1 Section 3.3.2.3 *Aquatic Resources – Habitat Attributes Expected to be Affected by the Proposed Project – Disease and Parasites* for the revisions.

Comment TR18-11

Timeline should include that in 2006, in the first proceeding of its kind under recent amendments to the Federal Power Act, an Administrative Law Judge ruled that there was indeed suitable habitat upstream of Iron Gate Dam for anadromous fishes.

Response to Comment TR18-11

The events described in the comment are noted and included in the record for consideration. The introduction to the timeline in Volume I Section 2.6.1 *Proposed Project – Project Background – Water Conflicts in the Klamath River Basin* has been modified to further clarify that it is not intended to be a comprehensive history. Please also note that the title for Section 2.6.1 of the EIR has been revised for clarity in Volume III. Please refer to Volume III Attachment 1 Section 2.6.1 *Project Background – Water History in the Klamath River Basin* for the revisions.

Please note that the determinations of the dispute resolution proceeding are used as a reference in the EIR.

Comment TR18-12

2.6.4 Prior/Related Environmental Reviews Page 2-24. This section should note that the 2007 FERC EIS recommended relicensing with trap and haul; however, the fish agencies later filed mandatory terms and conditions pursuant to section 4e of the Federal Power Act mandating volitional fish passage. This mandate by the agencies was challenged in court by PacifiCorp who alleged there was no viable fish habitat upstream of the dams. In 2006, the Administrative Law Judge overseeing PacifiCorp's appeal of agency terms and conditions ruled that fish habitat does indeed exist above the dams and affirmed the agency mandates.

Response to Comment TR18-12

Volume I Section 2.6.4 *Proposed Project – Project Background – Prior/Related Environmental Reviews* is a summary of the environmental reviews conducted in relation to the Proposed Project, and it does not include details regarding the determinations of the 2006 Administrative Law Judge. Please refer to Section 4.1.1.1 *Alternatives – Alternatives Selection/Overview – Alternatives Selection – Alternatives Carried Forward for More Detailed Analysis – Continued Operation with Fish Passage Alternative* (pages 4-3 to 4-4). For information on the Continued Operations with Fish Passage Alternative that discusses its incorporation of the 2007 FERC staff Alternative along with the mandatory fish passage conditions required agencies. Additionally, please refer to the Volume I Section 4.4 *Continued Operations with Fish Passage Alternative* for evaluation of various fish passage options if the Lower Klamath Project continued to operation which includes trap and haul as well as volitional fish passage as required by mandatory conditions during relicensing of the Klamath Hydroelectric Project KHP).

Comment TR18-13

3.2.3 Significance Criteria Page 3-43 – The Significance Criteria includes water quality control plans for the Hoopa Valley Tribe and Yurok Tribe but not that of the Karuk Tribe. This exclusion of the Karuk Tribe continues throughout the section. The Karuk Tribe water quality control plan and our pending 'Treatment as a State' application to EPA are attached for inclusion.

Response to Comment TR18-13

The State Water Board notes the receipt of the Karuk Tribe's water quality control plan and has included it in the record.

Comment TR18-14

Section 3.3.2.1 Aquatic Species Page 3-194 The Karuk Tribe and the Salmon River Restoration Council recently submitted a petition to list Upper Klamath Trinity River Spring Chinook salmon the California Endangered Species List. (petition attached). On February 6, 2019 the California Fish and Game Commission voted unanimously to make Upper Klamath Trinity River Spring Chinook a candidate for listing while the petition undergoes a 12-month review. Table 3.3-1 should break out Upper Klamath Trinity River Spring Chinook from the more generic Chinook salmon category.

Response to Comment TR18-14

The Upper Klamath-Trinity River Spring-run Chinook salmon has been added to Section 3.3.1 *Aquatic Resources – Environmental Setting – Aquatic Species* Table 3.3-1. Please refer to Volume III Attachment 1 Section 3.3.1 *Aquatic Resources – Environmental Setting – Aquatic Species* for the revisions.

Comment TR18-15

Table 3.3-2 Misrepresents the population of wild Upper Klamath-Trinity Spring Chinook by including Trinity River spawners that are of hatchery origin. Wild Upper Klamath-Trinity Spring Chinook spawn almost exclusively in the Salmon River and South Fork Trinity Rivers and have averaged 786 individuals since 1981. See CDFW staff presentation on the petition to list Spring Chinook to the CA Fish and Game Commission on February 6, 2019 (https://videobookcase.com/california/fish-game-commission/february-6-2019-2/).

Response to Comment TR18-15

Section 3.3.1 *Aquatic Resources – Environmental Setting – Aquatic Species* Table 3.3-2 has been revised to clarify that California Department of Fish and Wildlife (CDFW) reports do not distinguish wild and hatchery origin for spring-run Chinook spawners, and that values are based on fish that returned to the hatchery. Please refer to Volume III Attachment 1 Section 3.3.1 *Aquatic Resources – Environmental Setting – Aquatic Species* for the revisions.

Comment TR18-16
Page 3-202 Refers to Salmon River Watershed Council – should be Salmon River Restoration Council.

Response to Comment TR18-16
Section 3.3.2.1 Aquatic Resources – Environmental Setting – Aquatic Species – Chinook Salmon has been revised to clarify the change from the Salmon River Watershed Council to the Salmon River Restoration Council. Please refer to Volume III Attachment Section 3.3.2.1 Aquatic Resources – Environmental Setting – Aquatic Species –Chinook Salmon for the revisions.

Comment TR18-17
Page 3-204 Should refer to Prince et al. 2017 and Thompson et al. 2018 for a more robust discussion of the status of Upper Klamath-Trinity River Spring Chinook population (attached). Thompson et al. 2018 includes physical evidence of the presence of Upper Klamath-Trinity River Spring Chinook above the dams.

Response to Comment TR18-17
Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Resources – Spring-Run Chinook Salmon* has been revised to clarify genetic information as requested. Please refer to Volume III Attachment 1 Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Resources – Spring-Run Chinook Salmon* for the revisions.

Comment TR18-18
Section 3.12.2.1 Tribal Cultural Chronology and Ethnology P3-794 The Karuk Tribe opposes mention of Ruffey Rancheria as representing the Shasta People. The founder and namesake of the Ruffey Rancheria, Old Man Ruffey, as well as the final distributees of the Rancheria, were all Karuk Indians. The present-day descendants of Old Man Ruffey and the final distributees who qualify by blood quantum are enrolled with the Karuk Tribe. A subgroup of Shasta People recently tried to use the terminated Ruffey Rancheria to congressionally establish their own Tribe. The Karuk Tribe's challenge to this group's claim to the Ruffey Rancheria effectively killed this effort. This EIR is an inappropriate venue to re-litigate the issue therefore mention of Ruffey Rancheria should be dismissed from the document or else Karuk's communications to congress should be included herein (attached).

Response to Comment TR18-18
Section 3.12.2.1 *Historical Resources and Tribal Cultural Resources – Environmental Setting – Tribal Cultural Chronology and Ethnography (including Historic and Pre-Historic Periods) – Northern Interior California Culture Area – Ethnography – Shasta People* has been clarified to remove the phrase referencing the Ruffey Rancheria. Please refer to Volume III Attachment 1 Section 3.12.2.1 *Historical Resources and Tribal Cultural Resources – Environmental Setting – Tribal Cultural Chronology and Ethnography (including*

Historic and Pre-Historic Periods) – Northern Interior California Culture Area – Ethnography – Shasta People for the revisions.

Comment TR18-19

P3-797 1979 was not the date when the Karuk Tribe became federally recognized. In that year, the Karuk Tribe re-established a government to government relationship with the United States.

The Karuk Tribe does not view Bright (1978) as a particularly good source to describe our ethnography. Attached is an ethnographic report we developed with a detailed bibliography. We also refer you to consider the ethnographic section of the 2012 Klamath Facilities Removal EIS/EIR as a reasonable attempt to describe Karuk Ethnography. See https://klamathrestoration.gov/sites/klamathrestoration.gov/files/Additonal%20Files%20/1/Chapter%203 %20-%20Affected%20Environment_Environmental%20Consequences.pdf

Response to Comment TR18-19

Section 3.12.2.1 *Historical Resources and Tribal Cultural Resources – Environmental Setting – Tribal Cultural Chronology and Ethnography – Northwest California Culture Area – Ethnography – Karuk* has been revised to clarify that in 1979 the Karuk Tribe re-established a government to government relationship with the United States. Please refer to Volume III Attachment 1 Section 3.12.2.1 *Historical Resources and Tribal Cultural Resources – Environmental Setting – Tribal Cultural Chronology and Ethnography – Northwest California Culture Area – Ethnography – Karuk* for the revisions.

Please note that the 2012 KHSA EIS/EIR was used as a source of information for developing Section 3.12.2.1 *Historical Resources and Tribal Cultural Resources – Environmental Setting – Tribal Cultural Chronology and Ethnography (including Historic and Pre-Historic Periods)*. The Bright (1978) citations referenced in this comment are carried over from the Karuk ethnography sections of the 2012 KHSA EIS/EIR. Additionally, the State Water Board appreciates that the Karuk Tribe has provided the Salter and Tucker (2010) summary of history and ethnography, thus including the associated information in the record for the Lower Klamath Project EIR.

Comment TR18-20

Section 3.12.2.2 Historic Period P3-803 The description of the 'Historic Period' is highly sanitized and offensive. Although there is reference to the growth of Euro American settlers, the document fails to mention the magnitude of the genocide waged against Indian People by those settlers. We refer you to Madley's An American Genocide: The United States and the California Indian Catastrophe, 1846-1873, or Lindsay's Murder State: California's Native American Genocide, 1846-1873.

The description of the Klamath Hydroelectric Project and the "significant role" it played in the area's economic development should also include the role it played in destroying the area's robust eco-tourism. Similarly, it should describe the preferential power rate that the California/Oregon Power Company was required to provide the Klamath Irrigation Project with was terminated in 2006.

Response to Comment TR18-20
Section 3.12.2.2 *Historical Resources and Tribal Cultural Resources – Environmental Setting – Tribal Cultural Chronology and Ethnography (including Historic and Pre-Historic Periods)* has revised to clarify that the development of the Klamath Hydroelectric Project (KHP) played a significant role that was both positive and negative in the area's development. Please refer to Volume III Attachment I Section 3.12.2.2 *Historical Resources and Tribal Cultural Resources – Environmental Setting* – Tribal Cultural Chronology and Ethnography (including Historic and Pre-Historic Periods) for the revision.

Comment TR18-21
P3-812 Klamath Cultural Riverscape The Board correctly includes a discussion of the Klamath Cultural Riverscape which provides important context for the document.

Response to Comment TR18-21
Comment noted.

Comment TR18-22
Section 3.12.5.1 Potential Impacts to Tribal Cultural Resources

Page 3-818 Mitigation Measure TCR-1 Develop and Implement a Tribal Cultural Resources Management Plan

The Karuk Tribe strongly supports this measure.

Response to Comment TR18-22
Comment noted.

Comment TR18-23
Mitigation Measure TCR-2 − Develop and Implement a Looting and Vandalism Prevention Program. The Karuk Tribe strongly supports this measure.

Response to Comment TR18-23
Comment noted.

Comment TR18-24
Mitigation Measure TCR-3 − Develop and Implement Inadvertent Discovery Plan (IDP) The Karuk Tribe strongly supports this measure.

Response to Comment TR18-24
Comment noted.

Comment TR18-25
Mitigation Measure TCR-4 − Endowment for Post-Project Implementation The Karuk Tribe asserts that the construction and operation of the Klamath Hydroelectric Project has had devastating impacts on Traditional Cultural Resources (TCRs) of every Tribe in the Klamath Basin. An endowment to protect and enhance TCRs should not be limited to the TCR's in the project area, but to all TCRs impacted by the construction and/or operation and/or removal of the dams.

Response to Comment TR18-25
CEQA requires that the lead agency analyze a proposed project's impacts to California environmental resources. Impacts of the proposed project are determined by comparing the actions of the proposed project to the existing environmental conditions which are usually established at the time CEQA was initiated. If there is a potentially significant impact compared to the baseline condition, then the EIR evaluates mitigation measures.
Mitigating for legacy impacts associated with prior project approvals and existing conditions (that together constitute the baseline) is not appropriate for this CEQA process.

Comment TR18-26
Mitigation Measure TCR-6 − Land Transfer Page 3-841 The Karuk Tribe tentatively agrees with the Board's interpretation of the KHSA Section 7.6.4. However, given the Board's acknowledgement that "The process for determining future land uses under KHSA Section 7.6.4 has not advanced to the point at which competing uses, financial limitations, parcel access requirements, or other constraints have become clear," and "it is too early in the process to determine the feasibility of such [a land] transfer" we see TCR-6 as overly specific and inappropriate to include as a mitigation measure.

Response to Comment TR18-26
During development of the Draft EIR, the State Water Board conducted formal Assembly Bill 52 (AB 52) consultation with the Shasta Nation, Shasta Indian Nation, and Yurok Tribe. In consultation with the Shasta Indian Nation and the Klamath River Renewal Corporation (KRRC), it was agreed upon by all three parties, that an appropriate mitigation measure to reduce impacts to Native American Tribal Cultural Resources (TCRs) associated with implementation of the Proposed Project would include the potential for land transfer of Project lands to Native American Tribal entities, which is consistent with Section 7.6.4 of the Klamath Hydroelectric Settlement Agreement (KHSA).

Mitigation Measure TCR-7 is similarly consistent with Section 7.6.4 of the KHSA, and provides for consideration of a range of potential real property instruments in

the process for disposition of Parcel B Lands. Neither it nor any other measure in this section of the EIR commits the KRRC to transfer specific portions of lands to specific Native American entities, or to adopt conservation easements or other real property protections for any particular parcel. The process outlined in Section 7.6.5 of the KHSA provides for input from KHSA signatories and other potentially affected tribes on the ultimate disposition of Parcel B lands.

CEQA provides that real property mitigation measures should be considered and are available for mitigation for tribal cultural resources impacts (Public Resources Code section 21084.3). Further, CEQA provides for identification of mitigation measures in tribal consultation, and for inclusion of such measures in the EIR (Public Resources Code sections 21080.3.2, 21082.3).

Comment TR18-27

Potential Impact 3.12-9 Klamath Cultural Riverscape Contributing Aspect – Combined effects on the Klamath River fishery of dam removal, changes in hatchery production, and increased habitat for salmonids and 3.3.2.3Habitat Attributes Expected to be Affected by the Proposed Project Page 3-247 Fish Hatcheries

These sections presume that the impact of hatcheries on Klamath basin fisheries is positive. The Karuk Tribe urges the Board to broaden the discussion and consider peer reviewed evidence to the contrary. Quinones et al. makes a compelling argument that Iron Gate Hatchery has served to reduce native wild Chinook salmon in the Klamath Basin. Furthermore, recent studies suggest that hatchery reared salmon suffer impaired survival rates due to epigenetic factors.

Response to Comment TR18-27

Volume III Attachment 1 Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Fish Hatcheries* includes an analysis of the effects of the Iron Gate Hatchery, including referencing research articles and studies specific to the Klamath River Basin. The analysis in the EIR includes consideration of research indicating potential positive and negative effects of hatcheries, including consideration of research consistent with Quinones et al. (2013) and the epigenetic study by Le Luyer et al. (2017), which have been included in the record. Consideration of the additional research referenced by commenter does not alter the analysis or conclusions reached by the EIR. Please also refer to responses to comments ORG34-14 and ORG42-9.

Comment TR18-28

Potential Impact 3.20-5 Changes to or loss of river conditions that support whitewater boating While it is true that dam removal will impact the current business model associated with commercial rafting the Hell's Corner reach, changes in river conditions and the restoration of the river channel will create new runs that may be commercially viable year-round. These new runs may

require a change in the business model (e.g. inflatable kayaks as opposed to guided 14-foot rafts or multi-day wilderness trips). In addition, the discussion here fails to highlight or mention how many of these 'user days' are marred by water quality impairments. This reach is commonly posted for blooms toxic blue green algae. This should be included in the discussion. The Karuk Tribe asserts that impacts to Hell's Corner are avoidable if the mitigation included assistance in re-writing existing business plans and you consider water quality improvements associated with dam removal.

Response to Comment TR18-28
State Water Board does not anticipate that consideration of the number of whitewater boating user days lost in the Hell's Corner Reach due to existing conditions water quality impairments would change the determination that the Proposed Project would result in the total loss of opportunity to raft Class IV+ rapids for three months during the late summer and early fall and this would be a significant and unavoidable impact. It is certainly possible that other recreational boating opportunities would become available under the Proposed Project; however, the degree to which this may happen is speculative and thus cannot be relied upon under CEQA for a significance determination.

Comment TR18-29
The only mitigation measure that we have questions about is the arsenic testing and remediation (WQ-3 - Monitoring and potential remediation of reservoir sediments deposited along the Middle and Lower Klamath River floodplain) (see specific comment below in 3.2.5.7)

The proposed water quality monitoring plan is inadequate. Our main concerns with the water quality monitoring plan here:

1) Add a site at Walker Bridge. There is a 60 mile gap in monitoring stations between Iron Gate Dam and Seiad Valley, and that reach of river will experience both the greatest short-term impacts and long-term changes following dam removal. A site should be added at Walker Bridge to address this concern. While it notes in the Definite Plan (Appendix B-Definite Plan Appendix M) that Walker Bridge site was dropped due to access issues, USGS staff have been working on securing a location for a Walker Bridge monitoring location.

Response to Comment TR18-29
Please refer to response to comment TR18-56 regarding Mitigation Measure WQ-3.

The commenter is expressing concerns that the Klamath River Renewal Corporation's (KRRC's) water quality monitoring plan, put forth in the Definite Plan, is inadequate. Additionally, the commenter asserts that the June 7, 2018, water quality monitoring and adaptive management plan required by the State Water Resources Control Board's draft water quality certification is also

inadequate. The commenter notes that it has provided comments on the State Water Resources Control Board's draft water quality certification.

The EIR analyzes the potential for environmental impacts due to implementation of the KRRC's Proposed Project and alternatives to the Proposed Project. The requests regarding monitoring and data collection are not raised in connection with concerns regarding the EIR's evaluation of potential environmental impacts of the Proposed Project, or mitigation for such impacts. The comment expresses general support for the EIR's impact analysis of fisheries impacts (please refer to comment TR18-5), and raises concerns regarding the EIR's water quality analysis with respect to only one mitigation measure regarding remediation for sediment deposits that is not a part of the water quality monitoring and data collection concerns.

Please note that the State Water Resources Control Board has made several revisions to its water quality monitoring and adaptive management plan that will be included in its final water quality certification, including in response to comments by the Karuk Tribe.

Please refer to Volume I Section 2.7.8.7 *Proposed Project – Proposed Project – Other Project Components – Water Quality Monitoring and Construction BMPs* (pages 2-97 to 2-99) for a general summary of the water quality monitoring included in the Definite Plan. Volume I Section 3.2.5 *Water Quality – Potential Impacts and Mitigation* provides a general discussion of the water quality monitoring with regards to the individual water quality parameters (see Potential Impact 3.2-1 for water temperature; Potential Impact 3.2-3 for suspended sediments; Potential Impact 3.2-7 for nutrients; Potential Impact 3.2-9 for dissolved oxygen; Potential Impact 3.2-11 for pH; Potential Impact 3.2-12 for chlorophyll-a and algal toxins; and, Potential Impact 3.2-14 for inorganic and organic contaminants). Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Comment TR18-30

Increase/adjust parameters collected for water quality monitoring. There is a substantial reduction in the number of stations and water quality parameters in the proposed water quality monitoring plan relative to the Klamath Hydroelectric Settlement Agreement (KHSA) Interim Measure 15 (IM15) monitoring program which has been collecting baseline data since 2009. Aside from the sonde and suspended sediment monitoring, the current monitoring plan only calls for total nitrogen, total phosphorous, and blue green algae speciation monthly. Monthly nutrient sampling should also include the other forms of nitrogen and phosphorous as well as dissolved carbon that are currently being collected as part of IM15. Total nitrogen and total phosphorous alone are not adequate in analyzing changes in nutrient loads from the proposed project. Phytoplankton speciation should be focused more in the seasonal growing period (May to October) rather than monthly throughout the year and should include not only

speciation of microcystin-producing algae but also concentrations of microcystin. Adding sites at state line (Shovel Creek) and Walker Bridge will allow for a more comprehensive analysis of water quality impacts by the project.

Response to Comment TR18-30
Please refer to response to comment TR18-29.

Comment TR18-31
Work with USGS and KRRC to ensure that enough event-based suspended sediment concentrations (SSC) samples will be collected. An adequate number of samples need to be collected to be able to combine with continuous turbidity and flow data to construct the sediment budgets that are necessary to understand the ultimate fate of reservoir sediments. Consider adding tributary sites as well (Shasta, Scott, Salmon, Trinity), particularly to aid in the development of the sediment budget.

Response to Comment TR18-31
Please refer to response to comment TR18-29.

Comment TR18-32
We would also suggest that monitoring should continue for at least five years post-drawdown. The massive scale of the proposed dam removal project merits a monitoring plan sufficiently detailed that it will adequately assess the results of the project. It is our understanding that the water quality monitoring plan is still in development, and that the SWRCB will have the final word on what needs to be included. Please ensure that the monitoring plan will provide enough information to determine if the actual effects of the dam removal matched the predictions, with the ancillary benefit of using this once-in-a-lifetime opportunity to provide crucial information needed to guide long-term river management.

Response to Comment TR18-32
Please refer to response to comment TR18- 29.

Comment TR18-33
The Comments on Specific Details section below is organized by section and page number. It provides suggested edits to improve the EIR's technical accuracy.

Response to Comment TR18-33
Comment noted.

Comment TR18-34
Similar text is often repeated on multiple pages within the DEIR. In general, our comments here specifically reference only one page (or section) but are intended to apply to multiple pages/sections if the text we reference also appears elsewhere in the DEIR.

Response to Comment TR18-34
Comment noted.

Comment TR18-35
2.7.8.7 Water Quality Monitoring and Construction BMPs

USGS did not collect sediment samples in 2017 from the reservoirs. We suggest contacting Ben Swann of CDM Smith to see which consultants to KRRC collected the samples.

Response to Comment TR18-35
Section 2.7.8.7 *Proposed Project – Proposed Project – Other Project Components – Water Quality Monitoring and Construction BMPs* has been updated to clarify that the Klamath River Renewal Corporation (KRRC) collected reservoir sediment core samples from November 28, 2017 to December 1, 2017. Please refer to Volume III Attachment 1 Section 2.7.8.7 *Proposed Project – Proposed Project – Other Project Components – Water Quality Monitoring and Construction BMPs* for the revisions.

Comment TR18-36
Please improve the water quality monitoring plan with suggestions listed above.

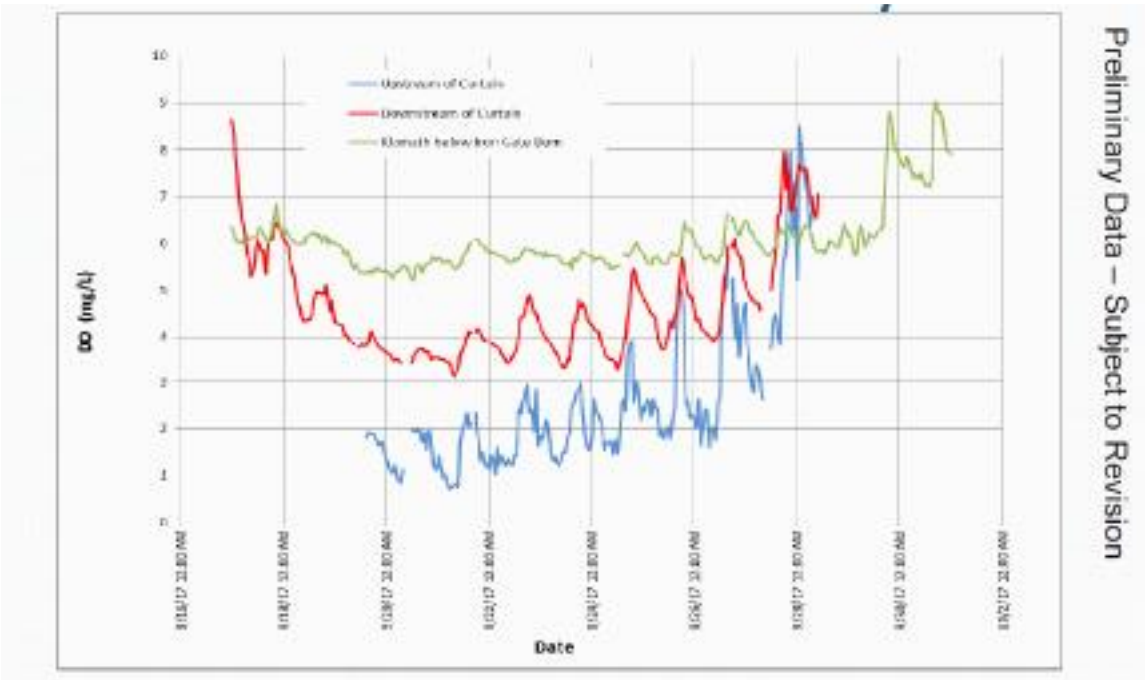
Response to Comment TR18-36
Please refer to response to comment TR18-29.

Comment TR18-37
Page 3-22: "The relatively shallow depth and short hydraulic residence times do not support thermal stratification in J.C. Boyle Reservoir (FERC 2007; Raymond 2008a, 2009a, 2010a) and thus this reservoir does not directly alter summertime water temperatures in further downstream reaches (NRC 2004)." We recommend adding ", other than reducing the magnitude of diel (i.e., 24-hour cycle) fluctuations" to the end of the sentence.

Response to Comment TR18-37
J.C. Boyle Reservoir itself does not alter the magnitude of the diel water temperature fluctuations in the J.C. Boyle Bypass Reach downstream of the dam. The magnitude of diel water temperatures is reduced due to bypass operations from J.C. Boyle Dam that reduce the relative proportion of flow in the river from upstream and increase the relative proportion of flow from groundwater springs in the J.C. Boyle Bypass Reach. Section 3.2.2.2 *Water Quality – Environmental Setting – Water Temperature* has been revised to clarify the influence of bypass operations on water temperatures in the J.C. Boyle Bypass Reach based on the comment recommendation. Please refer to Volume III Section 3.2.2.2 *Water Quality – Environmental Setting – Water Temperature* for these revisions.

Comment TR18-38

Page 3-23 (and also applicable to many other section of the DEIR): We recommend that any text discussing the effects of the Iron Gate Reservoir curtain should also note that during intense algae blooms the curtain has the detrimental side-effect of reducing dissolved oxygen concentrations in water released downstream. Operationally, this means that the curtain must be raised during intense blooms to avoid reducing dissolved oxygen downstream, which limits the curtain's usefulness for reducing algae. The preliminary data in the following slide from PacifiCorp's October 16, 2017 presentation to the Interim Measures Implementation Committee (there is not yet a draft report that includes these data) shows low dissolved oxygen values in late September 2017 downstream of the curtain (red line) and below Iron Gate Dam (green line):



Response to Comment TR18-38

The preliminary dissolved oxygen data from PacifiCorp's October 16, 2017 presentation to the Interim Measures (IMs) Implementation Committee that is provided in the comment is too limited to draw broad conclusions about the influence of the Iron Gate Reservoir powerhouse intake curtain on dissolved oxygen conditions downstream of Iron Gate Dam. However, in its 2018 report, PacifiCorp acknowledges that it had to raise the curtain several times after the curtain was deployed to access water with higher dissolved oxygen concentrations and comply with water quality standards, potentially limiting the effectiveness of the curtain to reduce transport of cyanobacteria into the Klamath River downstream of Iron Gate Dam (PacifiCorp 2018a). Section 3.2.2.2 *Water Quality – Existing Conditions – Water Temperature* and other water quality sections discussing the powerhouse intake curtain have been clarified to

acknowledge that the potential beneficial effects of the intake curtain on algae and water temperature in the Klamath River downstream of Iron Gate Dam may be reduced when the curtain is raised in response to low dissolved oxygen concentrations. Please refer to Volume III Attachment 1 Section 3.2.2.2 *Water Quality – Existing Conditions – Water Temperature*, Section 3.2.2.7 *Water Quality – Existing Conditions – Chlorophyll-a and Algal Toxins*, Section 4.2.2 *No Project Alternative – Water Quality – Water Temperature*, Section 4.2.2 *No Project Alternative – Water Quality – Chlorophyll-a and Algal Toxins,* Section 4.4.2.1 *Continued Operations with Fish Passage Alternative – Water Quality – Water Temperature*, Section 4.4.2.2 *Continued Operations with Fish Passage Alternative – Water Quality – Suspended Sediments*, Section 4.4.2.4 *Continued Operations with Fish Passage Alternative – Water Quality – Dissolved Oxygen, and Section 4.4.2.6 Continued Operations with Fish Passage Alternative – Water Quality – Chlorophyll-a and Algal Toxins* these revisions.

Comment TR18-39

Page 3-24 "Species present in the Klamath River capable of producing microcystin include Microcystis aeruginosa and Anabaena flos-aquae, while species present in the Klamath River in the genus Anabaena can produce anatoxin-a and saxitoxin." Other species capable of producing microcystin have been detected in the Klamath River as well (even though they never dominate). These are Gloeotrichia and Planktothrix/Oscillatoria (Genzoli and Kann 2017, E&S Environmental Chemistry, Inc. 2018, Asarian and Kann 2006). Additional potentially toxin producing genera found in the Klamath River and/or reservoirs include Limnothrix (E&S Environmental Chemistry, Inc. 2018) and Pseudanabaena (Genzoli and Kann 2017).

Response to Comment TR18-39

Please note that the sentence quoted in the comment and attributed to page 3-24 is actually found on page 3-34.

Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* has been revised to clarify using language similar to that requested in the comment. Please refer to Volume III Attachment 1 Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* for the revisions.

Comment TR18-40

Page 3-26 "However, in the summer months, organic suspended materials can increase in the Klamath River between Iron Gate Dam and Seiad Valley (RM 132.7) due to the transport of in-reservoir algal blooms to downstream reaches of Klamath River as well as resuspension of previously settled organic materials (YTEP 2005; Sinnott 2008; Armstrong and Ward 2008; Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016). Further downstream, near the confluence with the Scott River (RM 145.1) concentrations of organic suspended materials tend to decrease with distance as phytoplankton gradually settle out of the water column farther downstream or are diluted by

tributary inputs (see Appendix C for more detail)." The Scott River is downstream of Seiad Valley, so it is potentially confusing to use the term "further downstream" here.

Response to Comment TR18-40
Section 3.2.2.3 Water Quality – Environmental Setting – Suspended Sediments has been revised to clarify the location near the Scott River confluence. Please refer to Volume III Attachment 1 Section 3.2.2.3 Water Quality – Environmental Setting – Suspended Sediments for the revision.

Comment TR18-41
Page 3-28: The sentence "TP and TN concentrations in the Klamath River vary with flow, with the highest concentrations tending to occur during low flow years (e.g., 2001-2004) and the lowest concentrations tending to occur during high flow years (e.g., 2006, 2010, 2011) (Asarian and Kann 2013)" should be revised to note that it pertains only to the low-flow season (summer and early fall). TP can be very high during peak winter and spring flows due to suspended sediment.

Response to Comment TR18-41
Section 3.2.2.4 *Water Quality – Environmental Setting – Nutrients* has been revised to clarify that the statement pertains to summer through early fall. Please refer to Volume III Attachment 1 Section 3.2.2.4 *Water Quality – Environmental Setting – Nutrients* for the revisions.

Comment TR18-42
Page 3-34: The sentence previous to this one "Diatoms (i.e., unicellular, photosynthetic microalgae) typically dominate in spring then decrease due to zooplankton grazing and the onset of water column stratification, which results in the diatoms settling out of the water column below the lake or reservoir surface layer (epilimnion)." refers to longitudinal trends including those for the riverine reaches, but this quoted sentence focuses on lentic (i.e., non-flowing) waters only- it should be revised to note that, since the dynamics do not apply to free-flowing river reaches.

Response to Comment TR18-42
Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* has been revised to clarify when the results being discussed are related to river or lake/reservoir conditions. Please refer to Volume III Attachment 1 Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* for the revisions.

Comment TR18-43
Page 3-36: "Phycocyanin, a pigment produced by blue-green algae, has been collected between May and November at some monitoring sites in the Klamath River downstream of Iron Gate Dam since 2007. At Seiad Valley (RM 132.7), phycocyanin is typically low from May through early August, increases to a peak

in early September, and decreases until reaching low levels again by the end of October (Asarian and Kann 2013). Phycocyanin concentrations generally coincide with chlorophyll-a concentrations for the portion of the Klamath River at Seiad Valley." We recommend that these sentences should be revised/replaced. Genzoli and Kann (2016) has a much more comprehensive analysis of Klamath River phycocyanin data than Asarian and Kann (2013). In addition, phycocyanin is measured by continuous probes, so it would be more accurate to say "measured" rather than "collected".

Response to Comment TR18-43
Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* has been revised to clarify phycocyanin data in the Klamath River according to the comment. Please refer to Volume III Attachment 1 Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* for the revisions.

Comment TR18-44
Page 3-37 The text citing the Otten et al. (2015) study should also be revised to briefly mention the genetic evidence for Iron Gate Reservoir being the source for Microcystis in the lower Klamath River. This genetic evidence is mentioned in section 3.4 Phytoplankton and Periphyton. Otten et al. (2015) document with genetic analysis that algal production in Iron Gate Reservoir is the principal source of Microcystis aeruginosa responsible for the observed public health exceedances occurring in the Klamath River downstream from Iron Gate Dam.

Response to Comment TR18-44
Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* been revised to clarify that the genetic analysis of *Microcystis aeruginosa* populations included Copco No. 1, Iron Gate Reservoir, and Klamath River sites and *Microcystis aeruginosa* populations in Iron Gate Reservoir likely contribute to *Microcystis aeruginosa* public health exceedances in the Klamath River below Iron Gate Reservoir. Please refer to Volume III Attachment 1 Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* for the revisions.

Comment TR18-45
Page 3-37: Genzoli and Kann (2017) serves as a recent compilation of Microcystis and microcystin trends in the middle Klamath River, including diel, seasonal and longitudinal trends. Although this document is covered elsewhere (e.g., page 3-403; 3-414; 3-417, 3-431) it would be useful to cite here as well.

Response to Comment TR18-45
Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* has been clarified as requested. Please refer to EIR Volume III Attachment 1 Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* for the revisions.

Comment TR18-46

Page 3-38 contains the following paragraph regarding anatoxin-a:

"Anatoxin-a produced by the genus Anabaena of blue-green algae species was detected in Iron Gate Reservoir on September 3, 2005, in testing by the California Department of Health Services (Kann 2007a; Kann 2008b). In additional, monitoring conducted for the Karuk Tribe during 2005, 2006, 2007, 2008 in Copco No. 1 or Iron Gate reservoirs found no anatoxin-a detected (Kann and Corum 2006, 2007, 2009; Kann 2007b). At Lower Klamath River monitoring sites, anatoxin-a was not detected above the reporting limit in water samples collected during 2008 and 2009 (Fetcho 2009, 2011). In recent years, anatoxin-a has been measured in the Klamath River downstream of Iron Gate Reservoir on several occasions, typically in the lower reaches including at monitoring sites near Weitchpec and Orleans (Otten 2017). While concentrations of Anabaena flos-aquae cells have continued to be monitored, anatoxin-a concentrations are not available for Lower Klamath Project reservoir and Klamath River sites in recent years."

We recommend that this paragraph be updated to reflect more recent Klamath River data, the uncertainty in the sources of anatoxin, and the potential contribution of benthic sources (i.e. periphyton) in anatoxin-a production. The issue of potential benthic contributions to anatoxin-a production also applies to several other places within the DEIR. In our opinion, potential benthic production of anatoxin would not change any of the effects determinations in DEIR but should probably be included for the sake of completeness. Here is a replacement paragraph to consider using in place of the paragraph quoted above:

"Anatoxin-a has been detected in the Klamath River system, although the timing, distribution, and sources of anatoxin-a production in the Klamath is not well understood. Cyanobacterial species from a number of genera are capable of producing anatoxin-a, including Dolichospermum (planktonic species previously considered part of the genus Anabaena are now called Dolichospermum), Anabaena (previously included planktonic and benthic species whereas it is now only benthic species), Aphanizomenon, Cylindrospermopsis, Planktothrix (Oscillatoria), and Phormidium (Chorus and Bartram 1999, Quiblier et al. 2013, U.S. EPA 2014, Bouma-Gregson et al. 2018). Although toxin-producing phytoplankton are more well studied, periphyton can also produce toxins including anatoxin-a (Heath et al. 2011, Quiblier et al. 2013). In many California rivers and streams not impounded by dams, periphyton are assumed to be the primary sources Anatoxin-a (Fetscher et al. 2015), including species in genus Anabaena and Phormidium in tributaries of the Eel River located south of the Klamath River (Asarian and Higgins 2018, Bouma-Gregson et al. 2018). Anatoxin-a was detected in Iron Gate Reservoir on September 3, 2005, in testing by the California Department of Health Services (Kann 2007a; Kann 2008b),

while monitoring conducted for the Karuk Tribe during 2005-2008 in Copco No. 1 and Iron Gate reservoirs did not detect anatoxin-a (Kann and Corum 2006, 2007, 2009; Kann 2007b). At Lower Klamath River monitoring sites, anatoxin-a was not detected in water samples collected during 2008 and 2009 (Fetcho 2009, 2011). In more recent years (2010, 2015, 2016), anatoxin-a was detected in the Klamath River from sites directly below Iron Gate Dam to the Klamath River Estuary (unpublished data from the Yurok and Karuk Tribes). Genetic tools that detect the presence of an anatoxin-a synthase gene came back positive for 19.5% of 123 samples from throughout the Klamath River system, although how the presence of the synthase gene relates to toxin concentrations is still unknown (Otten 2017). The detection of anatoxin-a over many years suggest that anatoxin-a poses a persistent public health threat for the Klamath River, yet the timing, spatial scale, and sources of the toxin are poorly understood due to limited monitoring for anatoxin-a."

Response to Comment TR18-46

Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* has been revised to clarify the discussion of uncertainty for anatoxin-a distribution and sources and which cyanobacteria species are capable of producing anatoxin-a. Please refer to Volume III Attachment 1 Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* for the revisions.

Comment TR18-47

Page 3-54: Table 3.2-7 lists the Hoopa Valley Tribe's water quality objectives that are to be used (along with the applicable objectives from the NCRWQCB and Yurok Tribe) to evaluate thresholds of significance for water quality impacts. The table has a footnote that:

'HVTEPA (2008) includes a natural conditions clause which states, "If dissolved oxygen standards are not achievable due to natural conditions, then the COLD and SPAWN standard shall instead be dissolved oxygen concentrations equivalent to 90% saturation under natural receiving water temperatures." USEPA has approved the Hoopa Valley Tribe definition of natural conditions; the provision that site-specific criteria can be set equal to natural conditions and the procedure for defining natural conditions have not been finalized as of December 2018.'

There is also a second similar footnote regarding total nitrogen and total phosphorus. While not strictly wrong, those footnotes are incomplete because they do not mention that until the Tribe establishes the procedure for defining natural conditions, and EPA approves that procedure, the natural conditions do not have any legal weight. The exact wording in EPA's Feb 14, 2008 approval letter was: "with the understanding that unless and until the Hoopa Valley Tribe completes the process of establishing Natural Condition reference conditions, the stated numerical criteria... will constitute the operative criteria for all purposes."

Therefore, we recommend that "USEPA has approved the Hoopa Valley Tribe definition of natural conditions; the provision that site-specific criteria can be set equal to natural conditions and the procedure for defining natural conditions have not been finalized as of December 2018" be replaced with "USEPA has approved the Hoopa Valley Tribe definition of natural conditions with the understanding that unless and until the Hoopa Valley Tribe completes the process of establishing Natural Condition reference conditions, the stated numerical criteria will constitute the operative criteria for all purposes."

Response to Comment TR18-47
Section 3.2.3.1 *Water Quality – Significance Criteria – Thresholds of Significance* Table 3.2-7 has been revised to include reference that United States Environmental Protection Agency (USEPA) has approved the Hoopa Valley Tribe definition of natural condition with the understanding that unless and until the Hoopa Valley Tribe completes the process of establishing the "natural conditions" reference condition, the stated numerical criteria will constitute the operative criteria for all purposes. Please refer to Volume III Attachment 1 Section 3.2.3.1 *Water Quality – Significance Criteria – Thresholds of Significance* Table 3.2-7 for the revisions.

Comment TR18-48
Page 3-59 and page 3-60: The overall approach for assessing the significant of impacts for nutrients makes sense, but we are unclear on why this section mentions the TMDL targets for Total Nitrogen (TN) and Total Phosphorus (TP) but not the Hoopa Valley Tribe's objectives for TN and TP?

Response to Comment TR18-48
Section 3.2.3.1 *Water Quality – Significance Criteria – Thresholds of Significance – Nutrients* has been revised to clarify a refence to Hoopa Valley Tribe Total Phosphorus (TP) and Total Nitrogen (TN) numeric targets. Please refer to Volume III Attachment 1 Section 3.2.3.1 *Water Quality – Significance Criteria – Thresholds of Significance – Nutrients* for the revisions.

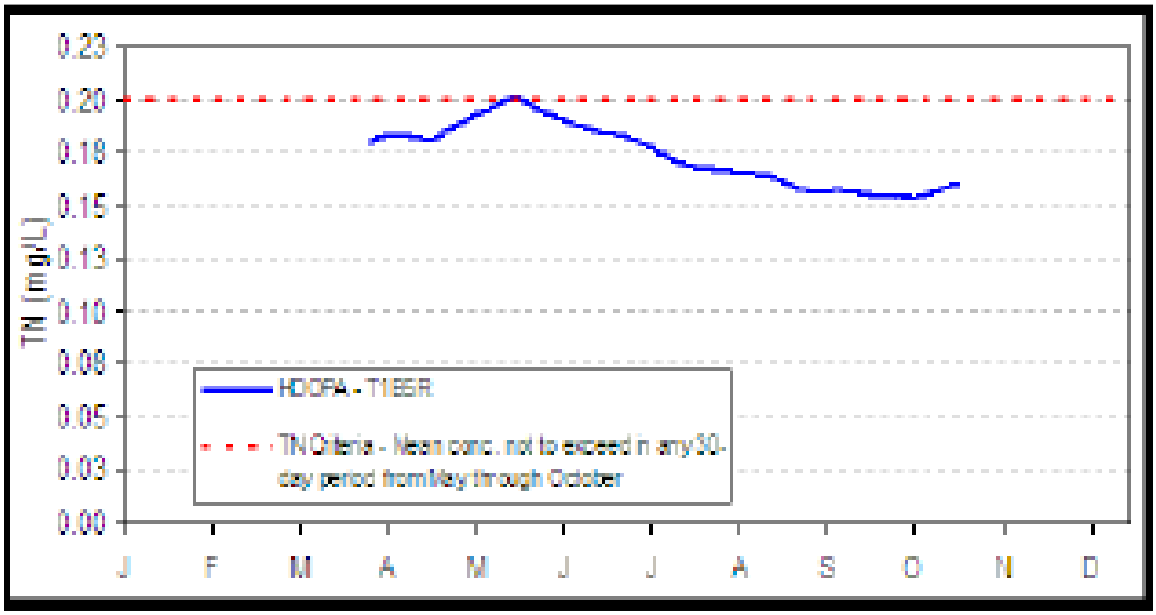
Please note, the minor clarifications raised by the comment do not change an environmental impact or mitigation measure analyzed in the EIR because the Hoopa Valley Tribe numeric TP and TN surface-water quality objectives already had been used in the Section 3.2.5.3 *Water Quality – Potential Impacts and Mitigation – Nutrients* Potential Impact 3.2-8 analysis. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Comment TR18-49
Page 3-117 includes the following sentence:

"Klamath River TMDL model results indicate that while resulting TP levels would meet the existing Hoopa Valley Tribe numeric water quality objective (0.035 mg/L TP) in all months at the Hoopa reach (approximately RM 45) of the Klamath

River, TN levels would continue to be in excess of the existing objective (0.2 mg/L TN) in all months, as would TN levels for the modeled 'natural conditions' (T1BSR) and the modeled 'dams-in' scenario (T4BSRN) (for the months of October through June) (North Coast Regional Board 2010)."

The second half of this sentence is incorrect, so we recommend that it be revised. The TN concentrations predicted in the final version of the 'natural conditions' (T1BSR) scenario exceeded the Hoopa Valley Tribe's criteria only for a few days in May, not 'in all months'. In addition, the magnitude of the exceedance is so small that it can reasonably be considered de minimis, as shown in the following figure from the North Coast Regional Board (2010):



The incorrect statement on TN exceedances may be a result of outdated information. Initial versions of the 'natural conditions' (T1BSR) scenario did indicate substantive exceedances of the Hoopa Valley Tribe's TN objective; however, these exceedances were caused by unrealistically high TN concentrations assigned to tributaries. Once these tributary concentrations were corrected to more closely represent available data, the exceedances essentially disappeared in the final official version of the model (i.e., see figure above).

Response to Comment TR18-49

Section 3.2.5.3 *Water Quality – Potential Impacts and Mitigation – Nutrients* Potential Impact 3.2-8 has been revised to clarify the Hoopa Valley Tribe numeric water quality Total Nitrogen (TN) objective exceedance information for Total Maximum Daily Load (TMDL) model results. Please refer to Volume III Attachment 1 Section 3.2.5.3 *Water Quality – Potential Impacts and Mitigation – Nutrients* Potential Impact 3.2-8 for the revisions.

Comment TR18-50

Page 3-117 "While there would be a slight increase in absolute nutrient concentrations entering the Middle Klamath River under the Proposed Project, phytoplankton, especially blue-green algae, would be limited in their ability to use those nutrients for growth and reproduction without calm reservoir habitat (Potential Impact 3.4-2)." We recognize that word choices are subjective, but "slight" is probably not the most accurate word to describe the expected increase, unless it is specifically in reference to annual time scales, not seasonal time scales. As noted on page 3-116, the increases in TN for the July through September period are expected to be in the range of 48-55%. We suggest replacing "a slight increase" with "an increase".

Response to Comment TR18-50

Section 3.2.5.3 *Water Quality – Potential Impacts and Mitigation – Nutrients* Potential Impact 3.2-8 has been clarified as requested. Please refer to Volume III Attachment 1 Section 3.2.5.3 *Water Quality – Potential Impacts and Mitigation – Nutrients* Potential Impact 3.2-8 for the revisions.

Comment TR18-51

Page 3-118: "In general, although dam removal would result in a slight long-term increase in TP and TN away from the numeric targets, such an increase would not support the growth of nuisance and/or noxious phytoplankton or nuisance periphyton." Similar to our previous comment above regarding page 3-117, it would be more accurate to replace "a slight long-term increase in TP and TN" with "a long-term increase in TP and TN" or "a slight long-term increase in annual TP and TN".

Response to Comment TR18-51

Section 3.2.5.3 *Water Quality – Potential Impacts and Mitigation – Nutrients* Potential Impact 3.2-8 has been clarified as requested. Please refer to Volume III Attachment 1 Section 3.2.5.3 *Water Quality – Potential Impacts and Mitigation – Nutrients* Potential Impact 3.2-8 for the revisions.

Comment TR18-52

Page 3-135: "…monitoring data at multiple locations further downstream in the Middle and Lower Klamath River indicate that pH patterns over a 24-hour period are driven primarily by photosynthesis and respiration of periphyton (Ward and Armstrong 2010; Asarian et al. 2015; see Section 3.4.2.2 Periphyton) rather than phytoplankton." A direct quantification of the relative contributions to primary production in the Middle Klamath River is provided by Genzoli and Hall (2016). Even though Genzoli and Hall's (2016) analysis did not specifically evaluate pH, we recommend that it should still be cited here.

Response to Comment TR18-52

The reference provided in the comment (i.e., Genzoli and Hall 2016) supports the premise of Section 3.2.5.5 *Water Quality – Potential Impacts and Mitigation – pH*

Potential Impact 3.2-11 discussion and analysis, which is that, in the absence of a reservoir phytoplankton bloom that is subsequently transported into the Middle and Lower Klamath River, periphyton are relatively more important for influencing diel fluctuations in water quality conditions (e.g., dissolved oxygen and pH) compared to phytoplankton. As the EIR analysis is focused on pH changes in the river, while the reference provided in the comment focuses on primary productivity in grams oxygen per square meter per day (g $O_2/m^2/d$) rather than pH, the reference provided in the comment has not been added to the pH analysis. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Comment TR18-53

Page 3-136: "Since N-fixing species dominate the periphyton communities in the lower portions of the Middle Klamath River as well as the Lower Klamath River where inorganic nitrogen concentrations are low (Asarian et al. 2010, 2014, 2015), changes in nutrients due to dam removal are not expected to alter the periphyton community in these reaches (see Potential Impact 3.4-5)." The species composition of the periphyton community may well shift, but the biomass is not expected to increase substantially. We suggest that this end of this sentence be revised to "…are not expected to substantially alter total periphyton biomass in these reaches (see Potential Impact 3.4-5)."

Response to Comment TR18-53

Section 3.2.5.5 *Water Quality – Potential Impacts and Mitigation – pH* Potential Impact 3.2-11 has been revised to clarify that changes in the periphyton species composition under the Proposed Project would not significantly alter the total periphyton biomass in the Middle and Lower Klamath River. Please refer to Volume III Attachment 1 Section 3.2.5.5 *Water Quality – Potential Impacts and Mitigation – pH* Potential Impact 3.2-11 for the revisions.

Comment TR18-54

Page 3-137. While reservoir phytoplankton are by far the dominant source of algal toxins in the Klamath River, Section 3.2.5.6 Chlorophyll-a and Algal Toxins should probably also mention that river periphyton are capable of producing cyanotoxins including anatoxin-a. This would not change the effects determinations but should be mentioned for the sake of completeness. See comments regarding page 3-38 above for details.

Response to Comment TR18-54

Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* has been updated to note that cyanotoxins (including anatoxin-a) can be produced by riverine periphyton in addition to phytoplankton. Please refer to Volume III Attachment I Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* for these revisions.

Please note, while some periphyton species are capable of producing algal toxins, including microcystin and anatoxin-a (Heath et al. 2011; Quiblier et al. 2013; see Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins*), all available data indicate that algal toxin presence (i.e., microcystin and anatoxin-a) in the Klamath River corresponds to high concentrations of phytoplankton blue-green algae cells (i.e., algae blooms of *Microcystis aeruginosa* for microcystin or *Anabaena flos-aquae* for anatoxin-a) (Kann and Corum 2006, 2007, 2009; Kann 2006, 2007a,b,c,d, 2008b; Jacoby and Kann 2007; CH2M Hill 2008; Kann et al. 2010a; Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016; Otten et al. 2015). Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Clarifications based on this comment do not change effects determinations in Section 3.2 *Water Quality*.

Comment TR18-55

"While algal toxins and chlorophyll-a produced in Upper Klamath Lake may still be transported downstream after dam removal, existing data indicate that microcystin concentrations in the Klamath River decrease to below California water quality objectives (see Section 3.2.3.1 Thresholds of Significance) by the upstream end of J.C. Boyle Reservoir, regardless of the microcystin concentration measured leaving the Upper Klamath Lake (Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016)."

There have been high microcystin levels on occasion in JC Boyle at Topsy Campground. It is more correct to say that microcystin concentrations in the Klamath River decrease to below California water quality objectives downstream of JC Boyle. (e.g., E&S Environmental Chemistry, Inc. 2018). Then the following sentence is still correct: "Thus, algal toxins and chlorophyll-a production upstream of J.C. Boyle Dam would not be expected to be transported into California and result in algal toxin or chlorophyll-a concentrations in a manner that would cause or substantially exacerbate an exceedance of water quality standards or would result in a failure to maintain existing beneficial uses currently supported."

Response to Comment TR18-55

Section 3.2.5.6 *Water Quality – Potential Impacts and Mitigation – Chlorophyll-a and Algal Toxins* Potential Impact 3.2-12 (pages 3-137 to 3-139) has been revised to clarify that high microcystin levels have been detected in J.C. Boyle Reservoir at Topsy Campground and the potential for localized *Microcystis aeruginosa* growth and high microcystin concentrations in J.C. Boyle would be reduced under the Proposed Project. Please refer to Volume III Attachment 1 Section 3.2.5.6 *Water Quality – Potential Impacts and Mitigation – Chlorophyll-a and Algal Toxins* for the revisions.

Comment TR18-56

Page 3-150: Mitigation Measure WQ-3 (Monitoring and potential remediation of reservoir sediments deposited along the Middle and Lower Klamath River floodplain) proposes that following dam removal, floodplain deposits in areas with agricultural and residential land use should be tested for arsenic and then remediated (removal or soil capping) if arsenic levels exceed background levels found in adjacent soils and USEPA or CalEPA human health residential screening levels. According to information presented on page 3-142 of the DEIR, soils in the Klamath Basin have naturally high arsenic levels, and arsenic levels in samples from reservoir sediments were within those natural ranges. Remediating arsenic-rich soils along the river corridor could be quite expensive and is not a decision to be taken lightly. Floodplains are naturally dynamic environments and healthy floodplains experience both sediment deposition and erosion. Floodplain soils are heterogeneous with deposits of varying ages and source compositions. Basing the decision about whether to remediate a particular reservoir-derived sediment deposit on a comparison to arsenic levels in adjacent soils seems subject to a high degree of uncertainty and luck of the draw (e.g. what particular portion of reservoir sediment ended up settling on top of what particular floodplain deposit). How will decisions be made about the definition "exceed" (e.g., does that mean that the average has to be 0.1% higher, or some greater threshold? What if any statistical tests will be used?) And how many samples will need to be collected and over what geographic area? There is definitely value in remediating truly contaminated soils that have arsenic concentrations substantially higher than ambient conditions, but is how will such thresholds be determined?

Response to Comment TR18-56

Comment noted. As described in Volume III Attachment 1 Section 3.2.5.7 *Water Quality – Potential Impacts and Mitigation – Inorganic and Organic Contaminants* Potential Impact 3.2-15, remediation is required only in instances where (1) there are visibly obvious sediment deposits that are consistent with physical sediment properties associated with Lower Klamath Project reservoir sediments (2) these are in agricultural or residential areas (with heightened ingestion potential) and (3) when these sediments have arsenic levels that are both higher than local background levels and exceed health residential screening levels. Please note that the State Water Board has revised Mitigation Measure WQ-3 to add additional reporting on and oversight of test methods and remediation in order to allow for appropriate tailoring of testing and remediation to the individual circumstance that arises.

Please refer to Volume III Attachment 1 Section 3.2.5.7 *Water Quality – Potential Impacts and Mitigation – Inorganic and Organic Contaminants* Mitigation Measure WQ-3 for the revisions.

Comment TR18-57

Page 3-397: Need to distinguish planktonic "Anabaena" which is now called Dolichospermum, from benthic forms still referred to as Anabaena.

Response to Comment TR18-57

Section 3.4.2.1 *Phytoplankton and Periphyton – Environmental Setting – Phytoplankton – Anabaena flos-aquae* has been revised to clarify that the EIR continues to use the *Anabaena* name for both planktonic and benthic species since *Anabaena* was more frequently used in the literature cited and it is still commonly used in descriptions of this species. Please refer to Volume III Attachment 1 Section 3.4.2.1 *Phytoplankton and Periphyton – Environmental Setting –Phytoplankton – Anabaena flos-aquae* for the revisions.

Comment TR18-58

Page 3-403: "Monitoring at multiple locations along the Middle and Lower Klamath River indicates that dissolved oxygen and pH patterns over a 24-hour period are driven primarily by photosynthesis and respiration of periphyton (Ward and Armstrong 2010, Asarian et al. 2015)." A citation of Genzoli and Hall (2016) should be added here (see comment above regarding page 3-135 for justification).

Response to Comment TR18-58

Section 3.4.2.2 *Phytoplankton and Periphyton – Environmental Setting – Periphyton* has been revised to clarify the relative influence of phytoplankton and periphyton on dissolved oxygen and pH in the Middle and Lower Klamath River. Please refer to Volume III Attachment 1 Section 3.4.2.2 *Phytoplankton and Periphyton – Environmental Setting – Periphyton* for the revisions.

Comment TR18-59

Page 3-413: "Nuisance blooms of periphyton have not been documented in the riverine portions of the Hydroelectric Reach. In the J.C. Boyle Peaking Reach, it has been noted that periphyton tends to be absent from the margins of the river that are alternately dried and wetted during peaking operations (E. Asarian, pers. comm., 2011)." We recommend that the end of this sentence be re-structured with different references, so that it ends with "periphyton tends to be absent from the margins of the river that are alternately dried and wetted during peaking operations (Karuk Tribe 2006), due to reasons described by PacifiCorp (2005)". Note that the PacifiCorp (2005) report is unavailable online but we have it in our files; please contact us if you need a copy.

Response to Comment TR18-59

Section 3.4.2.3 *Phytoplankton and Periphyton – Environmental Setting – Hydroelectric Reach – Periphyton* has been revised to clarify that the lack of periphyton along the margins of the J.C. Boyle Peaking Reach is due to turbid conditions that limit light availability for photosynthesis, high water velocities that limit establishment and growth of periphyton, and the variable flow regime that

causes cycles of drying and rewetting. Please refer to Volume III Attachment 1 Section 3.4.2.3 *Phytoplankton and Periphyton – Environmental Setting – Hydroelectric Reach – Periphyton* for the revisions.

Comment TR18-60

Page 3-431: This sentence suggests that river growth of BGA is causing exceedances:

"Some phytoplankton growth may still occur after dam removal in calm, slow-moving habitats along shorelines and protected coves and backwaters during low-flow periods in the Middle and Lower Klamath River, but these habitats already support growth of blue-green algae, including Microcystis aeruginosa, that results in occasional exceedances of 2016 CCHAB secondary thresholds and WHO guidelines (Falconer et al. 1999; Kann et al. 2010; State Water Board et al. 2010, updated 2016; Genzoli and Kann 2016, 2017)."

It is not likely that these slow-moving and backwater areas support growth of blue-green algae, but rather are sites where upstream sources accumulate as slowed velocity allows them to settle or become trapped in vegetation. Thus the exceedances currently detected in such areas would decrease with dam removal. There is no evidence that we are aware of for actual growth of planktonic cyanobacteria in the Middle and Lower Klamath.

Response to Comment TR18-60

Section 3.4.5.1 *Phytoplankton and Periphyton – Potential Impacts and Mitigation – Phytoplankton* Potential Impact 3.4-2 has been revised to clarify blue-green algae and microcystin entrapment and accumulation in backwater areas of the Klamath River from upstream sources. Please refer to Volume III Attachment 1 Section 3.4.5.1 *Phytoplankton and Periphyton – Potential Impacts and Mitigation – Phytoplankton* Potential Impact 3.4-2 for the revisions

Comment TR18-61

Page 3-717. This section mentions that the DEIR's method for estimating methane emissions from Klamath Hydroelectric Project reservoirs was adapted from Karuk Tribe's (2006) comments which multiplyied the reservoirs' area by areal emissions rates from reservoirs around the world with similar water quality characteristics. The Karuk Tribe's estimates were best the information available at that time, but there is now new information available including a global synthesis (Deemer et al. 2016) and field measurements of methane emissions available from J.C. Boyle Reservoir and Keno Reservoir (Harrison et al 2017) using methods from Deemer et al. (2011). We also encourage SWRCB to consider incorporating these recent studies into the EIR.

Response to Comment TR18-61
This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Greenhouse Gas Emissions and Energy*).

Comment TR18-62
During our review of the DEIR we noticed a few minor/insignificant errors, which we present in this separate list to avoid cluttering our other comments.

Response to Comment TR18-62
Comment noted. This comment indicates that a few minor/insignificant errors were noticed, and are provided in comments below.

Comment TR18-63
Page 2-98: "Microcystin [-Producing Blue-green Algae] Cell Count" is odd phrasing that doesn't match the conventions used in the rest of the DEIR. Should be "Microcystin-Producing Blue-green Algae Cell Count"?

Response to Comment TR18-63
Section 2.7.8.7 *Proposed Project – Proposed Project – Other Project Components – Water Quality Monitoring and Construction BMPs* summarizes the Klamath River Renewal Corporation (KRRC) Proposed Water Quality Monitoring Plan included in the Proposed Project (see Volume II Appendix B: *Definite Plan – Appendix M*). In the Proposed Project Water Quality Monitoring Plan, one parameter to monitor is called "Microcystin Cell Count", but this is likely a typo because microcystin is only chemical compound that does not have a cellular structure that can be counted. It is assumed that the "Microcystin Cell Count" parameter is meant to refer to microcystin-producing blue-green algae cell counts, a commonly measured blue-green algae parameter. Thus, Section 2.7.8.7 *Proposed Project – Proposed Project – Other Project Components – Water Quality Monitoring and Construction BMPs* Table 2.7-18 (page 2-98) lists the parameter name as specified in the Proposed Project Water Quality Monitoring Plan, but it uses brackets [ ] to clarify what the parameter name actually means (i.e., microcystin-producing blue-green algae cell counts).

Comment TR18-64
Page 3-35: The last sentence on this page references the wrong figure regarding chlorophyll-a (should be Figure 3.2-5, not Figure 3.2-25).

Response to Comment TR18-64
Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* has been revised to clarify the refence to Figure 3.2-5, which originally incorrectly referred to Figure 3.2-25. Please refer to Volume III Attachment 1 Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* for the revision.

Comment TR18-65
page 3-58: "the clarity or murkiness of the water causes by small particles" should be "the clarity or murkiness of the water caused by small particles"

Response to Comment TR18-65
Section 3.2.3.1 *Water Quality – Significance Criteria – Thresholds of Significance – Suspended Sediments* has been clarified as requested. Please refer to Volume III Attachment 1 Section 3.2.3.1 *Water Quality – Significance Criteria – Thresholds of Significance – Suspended Sediments* for the revision.

Comment TR18-66
Page 3-137: "Microcystis aeruginosa" should be italicized at line bottom of the page

Response to Comment TR18-66
Section 3.2.5 *Water Quality – Potential Impacts and Mitigation – Chlorophyll-a and Algal Toxins* Potential Impact 3.2-12 has been clarified as requested. Please refer to Volume III Attachment 1 Section 3.2.5 *Water Quality – Potential Impacts and Mitigation – Chlorophyll-a and Algal Toxins* for the revision.

Comment TR18-67
Page 3-717: This page cites Appendix N for greenhouse gas emissions but it should actually be Appendix O instead?

Response to Comment TR18-67
This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Greenhouse Gas Emissions and Energy*).

Quartz Valley Indian Reservation, Crystal Robinson

Comment TR20-1
Attached is a scientific review, from the Quartz Valley Tribal Environmental Program, of the Draft Environmental Impact Report for the Lower Klamath Project License Surrender, State Clearinghouse No. 2016122047.

If there are any questions, please contact me.

Response to Comment TR20-1
Thank you for your comment. Comment noted.

Comment TR20-2
We have reviewed, with the help of our consultants Kier Associates, portions of the California State Water Resources Control Board's (SWRCB) draft Environmental Impact Report for the lower Klamath Project License Surrender, State Clearinghouse No. 201612204v(DEIR) that was circulated for public comment in December of 2018. We focused our review almost exclusively on

the portions of the following sections most relevant to water quality: Executive Summary, 3.2 Water Quality, and 3.4 Phytoplankton and Periphyton. We did not review Appendix C - Water Quality Supporting Technical Information or Appendix D - Water Quality Environmental Effects Determination Methodology Supplemental Information, but some of our comments on other sections are likely applicable to those appendices.

We recognize the long-term benefits of removal of the four Klamath River dams far outweigh the short-term impacts. Overall, the sections of the DEIR that we reviewed do a good job of characterizing the impacts and benefits of the proposed dam removal project, and the proposed mitigation measures seem reasonable. The only mitigation measure that we have questions about is the arsenic testing and remediation (WQ-3 - Monitoring and potential remediation of reservoir sediments deposited along the Middle and Lower Klamath River floodplain).

Response to Comment TR20-2
This comment expresses general support for the analysis in the sections the commenter reviewed, and notes a concern with Mitigation Measures WQ-3. Comment noted. With respect to Mitigation Measure WQ-3, please refer to response to comment TR20-25.

Comment TR20-3
Our biggest concern is the proposed water quality monitoring plan. The plan proposed by the Klamath River Renewal Corporation (KRRC) is inadequate , as are the proposed monitoring requirements in the SWRCB's June 2018 draft Water Quality Certification for the Lower Klamath Project. During the June 2018 public comment period for the draft Water Quality Certification, we provided detailed comments regarding the draft monitoring plan that we will not repeat here given that the current public comment opportunity is focused on the DEIR's proposed mitigation measures and descriptions of environmental impacts. However, we are compelled to reiterate our main concerns with the water quality monitoring plan here: 1) the 60 mile gap in monitoring stations between Iron Gate Dam and Seiad Valley, the reach of river that will experience both the greatest short-term impacts and long-term changes following dam removal, 2) the substantial reduction in the number of stations in the proposed water quality monitoring plan relative to the Klamath Hydroelectric Settlement Agreement (KHSA) Interim Measure 15 (IM15) monitoring program which has been collecting baseline data since 2009, 3) lack of enough event-based suspended sediment concentrations (SSC) sampling to be able to combine with continuous turbidity and flow data to construct the sediment budgets that are necessary to understand the ultimate fate of reservoir sediments, and 4) given the Klamath River's high interannual hydrologic variability, monitoring should continue for at least five years post-drawdown. The massive scale of the proposed dam removal project merits a monitoring plan sufficiently detailed that it will adequately assess the results of the project. It is our understanding that the

water quality monitoring plan is still in development, and that the SWRCB will have the final word on what needs to be included. Please ensure that the monitoring plan will provide enough information to determine if the actual effects of the dam removal matched the predictions, with the ancillary benefit of using this once-in-a-lifetime opportunity to provide crucial information needed to guide long-term river management.

Response to Comment TR20-3
The commenter is expressing concerns that the Klamath River Renewal Corporation's (KRRC's) water quality monitoring plan, put forth in the Definite Plan, is inadequate. Additionally, the commenter asserts that the June 7, 2018, water quality monitoring and adaptive management plan required by the State Water Resources Control Board's draft water quality certification is also inadequate. The commenter notes that it has provided comments on the State Water Resources Control Board's draft water quality certification.

The EIR analyzes the potential for environmental impacts due to implementation of the KRRC's Proposed Project and alternatives to the Proposed Project. The requests regarding monitoring and data collection are not raised in connection with concerns regarding the EIR's evaluation of potential environmental impacts of the Proposed Project, or mitigation for such impacts. The comment expresses general support for the EIR's impact analysis and raises concerns as to only one mitigation measure that is not a part of the water quality monitoring and data collection concerns. See response to comment TR20-2.

Please note that the State Water Resources Control Board has made several revisions to its water quality monitoring and adaptive management plan that will be included in its final water quality certification, including in response to comments by the Quartz Valley Indian Reservation.

Please refer to Volume I Section 2.7.8.7 *Proposed Project – Proposed Project – Other Project Components – Water Quality Monitoring and Construction BMPs* (pages 2-97 to 2-99) for a general summary of the water quality monitoring included in the Definite Plan. Volume 1 Section 3.2.5 *Water Quality – Potential Impacts and Mitigation* provides a general discussion of the water quality monitoring with regards to the individual water quality parameters (Potential Impact 3.2-1 for water temperature; Potential Impact 3.2-3 for suspended sediments; Potential Impact 3.2-7 for nutrients; Potential Impact 3.2-9 for dissolved oxygen; Potential Impact 3.2-11 for pH; Potential Impact 3.2-12 for chlorophyll-a and algal toxins; and, Potential Impact 3.2-14 for inorganic and organic contaminants). Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Comment TR20-4
The Comments on Specific Details section below is organized by section and page number. It provides suggested edits to improve the EIR's technical accuracy.

COMMENTS ON SPECIFIC DETAILS

Similar text is often repeated on multiple pages within the DEIR. In general, our comments here specifically reference only one page (or section) but are intended to apply to multiple pages/sections if the text we reference also appears elsewhere in the DEIR.

Response to Comment TR20-4
Comment noted.

Comment TR20-5
As described in the summary at the beginning of our comments above, and in our previous comments on the June 2018 draft Water Quality Certification for the Lower Klamath Project, the water quality monitoring plan proposed by KRRC is inadequate and needs to be substantially improved.

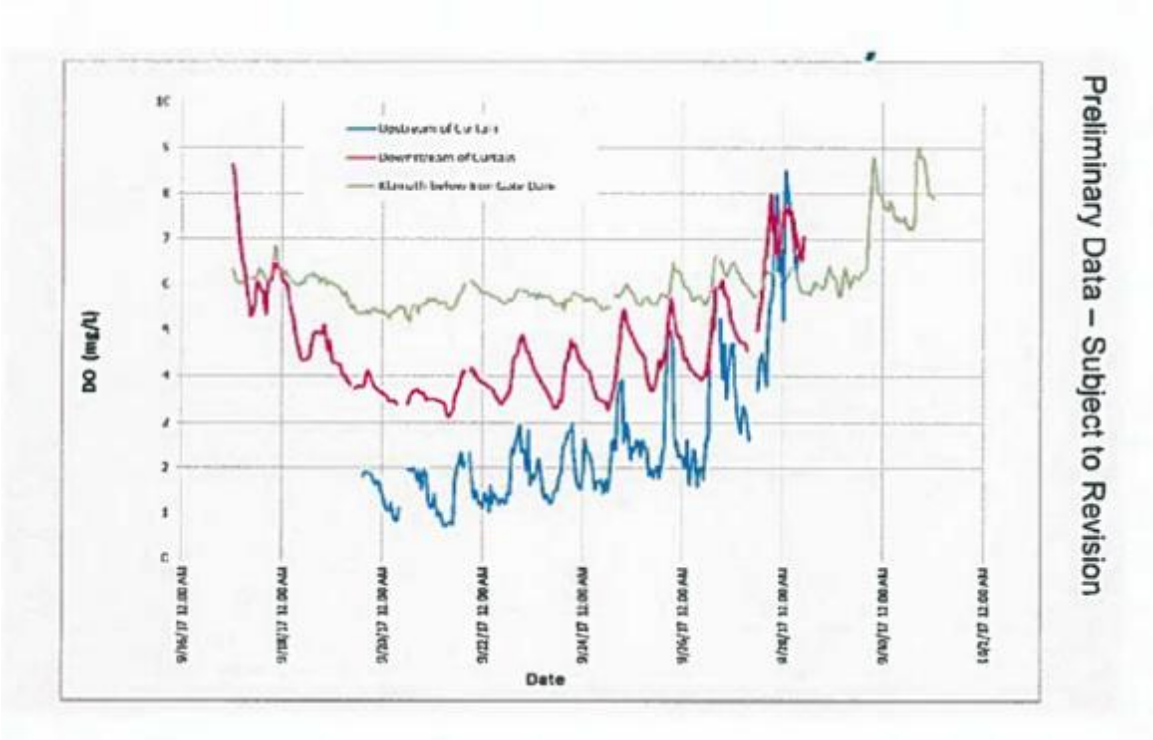
Response to Comment TR20-5
Please see response to comment TR20-3.

Comment TR20-6
Page 3-22: "The relatively shallow depth and short hydraulic residence times do not support thermal stratification in J.C. Boyle Reservoir (FERC 2007; Raymond 2008a, 2009a, 2010a) and thus this reservoir does not directly alter summertime water temperatures in further downstream reaches (NRC 2004). "We recommend adding", other than reducing the magnitude of diel (i.e., 24-hour cycle) fluctuations" to the end of the sentence.

Response to Comment TR20-6
J.C. Boyle Reservoir itself does not alter the magnitude of the diel water temperature fluctuations in the J.C. Boyle Bypass Reach downstream of the dam. The magnitude of diel water temperatures is reduced due to bypass operations from J.C. Boyle Dam that reduce the relative proportion of flow in the river from upstream and increase the relative proportion of flow from groundwater springs in the J.C. Boyle Bypass Reach. Section 3.2.2.2 *Water Quality – Environmental Setting – Water Temperature* has been revised to clarify the influence of bypass operations on water temperatures in the J.C. Boyle Bypass Reach based on the comment recommendation. Please refer to Volume III Section 3.2.2.2 *Water Quality – Environmental Setting – Water Temperature* for these revisions.

Comment TR20-7
Page 3-23 (and also applicable to many other section of the DEIR): We recommend that any text discussing the effects of the Iron Gate Reservoir curtain should also note that during intense algae blooms the curtain has the detrimental side-effect of reducing dissolved oxygen concentrations in water released

downstream. Operationally, this means that the curtain must be raised during intense blooms to avoid reducing dissolved oxygen downstream, which limits the curtain's usefulness for reducing algae. The preliminary data in the following slide from PacifiCorp's October 16, 2017 presentation to the Interim Measures Implementation Committee (there is not yet a draft report that includes these data) shows low dissolved oxygen values in late September 2017 downstream of the curtain (red line) and below Iron Gate Dam (green line):



Response to Comment TR20-7

The preliminary dissolved oxygen data from PacifiCorp's October 16, 2017 presentation to the Interim Measures Implementation Committee (IMIC) that is provided in the comment is too limited to draw broad conclusions about the influence of the Iron Gate Reservoir powerhouse intake curtain on dissolved oxygen conditions downstream of Iron Gate Dam. However, in its 2018 report, PacifiCorp acknowledges that it had to raise the curtain several times after the curtain was deployed to access water with higher dissolved oxygen concentrations and comply with water quality standards, potentially limiting the effectiveness of the curtain to reduce transport of cyanobacteria into the Klamath River downstream of Iron Gate Dam (PacifiCorp 2018a). Section 3.2.2.2 *Water Quality – Existing Conditions – Water Temperature* and other water quality sections discussing the powerhouse intake curtain have been clarified to acknowledge that the potential beneficial effects of the intake curtain on algae and water temperature in the Klamath River downstream of Iron Gate Dam may be reduced when the curtain is raised in response to low dissolved oxygen concentrations. Please refer to Volume III Attachment 1 Section 3.2.2.2 *Water*

Quality – Existing Conditions – Water Temperature, Section 3.2.2.7 *Water Quality – Existing Conditions – Chlorophyll-a and Algal Toxins*, Section 4.2.2 *No Project Alternative – Water Quality – Water Temperature*, Section 4.2.2 *No Project Alternative – Water Quality – Chlorophyll-a and Algal Toxins,* Section 4.4.2.1 *Continued Operations with Fish Passage Alternative – Water Quality – Water Temperature*, Section 4.4.2.2 *Continued Operations with Fish Passage Alternative – Water Quality – Suspended Sediments*, Section 4.4.2.4 *Continued Operations with Fish Passage Alternative – Water Quality – Dissolved Oxygen, and Section 4.4.2.6 Continued Operations with Fish Passage Alternative – Water Quality – Chlorophyll-a and Algal Toxins* these revisions.

Comment TR20-8

Page 3-24 "Species present in the Klamath River capable of producing microcystin include Microcystis aeruginosa and Anabaena flos-aquae, while species present in the Klamath River in the genus Anabaena can produce anatoxin-a and saxitoxin." Other species capable of producing microcystin have been detected in the Klamath River as well (even though they never dominate). These are Gloeotrichia and Planktothrix/Oscillatoria (Genzoli and Kann 2017, E&S Environmental Chemistry, Inc. 2018, Asarian and Kann 2006). Additional potentially toxin producing genera found in the Klamath River and/or reservoirs include Limnothrix (E&S Environmental Chemistry, Inc. 2018) and Pseudanabaena (Genzoli and Kann 2017).

Response to Comment TR20-8

Please note that the sentence quoted in the comment and attributed to page 3-24 is actually found on page 3-34.

Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* has been revised to clarify using language similar to that requested in the comment. Please refer to Volume III Attachment 1 Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* for the revisions.

Comment TR20-9

Page 3-26 "However, in the summer months, organic suspended materials can increase in the Klamath River between Iron Gate Dam and Seiad Valley (RM 132.7) due to the transport of in-reservoir algal blooms to downstream reaches of Klamath River as well as resuspension of previously settled organic materials (YTEP 2005; Sinnott 2008; Armstrong and Ward 2008; Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016). Further downstream, near the confluence with the Scott River (RM 145.1) concentrations of organic suspended materials tend to decrease with distance as phytoplankton gradually settle out of the water column farther downstream or are diluted by tributary inputs (see Appendix C for more detail)." The Scott River is downstream of Seiad Valley, so it is potentially confusing to use the term "further downstream" here.

Response to Comment TR20-9
Section 3.2.2.3 *Water Quality – Environmental Setting – Suspended Sediments* has been revised to clarify the location near the Scott River confluence. Please refer to Volume III Attachment 1 Section 3.2.2.3 *Water Quality – Environmental Setting – Suspended Sediments* for the revision.

Comment TR20-10
Page 3-28: The sentence "TP and TN concentrations in the Klamath River vary with flow, with the highest concentrations tending to occur during low flow years (e.g., 2001-2004) and the lowest concentrations tending to occur during high flow years (e.g., 2006, 2010, 2011) (Asarian and Kann 2013)" should be revised to note that it pertains only to the low-flow season (summer and early fall). TP can be very high during peak winter and spring flows due to suspended sediment.

Response to Comment TR20-10
Section 3.2.2.4 *Water Quality – Environmental Setting – Nutrients* has been revised to clarify that the statement pertains to summer through early fall. Please refer to Volume III Attachment 1 Section 3.2.2.4 *Water Quality – Environmental Setting – Nutrients* for the revisions.

Comment TR20-11
Page 3-34: The sentence previous to this one "Diatoms (i.e., unicellular, photosynthetic microalgae) typically dominate in spring then decrease due to zooplankton grazing and the onset of water column stratification, which results in the diatoms settling out of the water column below the lake or reservoir surface layer (epilimnion)." refers to longitudinal trends including those for the riverine reaches, but this quoted sentence focuses on lentic (i.e., non-flowing) waters only- it should be revised to note that, since the dynamics do not apply to free-flowing river reaches.

Response to Comment TR20-11
Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* has been revised to clarify when the results being discussed are related to river or lake/reservoir conditions. Please refer to Volume III Attachment 1 Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* for the revisions.

Comment TR20-12
Page 3-36: "Phycocyanin, a pigment produced by blue-green algae, has been collected between May and November at some monitoring sites in the Klamath River downstream of Iron Gate Dam since 2007. At Seiad Valley (RM 132.7), phycocyanin is typically low from May through early August, increases to a peak in early September, and decreases until reaching low levels again by the end of October (Asarian and Kann 2013). Phycocyanin concentrations generally coincide with chlorophyll-a concentrations for the portion of the Klamath River at Seiad Valley." We recommend that these sentences should be revised/replaced.

Genzoli and Kann (2016) has a much more comprehensive analysis of Klamath River phycocyanin data than Asarian and Kann (2013). In addition, phycocyanin is measured by continuous probes, so it would be more accurate to say "measured" rather than "collected".

Response to Comment TR20-12
Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* has been revised to clarify phycocyanin data in the Klamath River according to the comment. Please refer to Volume III Attachment 1 Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* for the revisions.

Comment TR20-13
Page 3-37 The text citing the Otten et al. (2015) study should also be revised to briefly mention the genetic evidence for Iron Gate Reservoir being the source for Microcyslis in the lower Klamath River. This genetic evidence is mentioned in section 3.4 Phytoplankton and Periphyton. Otten et al. (2015) document with genetic analysis that algal production in Iron Gate Reservoir is the principal source of Microcystis aeruginosa responsible for the observed public health exceedances occurring in the Klamath River downstream from Iron Gate Darn.

Response to Comment TR20-13
Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* been revised to clarify that the genetic analysis of *Microcystis aeruginosa* populations included Copco No. 1, Iron Gate Reservoir, and Klamath River sites and *Microcystis aeruginosa* populations in Iron Gate Reservoir likely contribute to *Microcystis aeruginosa* public health exceedances in the Klamath River below Iron Gate Reservoir. Please refer to Volume III Attachment 1 Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* for the revisions.

Comment TR20-14
Page 3-37: Genzoli and Kann (2017) serves as a recent compilation of Microcystis and microcystin trends in the middle Klamath River, including diel, seasonal and longitudinal trends. Although this document is covered elsewhere (e.g., page 3-403; 3-414; 3-417, 3-431) it would be useful to cite here as well.

Response to Comment TR20-14
Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* has been clarified as requested. Please refer to EIR Volume III Attachment 1 Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* for the revisions.

Comment TR20-15
Page 3-38 contains the following paragraph regarding anatoxin-a:

"Anatoxin-a produced by the genus Anabaena of blue-green algae species was detected in Iron Gate Reservoir on September 3, 2005, in testing by the California Department of Health Services (Kann 2007a; Kann 2008b). In addition, monitoring conducted for the Karuk Tribe during 2005, 2006, 2007, 2008 in Copco No. 1 or Iron Gate reservoirs found no anatoxin-a detected (Kann and Corum 2006, 2007, 2009; Kann 2007b). At Lower Klamath River monitoring sites, anatoxin-a was not detected above the reporting limit in water samples collected during 2008 and 2009 (Fetcho 2009, 2011). In recent years, anatoxin-a has been measured in the Klamath River downstream of Iron Gate Reservoir on several occasions, typically in the lower reaches including at monitoring sites near Weitchpec and Orleans (Otten 2017). While concentrations of Anabaena flos-aquae cells have continued to be monitored, anatoxin-a concentrations are not available for Lower Klamath Project reservoir and Klamath River sites in recent years."

We recommend that this paragraph be updated to reflect more recent Klamath River data, the uncertainty in the sources of anatoxin, and the potential contribution of benthic sources (i.e. periphyton) in anatoxin-a production. The issue of potential benthic contributions to anatoxin-a production also applies to several other places within the DEIR. In our opinion, potential benthic production of anatoxin would not change any of the effects determinations in DEIR but should probably be included for the sake of completeness. Here is a replacement paragraph to consider using in place of the paragraph quoted above:

"Anatoxin-a has been detected in the Klamath River system, although the timing, distribution, and sources of anatoxin-a production in the Klamath is not well understood. Cyanobacterial species from a number of genera are capable of producing anatoxin-a, including Dolichospermum (planktonic species previously considered part of the genus Anabaena are now called Dolichmpermum), Anabaena (previously included planktonic and benthic species whereas it is now only benthic species), Aphanizome11011, Cylindrmpermopsis, Planktothrix (Oscillatoria), and Phormidium (Chorus and Bartram 1999, Quiblier et al. 2013, U.S. EPA 2014, Bouma-Gregson et al. 2018). Although toxin- producing phytoplankton are more well studied, periphyton can also produce toxins including anatoxin-a (Heath et al. 2011, Quiblier et al. 2013). In many California rivers and streams not impounded by dams, periphyton are assumed to be the primary sources Anatoxin-a (Fetscher et al. 2015), including species in genus Anabaena and Phormidium in tributaries of the Eel River located south of the Klamath River (Asarian and Higgins 2018, Bouma-Gregson et al. 2018). Anatoxin-a was detected in Iron Gate Reservoir on September 3, 2005, in testing by the California Department of Health Services (Kann 2007a; Kann 2008b), while monitoring conducted for the Karuk Tribe during 2005-2008 in Copco No. I and Iron Gate reservoirs did not detect anatoxin-a (Kann and Corum 2006, 2007, 2009; Kann 2007b). At Lower Klamath River monitoring sites, anatoxin-a was not detected in water samples collected during 2008 and 2009 (Fetcho 2009,

2011). In more recent years (2010, 20 I 5, 2016), anatoxin-a was detected in the Klamath River from sites directly below Iron Gate Dam to the Klamath River Estuary (unpublished data from the Yurok and Karuk Tribes). Genetic tools that detect the presence of an anatoxin-a synthase gene came back positive for I 9.5% of 123 samples from throughout the Klamath River system, although how the presence of the synthase gene relates to toxin concentrations is still unknown (Otten 2017). The detection of anatoxin-a over many years suggest that anatoxin-a poses a persistent public health threat for the Klamath River, yet the timing, spatial scale, and sources of the toxin are poorly understood due to limited monitoring for anatoxin-a."

Response to Comment TR20-15
Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* has been revised to clarify the discussion of uncertainty for anatoxin-a distribution and sources and which cyanobacteria species are capable of producing anatoxin-a. Please refer to Volume III Attachment 1 Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* for the revisions.

Comment TR20-16
Page 3-54: Table 3.2-7 lists the Hoopa Valley Tribe's water quality objectives that are to be used (along with the applicable objectives from the NCRWQCB and Yurok Tribe) to evaluate thresholds of significance for water quality impacts. The table has a footnote that:

'HVTEPA (2008) includes a natural conditions clause which states, "If dissolved oxygen standards are not achievable due to natural conditions, then the COLD and SPAWN standard shall instead be dissolved oxygen concentrations equivalent to 90% saturation under natural receiving water temperatures." USEPA has approved the Hoopa Valley Tribe definition of natural conditions; the provision that site-specific criteria can be set equal to natural conditions and the procedure for defining natural conditions have not been finalized as of December 2018.'

There is also a second similar footnote regarding total nitrogen and total phosphorus. While not strictly wrong, those footnotes are incomplete because they do not mention that until the Tribe establishes the procedure for defining natural conditions, and EPA approves that procedure, the natural conditions do not have any legal weight. The exact wording in EPA's Feb 14, 2008 approval letter was: "with the understanding that unless and until the Hoopa Valley Tribe completes the process of establishing Natural Condition reference conditions, the stated numerical criteria... will constitute the operative criteria for all purposes." Therefore, we recommend that "USEPA has approved the Hoopa Valley Tribe definition of natural conditions; the provision that site-specific criteria can be set equal to natural conditions and the procedure for defining natural conditions have not been finalized as of December 2018" be replaced with "'USEPA has

approved the Hoopa Valley Tribe definition of natural conditions with the understanding that unless and until the Hoopa Valley Tribe completes the process of establishing Natural Condition reference conditions, the stated numerical criteria will constitute the operative criteria for all purposes."

Response to Comment TR20-16
Section 3.2.3.1 *Water Quality – Significance Criteria – Thresholds of Significance* Table 3.2-7 has been revised to include reference that United States Environmental Protection Agency (USEPA) has approved the Hoopa Valley Tribe definition of natural condition with the understanding that unless and until the Hoopa Valley Tribe completes the process of establishing the "natural conditions" reference condition, the stated numerical criteria will constitute the operative criteria for all purposes . Please refer to Volume III Attachment 1 Section 3.2.3.1 *Water Quality – Significance Criteria – Thresholds of Significance* Table 3.2-7 for the revisions.

Comment TR20-17
Page 3-59 and page 3-60: The overall approach for assessing the significant of impacts for nutrients makes sense, but we are unclear on why this section mentions the TMDL targets for Total Nitrogen (TN) and Total Phosphorus (TP) but not the Hoopa Valley Tribe's objectives for TN and TP?

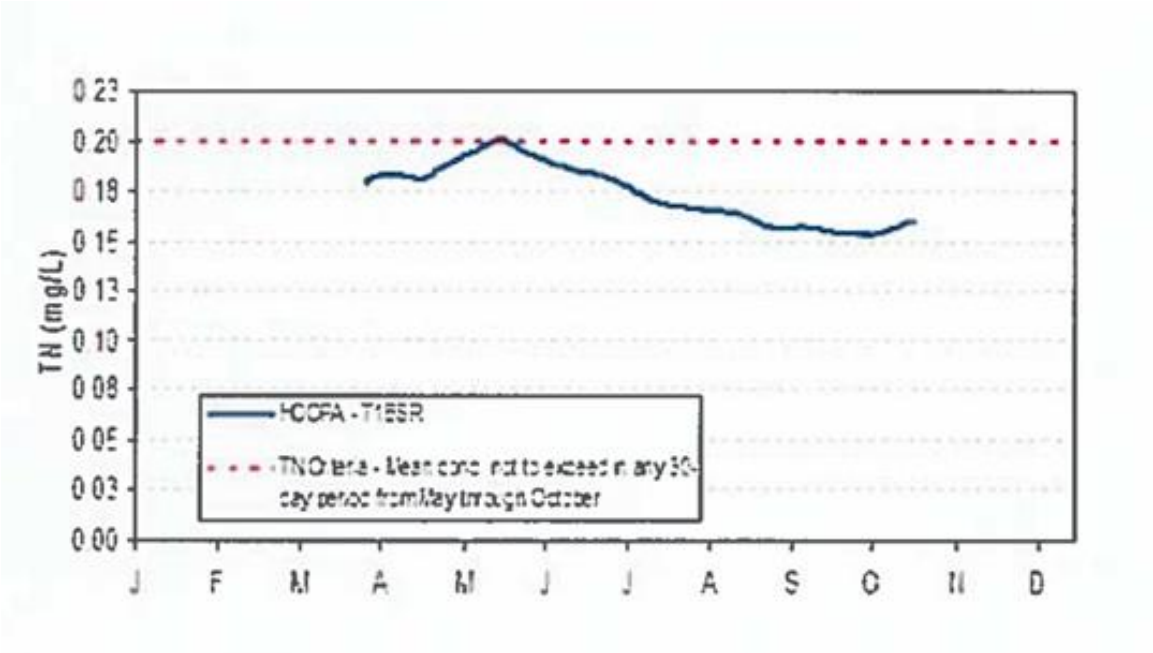
Response to Comment TR20-17
Section 3.2.3.1 *Water Quality – Significance Criteria – Thresholds of Significance – Nutrients* has been revised to clarify a refence to Hoopa Valley Tribe Total Phosphorus (TP) and Total Nitrogen (TN) numeric targets. Please refer to Volume III Attachment 1 Section 3.2.3.1 *Water Quality – Significance Criteria – Thresholds of Significance – Nutrients* for the revisions.

Please note, the minor clarifications raised by the comment do not change an environmental impact or mitigation measure analyzed in the EIR because the Hoopa Valley Tribe numeric TP and TN surface-water quality objectives already had been used in the Section 3.2.5.3 *Water Quality – Potential Impacts and Mitigation – Nutrients* Potential Impact 3.2-8 analysis. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Comment TR20-18
Page 3-117 includes the following sentence:

'"Klamath River TMDL model results indicate that while resulting TP levels would meet the existing Hoopa Valley Tribe numeric water quality objective (0.035 mg/L TP) in all months at the Hoopa reach (approximately RM 45) of the Klamath River, TN levels would continue to be in excess of the existing objective (0.2 mg/L TN) in all months, as would TN levels for the modeled 'natural conditions' (Tl BSR) and the modeled 'dams- in' scenario (T4BSRN) (for the months of October through June) (North Coast Regional Board 2010)."

The second half of this sentence is incorrect, so we recommend that it be revised. The TN concentrations predicted in the final version of the 'natural conditions' (TI BSR) scenario exceeded the Hoopa Valley Tribe's criteria only for a few days in May, not 'in all months'. In addition, the magnitude of the exceedance is so small that it can reasonably be considered de minimis, as shown in the following figure from the North Coast Regional Board (2010):



The incorrect statement on TN exceedances may be a result of outdated information. Initial versions of the •natural conditions' (Tl BSR) scenario did indicate substantive exceedances of the Hoopa Valley Tribe's TN objective; however, these exceedances were caused by unrealistically high TN concentrations assigned to tributaries. Once these tributary concentrations were corrected to more closely represent available data, the exceedances essentially disappeared in the final official version of the model (i.e., see figure above).

Response to Comment TR20-18

Section 3.2.5.3 *Water Quality – Potential Impacts and Mitigation – Nutrients* Potential Impact 3.2-8 has been revised to clarify the Hoopa Valley Tribe numeric water quality Total Nitrogen (TN) objective exceedance information for Total Maximum Daily Load (TMDL) model results. Please refer to Volume III Attachment 1 Section 3.2.5.3 *Water Quality – Potential Impacts and Mitigation – Nutrients* Potential Impact 3.2-8 for the revisions.

Comment TR20-19

Page 3-117 "While there would be a slight increase in absolute nutrient concentrations entering the Middle Klamath River under the Proposed Project, phytoplankton, especially blue-green algae, would be limited in their ability to use

those nutrients for growth and reproduction without calm reservoir habitat (Potential Impact 3.4-2)." We recognize that word choices are subjective, but "slight" is probably not the most accurate word to describe the expected increase, unless it is specifically in reference to annual time scales, not seasonal time scales. As noted on page 3-116, the increases in TN for the July through September period are expected to be in the range of 48- 55%. We suggest replacing "a slight increase" with "an increase".

Response to Comment TR20-19
Section 3.2.5.3 *Water Quality – Potential Impacts and Mitigation – Nutrients* Potential Impact 3.2-8 has been clarified as requested. Please refer to Volume III Attachment 1 Section 3.2.5.3 *Water Quality – Potential Impacts and Mitigation – Nutrients* Potential Impact 3.2-8 for the revisions.

Comment TR20-20
Page 3-118: "In general, although dam removal would result in a slight long-term increase in TP and TN away from the numeric targets, such an increase would not support the growth of nuisance and/or noxious phytoplankton or nuisance periphyton." Similar to our previous comment above regarding page 3-117, it would be more accurate to replace "a slight long-term increase in TP and TN" with "a long-term increase in TP and TN" or "a slight long-term increase in annual TP and TN".

Response to Comment TR20-20
Section 3.2.5.3 *Water Quality – Potential Impacts and Mitigation – Nutrients* Potential Impact 3.2-8 has been clarified as requested. Please refer to Volume III Attachment 1 Section 3.2.5.3 *Water Quality – Potential Impacts and Mitigation – Nutrients* Potential Impact 3.2-8 for the revisions.

Comment TR20-21
Page 3-135: "....monitoring data at multiple locations further downstream in the Middle and Lower Klamath River indicate that pH patterns over a 24-hour period are driven primarily by photosynthesis and respiration of periphyton (Ward and Armstrong 2010; Asarian et al. 2015; see Section 3.4.2.2 Periphyton) rather than phytoplankton." A direct quantification of the relative contributions to primary production in the Middle Klamath River is provided by Genzoli and Hall (2016). Even though Genzoli and Hall's (2016) analysis did not specifically evaluate pH, we recommend that it should still be cited here.

Response to Comment TR20-21
The reference provided in the comment (i.e., Genzoli and Hall 2016) supports the premise of Section 3.2.5.5 *Water Quality – Potential Impacts and Mitigation – pH* Potential Impact 3.2-11 discussion and analysis, which is that, in the absence of a reservoir phytoplankton bloom that is subsequently transported into the Middle and Lower Klamath River, periphyton are relatively more important for influencing diel fluctuations in water quality conditions (e.g., dissolved oxygen and pH)

compared to phytoplankton. As the EIR analysis is focused on pH changes in the river, while the reference provided in the comment focuses on primary productivity in grams oxygen per square meter per day (g $O_2/m^2/d$) rather than pH, the reference provided in the comment has not been added to the pH analysis. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Comment TR20-22

Page 3-136: "Since N-fixing species dominate the periphyton communities in the lower portions of the Middle Klamath River as well as the Lower Klamath River where inorganic nitrogen concentrations are low (Asarian et al. 2010, 2014, 2015), changes in nutrients due to dam removal are not expected to alter the periphyton community in these reaches (see Potential Impact 3.4-5)." The species composition of the periphyton community may well shift, but the biomass is not expected to increase substantially. We suggest that this end of this sentence be revised to "...are not expected to substantially alter total periphyton biomass in these reaches (see Potential Impact 3.4-5)."

Response to Comment TR20-22

Section 3.2.5.5 *Water Quality – Potential Impacts and Mitigation – pH* Potential Impact 3.2-11 has been revised to clarify that changes in the periphyton species composition under the Proposed Project would not significantly alter the total periphyton biomass in the Middle and Lower Klamath River. Please refer to Volume III Attachment 1 Section 3.2.5.5 *Water Quality – Potential Impacts and Mitigation – pH* Potential Impact 3.2-11 for the revisions.

Comment TR20-23

Page 3-137. While reservoir phytoplankton are by far the dominant source of algal toxins in the Klamath River, Section 3.2.5.6 Chlorophyll-a and Algal Toxins should probably also mention that river periphyton are capable of producing cyanotoxins including anatoxin-a. This would not change the effects determinations but should be mentioned for the sake of completeness. See comments regarding page 3-38 above for details.

Response to Comment TR20-23

Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* has been updated to note that cyanotoxins (including anatoxin-a) can be produced by riverine periphyton in addition to phytoplankton. Please refer to Volume III Attachment I Section 3.2.2.6 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* for these revisions.

Please note, while some periphyton species are capable of producing algal toxins, including microcystin and anatoxin-a (Heath et al. 2011; Quiblier et al. 2013; see Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins*), all available data indicate that algal toxin presence (i.e., microcystin and anatoxin-a) in the Klamath River corresponds to high

concentrations of phytoplankton blue-green algae cells (i.e., algae blooms of *Microcystis aeruginosa* for microcystin or *Anabaena flos-aquae* for anatoxin-a) (Kann and Corum 2006, 2007, 2009; Kann 2006, 2007a,b,c,d, 2008b; Jacoby and Kann 2007; CH2M Hill 2008; Kann et al. 2010a; Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016; Otten et al. 2015). Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Clarifications based on this comment do not change effects determinations in Section 3.2 *Water Quality*.

Comment TR20-24
Page 3-138. This statement merits correction:

"While algal toxins and chlorophyll-a produced in Upper Klamath Lake may still be transported downstream after dam removal, existing data indicate that microcystin concentrations in the Klamath River decrease to below California water quality objectives (see Section 3.2.3.1 Thresholds of Significance) by the upstream end of J.C. Boyle Reservoir, regardless of the microcystin concentration measured leaving the Upper Klamath Lake (Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016)."

There have been high microcystin levels on occasion in JC Boyle at Topsy Campground. It is more correct to say that microcystin concentrations in the Klamath River decrease to below California water quality objectives downstream of JC Boyle. (e.g., E&S Environmental Chemistry, Inc. 2018). T hen the following sentence is still correct: "Thus, algal toxins and chlorophyll-a production upstream of J.C. Boyle Dam would not be expected to be transported into California and result in algal toxin or chlorophyll-a concentrations in a manner that would cause or substantially exacerbate an exceedance of water quality standards or would result in a failure to maintain existing beneficial uses currently supported."

Response to Comment TR20-24
Section 3.2.5.6 *Water Quality – Potential Impacts and Mitigation – Chlorophyll-a and Algal Toxins* Potential Impact 3.2-12 (pages 3-137 to 3-139) has been revised to clarify that high microcystin levels have been detected in J.C. Boyle Reservoir at Topsy Campground and the potential for localized *Microcystis aeruginosa* growth and high microcystin concentrations in J.C. Boyle would be reduced under the Proposed Project. Please refer to Volume III Attachment 1 Section 3.2.5.6 *Water Quality – Potential Impacts and Mitigation – Chlorophyll-a and Algal Toxins* for the revisions.

Comment TR20-25
Page 3-150: Mitigation Measure WQ-3 (Monitoring and potential remediation of reservoir sediments deposited along the Middle and Lower Klamath River

floodplain) proposes that following dam removal, floodplain deposits in areas with agricultural and residential land use should be tested for arsenic and then remediated (removal or soil capping) if arsenic levels exceed background levels found in adjacent soils and USEPA or CalEPA human health residential screening levels. According to information presented on page 3-142 of the DEIR, soils in the Klamath Basin have naturally high arsenic levels, and arsenic levels in samples from reservoir sediments were within those natural ranges. Remediating arsenic-rich soils along the river corridor could be quite expensive and is not a decision to be taken lightly. Floodplains are naturally dynamic environments and healthy floodplains experience both sediment deposition and erosion. Floodplain soils are heterogeneous with deposits of varying ages and source compositions. Basing the decision about whether to remediate a particular reservoir-derived sediment deposit on a comparison to arsenic levels in adjacent soils seems subject to a high degree of uncertainty and luck of the draw (e.g. what particular portion of reservoir sediment ended up settling on top of what particular floodplain deposit). How will decisions be made about the definition "exceed" (e.g., does that mean that the average has to be 0.1% higher, or some greater threshold? What if any statistical tests will be used?) And how many samples will need to be collected and over what geographic area? There is definitely value in remediating truly contaminated soils that have arsenic concentrations substantially higher than ambient conditions, but is how will such thresholds be determined?

Response to Comment TR20-25
Comment noted. As described in Volume III Attachment 1 Section 3.2.5.7 *Water Quality – Potential Impacts and Mitigation – Inorganic and Organic Contaminants* Potential Impact 3.2-15, remediation is required only in instances where (1) there are visibly obvious sediment deposits that are consistent with physical sediment properties associated with Lower Klamath Project reservoir sediments (2) these are in agricultural or residential areas (with heightened ingestion potential) and (3) when these sediments have arsenic levels that are both higher than local background levels and exceed health residential screening levels. Please note that the State Water Board has revised Mitigation Measure WQ-3 to add additional reporting on and oversight of test methods and remediation in order to allow for appropriate tailoring of testing and remediation to the individual circumstance that arises.

Please refer to Volume III Attachment 1 Section 3.2.5.7 *Water Quality – Potential Impacts and Mitigation – Inorganic and Organic Contaminants* Mitigation Measure WQ-3 for the revisions.

Comment TR20-26
Page 3-397: Need to distinguish planktonic "Anabaena" which is now called Dolichospermum, from benthic forms still referred to as Anabaena.

Response to Comment TR20-26
Section 3.4.2.1 *Phytoplankton and Periphyton – Environmental Setting – Phytoplankton – Anabaena flos-aquae* has been revised to clarify that the EIR continues to use the *Anabaena* name for both planktonic and benthic species since *Anabaena* was more frequently used in the literature cited and it is still commonly used in descriptions of this species. Please refer to Volume III Attachment 1 Section 3.4.2.1 *Phytoplankton and Periphyton – Environmental Setting –Phytoplankton – Anabaena flos-aquae* for the revisions.

Comment TR20-27
Page 3-403: "Monitoring at multiple locations along the Middle and Lower Klamath River indicates that dissolved oxygen and pH patterns over a 24-hour period are driven primarily by photosynthesis and respiration of periphyton (Ward and Armstrong 2010, Asarian et al. 2015)." A citation of Genzoli and Hall (2016) should be added here (see comment above regarding page 3- I 35 for justification).

Response to Comment TR20-27
Section 3.4.2.2 *Phytoplankton and Periphyton – Environmental Setting – Periphyton* has been revised to clarify the relative influence of phytoplankton and periphyton on dissolved oxygen and pH in the Middle and Lower Klamath River. Please refer to Volume III Attachment 1 Section 3.4.2.2 *Phytoplankton and Periphyton – Environmental Setting – Periphyton* for the revisions.

Comment TR20-28
Page 3-413: "Nuisance blooms ofperiphyton have not been documented in the riverine portions of the Hydroelectric Reach. In the J.C. Boyle Peaking Reach, it has been noted that periphyton tends to be absent from the margins of the river that are alternately dried and wetted during peaking operations (E. Asarian, pers. comm., 2011)." We recommend that the end of this sentence be re-structured with different references, so that it ends with "periphyton tends to be absent from the margins of the river that are alternately dried and wetted during peaking operations (Karuk Tribe 2006), due to reasons described by PacifiCorp (2005)". Note that the PacifiCorp (2005) report is unavailable online but we have it in our files; please contact us if you need a copy.

Response to Comment TR20-28
Section 3.4.2.3 *Phytoplankton and Periphyton – Environmental Setting – Hydroelectric Reach – Periphyton* has been revised to clarify that the lack of periphyton along the margins of the J.C. Boyle Peaking Reach is due to turbid conditions that limit light availability for photosynthesis, high water velocities that limit establishment and growth of periphyton, and the variable flow regime that causes cycles of drying and rewetting. Please refer to Volume III Attachment 1 Section 3.4.2.3 *Phytoplankton and Periphyton – Environmental Setting – Hydroelectric Reach – Periphyton* for the revisions.

Comment TR20-29

Page 3-431: This sentence suggests that river growth of BOA is causing exceedances:

"Some phytoplankton growth may still occur after dam removal in calm, slow-moving habitats along shorelines and protected coves and backwaters during low-flow periods in the Middle and Lower Klamath River, but these habitats already support growth of blue- green algae, including Microcystis aeruginosa, that results in occasional exceedances of 2016 CCI-IAB secondary thresholds and WHO guidelines (Falconer et al. 1999; Kann et al. 2010; State Water Board et al. 2010, updated 2016; Genzoli and Kann 2016, 2017)."

It is not likely that these slow-moving and backwater areas support growth of blue-green algae, but rather are sites where upstream sources accumulate as slowed velocity allows them to settle or become trapped in vegetation. Thus, the exceedances currently detected in such areas would decrease with dam removal. There is no evidence that we are aware of for actual growth of planktonic cyanobacteria in the Middle and Lower Klamath.

Response to Comment TR20-29

Section 3.4.5.1 *Phytoplankton and Periphyton – Potential Impacts and Mitigation – Phytoplankton* Potential Impact 3.4-2 has been revised to clarify blue-green algae and microcystin entrapment and accumulation in backwater areas of the Klamath River from upstream sources. Please refer to Volume III Attachment 1 Section 3.4.5.1 *Phytoplankton and Periphyton – Potential Impacts and Mitigation – Phytoplankton* Potential Impact 3.4-2 for the revisions

Comment TR20-30

Page 3-717. This section mentions that the DEIR's method for estimating methane emissions from Klamath Hydroelectric Project reservoirs was adapted from Karuk Tribe's (2006) comments which multiplied the reservoirs' area by areal emissions rates from reservoirs around the world with similar water quality characteristics. The Karuk Tribe's estimates were the best information available at that time, but there is now new information available including a global synthesis (Deemer et al. 2016) and field measurements of methane emissions available from J.C. Boyle Reservoir and Keno Reservoir (Harrison et al 2017) using methods from Deemer et al. (2011). We also encourage SWRCB to consider incorporating these recent studies into the EIR.

Response to Comment TR20-30

This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Greenhouse Gas Emissions and Energy*).

Comment TR20-31
During our review of the DEIR we noticed a few minor/insignificant errors, which we present in this separate list to avoid cluttering our other comments.

Response to Comment TR20-31
Comment noted. This comment indicates that a few minor/insignificant errors were noticed, and are provided in comments below.

Comment TR20-32
Page 2-98: "Microcystin [-Producing Blue-green Algae] Cell Count" is odd phrasing that doesn't match the conventions used in the rest of the DEIR. Should be '"Microcystin-Producing Blue- green Algae Cell Count"?

Response to Comment TR20-32
Section 2.7.8.7 *Proposed Project – Proposed Project – Other Project Components – Water Quality Monitoring and Construction BMPs* summarizes the Klamath River Renewal Corporation (KRRC) Proposed Water Quality Monitoring Plan included in the Proposed Project (see Volume II Appendix B: *Definite Plan – Appendix M*). In the Proposed Project Water Quality Monitoring Plan, one parameter to monitor is called "Microcystin Cell Count", but this is likely a typo because microcystin is only chemical compound that does not have a cellular structure that can be counted. It is assumed that the "Microcystin Cell Count" parameter is meant to refer to microcystin-producing blue-green algae cell counts, a commonly measured blue-green algae parameter. Thus, Section 2.7.8.7 *Proposed Project – Proposed Project – Other Project Components – Water Quality Monitoring and Construction BMPs* Table 2.7-18 (page 2-98) lists the parameter name as specified in the Proposed Project Water Quality Monitoring Plan, but it uses brackets [ ] to clarify what the parameter name actually means (i.e., microcystin-producing blue-green algae cell counts).

Comment TR20-33
Page 3-35: The last sentence on this page references the wrong figure regarding chlorophyll-a (should be Figure 3.2-5, not Figure 3.2-25).

Response to Comment TR20-33
Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* has been revised to clarify the refence to Figure 3.2-5, which originally incorrectly referred to Figure 3.2-25. Please refer to Volume III Attachment 1 Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* for the revision.

Comment TR20-34
page 3-58: "the clarity or murkiness of the water causes by small particles" should be "the clarity or murkiness of the water caused by small particles"

Response to Comment TR20-34
Section 3.2.3.1 *Water Quality – Significance Criteria – Thresholds of Significance – Suspended Sediments* has been clarified as requested. Please refer to Volume III Attachment 1 Section 3.2.3.1 *Water Quality – Significance Criteria – Thresholds of Significance – Suspended Sediments* for the revision.

Comment TR20-35
Page 3-137: "Microcystis aeruginosa" should be italicized at line bottom of the page

Response to Comment TR20-35
Section 3.2.5 *Water Quality – Potential Impacts and Mitigation – Chlorophyll-a and Algal Toxins* Potential Impact 3.2-12 has been clarified as requested. Please refer to Volume III Attachment 1 Section 3.2.5 *Water Quality – Potential Impacts and Mitigation – Chlorophyll-a and Algal Toxins* for the revision.

Comment TR20-36
Page 3-717: This page cites Appendix N for greenhouse gas emissions, but it should actually be Appendix O instead?

Response to Comment TR20-36
This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Greenhouse Gas Emissions and Energy*).

Shasta Indian Nation, Chair Janice Crowe, Sami Jo Difuntorum

Comment TR23-1
Thank you for the opportunity to comment on the California State Water Resource Control Board's Draft Environmental Impact Report (DEIR) for the Lower Klamath Project License Surrender (Project). Our comments will focus on Tribal Cultural Resources and other Project activities under consideration as they pertain to Tribal Cultural Resources.

The Shasta Indian Nation's membership is comprised principally of the Shasta Indian descendants who were impacted by the construction of the Copco No. 1 Dam. Our ancestors owned property that was taken by eminent domain for its construction. Although the Federal government arranged for our Tribe to live on land nearby, this dam's construction disrupted our community in significant ways. Some of our traditional villages, burial grounds, and fishing sites were inundated by rising waters and remain submerged today. Ongoing dam operations have impacted our Tribe's ability to access sacred places for prayers and ceremonies. One of our most sacred places known as K'uč'ux·warax in our language and which we sing about in our prayer songs, is oil limits to us.

Our ancestors cried when the Copco No. 1 Dam was constructed. They knew how devastating it would be to the lives of our people and to our Tribe. One of our elders died as she was removed from her home. There is no way to turn back time and to mitigate these impacts.

The Project now proposes the decommissioning and removal of four dams (J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate) and associated facilities, to re-establish a free-flowing Klamath River. The dam's removal will also result in significant impacts to our now inundated villages, burial grounds, fishing sites, and sacred places, as well as to non-inundated Tribal Cultural Resources located within the Project area.

Response to Comment TR23-1
The potential for impacts to tribal cultural resources due to the Proposed Project is analyzed in Section 3.12 *Historical Resources and Tribal Cultural Resources*. As noted in this section, the Shasta Indian Nation requested consultation under AB 52 and met with the State Water Board and the Klamath River Renewal Corporation (KRRC) in a series of confidential consultation meetings within the timeframe of February 2017 through October 2018. The consultations with the Yurok Tribe and the Shasta Indian Nation resulted in identification of potentially-impacted resources, articulation of potential impacts, and development of, and agreement on, specific mitigation measures (see Section 3.12.5.1 *Potential Impacts to Tribal Cultural Resources*, TCR-1 through TCR-8). Please refer to Volume III Attachment 1 for the final Section 3.12 *Historical Resources and Tribal Cultural Resources.*

State Water Board staff have valued the information and perspectives shared by the Shasta Indian Nation during consultation. Information shared by the Shasta Indian Nation has assisted the State Water Board in understanding the scope, scale, and significance of Shasta Indian Nation tribal cultural resources located in the Proposed Project area. Details on our consultation process have been included in Volume I Confidential Appendix Q and distributed to the Shasta Indian Nation.

Comment TR23-2
The California State Water Resource Control Board's DEIR finds that this Project will result in significant and unavoidable impacts to Tribal Cultural Resources. We support this finding. The Shasta Indian Nation also concurs with the proposed DEIR that these impacts include:

1) Pre-dam-removal activities that involve disturbance of the landscape, including construction or improvement of associated roads, bridges, water supply lines, staging areas, disposal sites, hatchery modifications, recreation site removal and/or development, and culvert construction and improvements that could result in potential exposure of or damage to known Tribal Cultural Resources through ground-disturbing construction and disposal activity and increased access to sensitive areas;

2) The drawdown of Iron Gate, Copco No. 1, and Copco No. 2 reservoirs that could result in shifting, erosion, and exposure of known or unknown, previously submerged Tribal Cultural Resources;

3) The removal of Iron Gate, Copco No. 1, and Copco No. 2 Dams that could result in physical disturbance to known Tribal Cultural Resources from blasting or other removal techniques;

4) Ground disturbance associated with reservoir restoration, recreation site removal and/or development, and disposal site restoration could physically disturb known Tribal Cultural Resources;

5) Increased potential for looting of Tribal Cultural Resources during Project activities;

6) Exposure of or disturbance to Tribal Cultural Resources following reservoir drawdown and prior to vegetation establishment/full stabilization of sediment deposits; and

7) Increased looting opportunities and surface and subsurface erosion of Tribal Cultural Resources over the long-term.

To address these impacts, a comprehensive mitigation plan has been proposed in the DEIR. These measures have been developed in consultation with affected Tribes including the Shasta Indian Nation. These measures include:

1. The development and implementation of a Tribal Cultural Resources management plan

2. The development and implementation of a looting and vandalism prevention program.

3. The development and implementation of inadvertent discovery program.

4. Acknowledgement that the transfer of Parcel B and other lands, the ultimate disposition of which is determined through KHSA Section 7.6.4., to tribal ownership and control will foster tribal cultural conservation practices, promote tribal identity and begin to address the impacts of the past disturbances of Tribal Cultural Resources caused during construction of Iron Gate Dam, Copco No. 1 Dam, and Copco No. 2 Dam and the associated reservoirs, and to mitigate the impacts to Tribal Cultural Resources during and following Project implementation.

5. To create an endowment for post-project activities related to Tribal Cultural Resources protection.

The Shasta Indian Nation supports and endorses these mitigation measures strongly, which were developed in consultation. Should the Klamath River Renewal Corporation implement the mitigation measures as they are currently written, the significant impacts to Tribal Cultural Resources caused by decommissioning and removing the dams and associated facilities will be mitigated successfully.

Response to Comment TR23-2
Thank you for your comment concurring with Shasta Indian Nation tribal cultural resource impacts and mitigation measures listed in Volume I Section 3.12 *Historical Resources and Tribal Cultural Resources*.

Comment TR23-3
Additionally, the California State Water Resource Control Board's DEIR identified a final recreation plan as a requirement for the proposed Project. The Shasta Indian Nation has ongoing concerns about post-dam removal recreation plans that have been developed for the Project without tribal consultation. The Shasta Indian Nation opposes the proposed "Copco Valley" Recreation Site (#5) because it will result in new negative impacts to Tribal Cultural Resources caused by earthwork and grading as well as increased access to the immediate area. The proposed DEIR mitigation measures are inadequate to address new adverse impacts that will result from the siting and construction of this proposed recreation site. There may also be negative impacts to Tribal Cultural Resources at the proposed "Fall Creek Boat Launch" Recreation Site (#6). We understand that a recent proposal moves the launch 1/3 mile downstream from the original site. Moving the launch site downstream past the confluence of Fall Creek will lessen the possibility of impact.

Response to Comment TR23-3
Section 3.12.5 *Historical Resources and Tribal Cultural Resources – Potential Impacts and Mitigation* Potential Impact 3.12-5 includes consideration of ground disturbance associated with recreation site removal and/or development that could physically disturb known Tribal Cultural Resources. Neither the Klamath River Renewal Corporation's (KRRC) Definite Plan nor the most recent water quality certification application, received December 2, 2019, identify the specific sites referenced in the comment; however, regardless of whether these sites or different sites were to be developed as new recreation sites under the Proposed Project, the KRRC would be required to implement Mitigation Measures TCR-1 (Tribal Cultural Resources Management Program [TCRMP]), TCR-2 (Looting and Vandalism Prevention Program [LVPP]), TCR-3 (Inadvertent Discovery Program [IDP]), and TCR-4 (Endowment) to reduce these impacts considerably, and, for most resources to avoid impacts completely. Further, as stated in Potential

Impact 3.12-5, the impact would remain significant and unavoidable. Please refer to Volume III Attachment 1 for the final Section 3.12 *Historical Resources and Tribal Cultural Resources.*

As listed in Mitigation Measure TCR-1, the KRRC shall develop, in consultation with Affected Tribes, a Historic Properties Management Plan (HPMP), which would include the development of a TCRMP. In part, the TCRMP shall include site-specific mitigation measures for potentially affected Tribal Cultural Resources (TCR). The TCRMP shall provide for ongoing consultation or site-specific mitigation refinement with the relevant Affected Tribe(s) with a traditional and cultural affiliation to an impacted TCR, as appropriate and feasible consistent with the schedule for Project implementation.

Though no Recreation Plan has been provided to the State Water Board, the above site-specific mitigation and consultation requirements of the TCRMP would be required for TCRs potentially affected by any new proposed recreation site.

Comment TR23-4

We welcome opportunities to engage in ongoing consultation and dialogue with the California State Water Resource Control Board and with the Klamath River Renewal Corporation about the Project. We gratefully acknowledge the California State Water Resource Control Board's good faith interest in the protection of the Shasta Indian Nation's Tribal Cultural Resources throughout this process consistent with the requirements under the California Environmental Quality Act. Please feel free to contact either me or Sami Jo Difuntorum, Tribal Cultural Resources Coordinator, for any questions or additional matters.

Response to Comment TR23-4

Thank you for your comment. State Water Board staff has valued the time and efforts invested by the Shasta Indian Nation during the consultation process.

Shasta Nation, Chairman Roy Hall

Comment TR24-1

I will be quoting some of the materials that have been submitted and commenting on each.

The next statements in Quotes are misleading and/or False and should be looked at carefully or removed from the Draft EIR.

Response to Comment TR24-1

Thank you for your comments. The structure of comment letter noted.

Comment TR24-2

Regarding: "Volume 1, 3. 12-15 December 2012. Establishment of the Klamath Tribes Interim Fishing Site could result in impacts/effects of Trust Resources and other Traditional used resources."

Comment 1

The fishing site in question located between Iron Gate and Federal Interstate highway 5 (I-5).

The area designated is wholly within the aboriginal lands of the Shasta Nation and its establishment is unacceptable. If the Klamath tribe believe that taking the dams out will 'make the fish return' to their lands then why would they ask for fishing sites below the dams?

In Pre-contact times the Klamath tribe asked permission to come onto Shasta lands to fish. They did so because the fish were met with natural barriers and hotsprings and NEVER traveled up the Klamath River into the Klamath Tribes lands.

The Klamath Tribes did not protest the dams. They were offered fish ladders but refused because the fish would still not be able to get up the river past the hot springs to their lands. Trucking fish up stream was also declined because the river is a hostile environment for spawning and immature fish.

Response to Comment TR24-2

Please see Section 3.12.2.1 *Historical Resources and Tribal Cultural Resources – Environmental Setting – Tribal Cultural Chronology and Ethnography (including Historic and Pre-Historic Periods) – Northern Interior California Culture Area – Ethnography – Shasta People* for the EIR's description of Shasta aboriginal lands, informed by consultation with the Shasta Nation under AB 52. Please refer to Volume III Attachment 1 for the final Section 3.12 *Historical Resources and Tribal Cultural Resources*. Please note that the material referenced by the commenter is from the USBR's 2012 document that analyzed dam removal in combination with other actions. The Proposed Project does not include establishment of a Klamath Tribes fishery below Iron Gate Dam, which was part of the now-expired Klamath Basin Restoration Agreement (KBRA). Additionally, regarding historic salmonid abundance, please refer to AQF-4.

Comment TR24-3

Regarding: "Appendix V KHSA 2012 EIS/EIR Section 3.12 Tribal Trust December 218 Volume II (Page:Vol, 3.12-16 December 2012)

3.12.3.2 Quartz Valley Community

3.12.3.2.1 Quartz valley Community History.

Quartz Valley Community History. Most of the Quartz valley Community's Tribal Members are descendants of people of Karuk Ancestry, although a few tribal members are also of Shasta Ancestry."

"(Therefore, their cultural traditions are similar to those described in the Karuk section of this report.)"

Comment 2

The two tribes do not have the same customs or cultures. Shasta's had rules and structure. The Karuk tribe lived a life without structure or laws. Prior to contact time, the Shasta did not interact with the Karuk unless absolutely necessary.

Response to Comment TR24-3
Please note that the appendix referenced in this comment is reprinted from the USBR's 2012 document. The following text changes have been made to clarify the history of the Quartz Valley Indian Community (Volume I page 3-799).

"Quartz Valley Indian Community
The Quartz Valley Community is a federally recognized tribe mainly representing people of Karuk and Shasta ancestry, with 174 acres of reservation lands in the Scott Valley, near Fort Jones, California. Karuk cultural history is described in Section 3.12.2.1 *Tribal Cultural Chronology and Ethnography (including Historic and Pre-Historic Periods) – Northwest California Culture Area – Ethnography –* Karuk (pages 3-798 to 3-799), and Shasta cultural history is described in Section 3.12.2.1 *Tribal Cultural Chronology and Ethnography (including Historic and Pre-Historic Periods) – Northern Interior California Culture Area – Ethnography – Shasta People* (pages 3-794 to 3-797). ~~Their cultural history is similar to that described for the Karuk, as most members are of Karuk ancestry (Appendix V – 2012 KHSA EIS/EIR *Section 3.12 Tribal Trust*).~~ The Quartz Valley Indian Community's reservation lands are located near the community of Fort Jones. The Quartz Valley Indian Community initially filed their constitution and bylaws with the Office of Indian Affairs in 1939 (DOI 1939)."

Please also refer to Master Response GEN-2.

Comment TR24-4
"The Quartz valley Community is a federally recognized tribe representing people of middle Klamath (Karuk) and Shasta Indian ancestry."

Comment 3

Quartz Valley is a Reservation that was created by the sole efforts of Fred Wicks, a Shasta Indian.

The reservation was established for the Shasta Indians who lived in Scott and Shasta Valleys and for the Shasta Indians on the upper Klamath. (Upper Klamath refers to the Shasta Indian on the mid river. It does not mean 'upriver' as the Karuks call themselves). Karuks were allowed to become members of Quartz Valley because they were homeless and there were allotments available. That does not make them aboriginal to Scott Valley.

Response to Comment TR24-4
Please refer to Master Response GEN-2.

Comment TR24-5
"Some tribal members are descendants of the same tribal leaders that signed the unratified 1851 Treaty 'R' negotiated between Indian agent Redick McKee and Indian inhabitants of Scott valley and the upper Trinity and Klamath Rivers."

Comment 4

Very misleading and incorrect. Only Shasta Indians signed Treaty "R" in Scott Valley. The Karuk tribe signed their own treaty down the River near the mouth of Salmon River. (The Karuk's treaty is Treaty Q/Supplement to 'the aforementioned treaty' signed by the Hoopa and Yurok)

Response to Comment TR24-5
Please note that the appendix referenced in this comment is reprinted from the USBR's 2012 document. Please refer to Master Response GEN-2.

Comment TR24-6
Comment 5

Everything in this EIR re: Quartz Valley Shasta Reservation IS FALSE AND MUST BE DELETED.

'Refer to the Karuk History to learn about the Shasta Indians' is an insult to the separate customs, cultures and heritage the tribes fight hard to preserve.

You have an excellent document in your possession to explain/ reveal the Shasta Nation history. The History of the Shasta by Brian Daniels. Use it.

Response to Comment TR24-6
Please refer to Master Response GEN-2. Section 3.12.2 *Historical Resources and Tribal Cultural Resources – Environmental Setting –Tribal Cultural Chronology and Ethnography (including Historic and Pre-Historic Periods) – Northern Interior California Culture Area – Ethnography – Shasta People* provides a description of the Shasta People, which includes information obtained from Daniels (2006). Please refer to Volume III Attachment 1 for the final Section 3.12 *Historical Resources and Tribal Cultural Resources.* Additional information

on the Shasta People was also included in Volume II Confidential Appendices P and Q, which also incorporate information obtained from Daniels (2006).

The following text changes have been made to clarify the history of the Quartz Valley Indian Community (Volume I page 3-799).

"Quartz Valley Indian Community
The Quartz Valley Community is a federally recognized tribe mainly representing people of Karuk and Shasta ancestry, with 174 acres of reservation lands in the Scott Valley, near Fort Jones, California. Karuk cultural history is described in Section 3.12.2.1 *Tribal Cultural Chronology and Ethnography (including Historic and Pre-Historic Periods) – Northwest California Culture Area – Ethnography –* Karuk (pages 3-798 to 3-799), and Shasta cultural history is described in Section 3.12.2.1 *Tribal Cultural Chronology and Ethnography (including Historic and Pre-Historic Periods) – Northern Interior California Culture Area – Ethnography – Shasta People* (pages 3-794 to 3-797). ~~Their cultural history is similar to that described for the Karuk, as most members are of Karuk ancestry (Appendix V – 2012 KHSA EIS/EIR *Section 3.12 Tribal Trust*).~~ The Quartz Valley Indian Community's reservation lands are located near the community of Fort Jones. The Quartz Valley Indian Community initially filed their constitution and bylaws with the Office of Indian Affairs in 1939 (DOI 1939)."

Comment TR24-7
Comment 6

The Shasta Nation has worked with and submitted information and relevant laws and California statutes directly related to the issues of dam removal, The Shasta Nation has been met either silence on all issues with no responses, resulting in default and dishonor. The dishonorable practice of KRRC inviting and involving any and all alien tribes to get a favorable consensus to move forward without Shasta Nation consent is biased and racist. Any and all tactics are acceptable as the Shasta Nation's Constitutional rights, Customs, Culture and Tribal Sovereignty is not recognized or respected.

To address these biases, and racist attitudes and actions, we must revisit these issues to comply with working with the appropriate Native American Indian Tribe, Tribes.

Response to Comment TR24-7
The State Water Board appreciates the consultation with the Shasta Nation that has informed the EIR. The comment raises concerns with consultation, with the legality of the dam removal proceedings and with the Klamath River Renewal Corporation's (KRRC's) tribal outreach and involvement. These comments are noted. Please note that CEQA documents analyze significant effects on the physical environment. (CEQA Guidelines, § 15131(a).)

Comment TR24-8
Comment 7

The Shasta Nation is in support of clean, renewable, hydro power, rule of law, protecting property rights, and affordable power rates.

The Shasta Nation supports Siskiyou County Supervisors, Siskiyou water users, and other local agencies and organizations who support re-licensing and keeping the dams on the Klamath River.

Response to Comment TR24-8
Please refer to Master Response GEN-1. Please also refer to Master Response ENR-1 for a discussion of power rates. With respect to renewable hydropower, please note that this comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Greenhouse Gas Emissions and Energy*).

In relation to the comment's reference to the rule of law and property rights please refer to Volume I Section 1.1 *Introduction – Authorization, Purpose and Use of EIR* (page 1-1) and to Volume I Section 2.8 *Proposed Project – Intended Uses of the EIR* (pages 2-110 to 2-111).

Comment TR24-9
Comment 8

The Shasta Nation would like to see curtailing excessive off shore salmon fishing and unsupervised salmon take by tribes down river. Those two activities have a great impact on the returning salmon count. They deplete our returning salmon population and decimates the ability of the few returning fish to spawn and increase the amount of salmon produced by the river.

Tribal tradition on the Klamath River is constantly being pushed in the comments. It was necessary, if all the Indians were to have plenty of salmon for food and spawning, and was strictly adhered to by ALL the tribes.

Each tribe (Yurok, Karok, Shasta) had people watch the salmon come up the river. When enough fish had gone by for the villages and tribes up the river, and for spawning, then, and only then, did the tribes start to take their share of the salmon run.

Response to Comment TR24-9
Commercial and tribal ocean and in-river fisheries are regulated by the Pacific States Marine Fisheries Commission (PSMFC). The PSMFC is an interstate compact agency that helps resource agencies and the fishing industry sustainably manage Pacific Ocean resources. Managing, or curtailing, harvest of salmonids does not address water quality concerns related to the Lower Klamath

Project facilities, or address the migration barriers these facilities present. As described in Volume I, Section 4.1 Alternatives – *Alternatives Selection Overview* (page 4-1) an alternative that does not address the underlying purpose of the proposed project is not a feasible alternative. Further, fisheries management is not under the purview of the Klamath River Renewal Corporation, is not a part of the Proposed Project, nor is it part of the Klamath Hydroelectric Project (KHP). Therefore, such management was not evaluated as a feasible alternative in the EIR.

Yurok Tribe, Vice Chairman Franklin Joseph Myers, Michael Belchik

Comment TR19-1

The Yurok Tribe hereby provides comments on the December 2018 Public Review Draft of the Environmental Impact Report for the Lower Klamath Project License Surrender (DEIR). As you know, the Klamath River is the axis around which Yurok cultural and spiritual beliefs and practices are centered. The Yurok Tribe is the largest California Tribe. The Yurok Reservation straddles the lower 45 miles of the Klamath River, for a mile on each side providing the Yurok Tribe with regulatory authority over the lands and river within the Reservation. The Tribe maintains senior water and fishing rights on the River. For the Yurok Tribe, there is no other river; no alternatives exist with regard to the restoration of the Klamath River. We have long believed that restoring the river is necessary and for true restoration to take place, landscape-scale actions must be implemented, including removal of the four dams along the mainstem river. We appreciate the Board's insights and creative thinking on how to mitigate the short-term impacts to the river so that the long-term benefits of dam removal and river restoration can be realized.

Response to Comment TR19-1

Thank you for your comments regarding river restoration and its importance to the Yurok Tribe.

Comment TR19-2

The Yurok Tribe fully supports the full removal alternative as described in the DEIR as well as the partial removal alternative as long as the river itself is restored to a free-flowing condition and any serious environmental impacts by remaining structures are adequately addressed. Years of study have led to a comprehensive understanding of the potential impacts of this project and we are past the time for additional studies—it is now time for action.

Response to Comment TR19-2

Please refer to Master Response GEN-1.

Comment TR19-3

In general, we support the impacts analyses and believe that sufficient study and analysis has happened to support moving forward with dam removal on an aggressive time schedule.

Response to Comment TR19-3
Comment noted. The comment refers to the sufficiency of the EIR analysis.

Comment TR19-4
We offer the following comments with regard to these specific areas:

- *Tribal Cultural Resources and the Fate of the Parcel B Lands*
- *Water Quality*
- *Restoration and Construction Activities*
- *Fisheries and Aquatic Resources*
- *Emergency Response*

Response to Comment TR19-4
The specific concerns raised are addressed below in responses to comments TR19-EMAIL-5 through TR19-EMAIL-16.

Comment TR19-5
One of the Yurok Tribe's most serious concerns has to do with the ultimate fate of the Parcel B lands as they become exposed when the reservoirs are drained.

The Yurok Tribe does not support mitigation measure seven regarding land transfer and recommends the mitigation measure be stricken from the document. The measure regards lands referred to as "parcel B" in the Klamath Hydroelectric Settlement Agreement ("KHSA"), Section 7.6.4 and identifies that the Shasta Indian Nation has proposed to transfer the lands to the Kikaceki Land Conservancy. The proposal is included in the mitigation measure for analysis in the Environmental Impact Report. The mitigation measure does not disclose details of the Shasta Indian Nation's proposal such as location of the lands or amount of acreage.

As the Yurok Tribe has previously expressed, it is inappropriate for the State Water Board to include this proposal in the Environmental Impact Report as: 1) doing so potentially circumvents the process in KHSA Section 7.6.4, 2) the record before the State Water Board is incomplete with respect to other tribal entities that may have traditional or cultural ties to the lands, and 3) the details of the proposal are confidential which prohibits other entities from determining whether the proposal has negative impacts on their legal rights. While Yurok acknowledges the mitigation measure does not undue the process in KHSA Section 7.6.4, it does give the proposal preferential treatment and an unfair advantage over other proposals by completing environmental work required for transfer. The Yurok Tribe recommends the reference to the proposal be stricken from the document.

Instead, the State Water Board should defer mitigation and any predetermination of the fate of these lands to a future time as prescribed in the KHSA 7.6.4. If

proposals come forward in the future regarding the fate of these lands, a separate environmental analysis could then be conducted.

Response to Comment TR19-5
Thank you for your comment. The State Water Board notes that the Yurok Tribe has concerns regarding the land transfer mitigation measure, and that land transfer presents a sensitive issue.

The EIR's analysis of the disposition and transfer of Parcel B lands is at a general level since the specific impacts associated with the transfers and any future land uses remain uncertain, and subject to the process described in the Klamath Hydroelectric Settlement Agreement (KHSA 2010) Section 7.6.4..Please note that ultimate disposition of Parcel B lands, and specific environmental impacts from future land uses, are speculative at this point. The EIR provides a general analysis of broadly applicable construction-related impacts to water quality and terrestrial resources and assesses the availability of generally accepted best management practices as mitigation measures (e.g., Section 3.2.5.8 *Water Quality – Potential Impacts and Mitigation – General Water Quality* Potential Impact 3.2-18 and Volume I Section 3.5.5.3 *Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities* Potential Impact 3.5-28; please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*). Any specific proposal to alter Parcel B lands would require further assessment. Please note that CEQA guidelines provide for a categorical exemption from CEQA for land transfers for purposes of protecting natural, historical and archaeological resources.

During development of the Draft EIR, the State Water Board conducted formal AB 52 consultation with the Shasta Nation, Shasta Indian Nation, and Yurok Tribe. In consultation with the Shasta Indian Nation and the Klamath River Renewal Corporation (KRRC), it was agreed upon by all three parties that an appropriate mitigation to reduce impacts to Native American Tribal Cultural Resources associated with implementation of the Proposed Project could include the potential transfer of Project lands to Native American Tribal entities, and particular resources were identified for which land transfer might be appropriate as a mitigation measure. As with other confidential information regarding the location of tribal cultural resources, this information is not disclosed in the public portions of the EIR. Any decision regarding whether transfer of these lands is ultimately feasible in light of other land use needs – and to whom the land would be transferred – would be made through the process established in Section 7.6.4 of the Klamath Hydroelectric Settlement Agreement (KHSA 2010).

Mitigation Measure TCR-7 is similarly consistent with Section 7.6.4 of the KHSA (2010), and it provides for consideration of a range of potential real property instruments in the process for disposition of Parcel B properties. Neither it nor any other measure in this section of the EIR commits the KRRC to transfer specific portions of lands to specific Native American entities, or to adopt

conservation easements or other real property protections for any particular parcel. The process outlined in Section 7.6.5 of the KHSA (2010) provides for input from KHSA signatories and other potentially affected tribes on the ultimate disposition of Parcel B lands.

CEQA provides that real property mitigation measures should be considered and are available for mitigation for tribal cultural resources impacts. (Public Resources Code section 21084.3.) Further, CEQA provides for identification of mitigation measures in tribal consultation, and for inclusion of such measures in the EIR. (Public Resources Code sections 21080.3.2, 21082.3.).

Comment TR19-6

Additionally, the Yurok Tribe does have specific concerns with some of the language in the Tribal Cultural Resources section of the document, and we herein provide alternative language below that addresses these concerns. (See page 3-799). Language requested for deletion is in ~~strikeout type~~, language for addition is underlined, and comments notes for consideration are in ***Bold****. Plain text language is quoted from the DEIR.*

Yurok

Pilling (1978) summarizes ethnographic information regarding Yurok collected by Waterman (1920), Waterman and Kroeber (1934), and others. Sloan (2003, 2011) also presents a summary of the ethnography of the Yurok and the relationship to the tribe to the Klamath River. Yurok are members of the Algonquian language family. ~~Yurok ancestral territory extends along the Pacific coast of California from Crescent City in the north to Trinidad in the south and along the Klamath River from the coast to a point near the confluence of the Klamath andTrinity Rivers and the town of Weitchpec (Pilling 1978).~~ The Ancestral Lands of the Yurok Tribe extend unbroken along the Pacific Ocean coast (including usual and customary off-shore fishing areas) from Damnation Creek, its northern boundary, to the southern boundary of the Little River drainage basin, and unbroken along the Klamath River, including both sides and its bed, from its mouth upstream to and including the Bluff Creek drainage basin. Included within these lands are the drainage basin of Wilson Creek, the drainage basins of all streams entering the Klamath River from its mouth upstream to and including the Bluff Creek and Slate Creek drainage basins, including the village site at Big Bar (except for the drainage basin upstream from the junction of Pine Creek and Snow Camp Creek), and the Canyon Creek (also known as Tank Creek) drainage basin of the Trinity River, the drainage basins of streams entering the ocean or lagoons between the Klamath River and Little River (except for the portion of the Redwood Creek drainage basin beyond the McArthur Creek drainage basin and except for the portions of the Little River drainage basin which lies six miles up from the ocean). ***[NOTE: Cite the Yurok Constitution for consistency as the existing reference isn't correct.]*** *The Yurok Tribe's reservation currently consists of a strip of land beginning at the*

Pacific Ocean and extending upstream a mile along each side of the Klamath River for approximately 45 miles.

The Yurok life, language, ceremonies, society, and economy are linked with the Klamath River. There are Yurok stories that reinforce the Yurok belief that the River was created in a distinct way in order to provide Yurok people with the best of worlds (Sloan 2003, 2011). Yurok refer to the river as HeL kik a wroi or "watercourse coming from way back in the mountains." Contemporary Yurok often refer to the Klamath River as the "Yurok Highway" emphasizing its comparison to a blood vessel that provides the main flow of sustenance. Karuk, Yurok, and Hupa share similar cultural traits and traditional stories state that the Klamath River was created to facilitate their interaction with each other and with salmon

The Yurok had permanent settlements with substantial architectural features including houses, smokehouses, and storage facilities (Kroeber and Barrett 1910, Pilling 1978). ~~*Pilling (1978) cites 44 villages, 97 fishing spots, 82 significant cultural places (e.g., places used for ceremonies, gathering, and hunting), and 41 places of cultural significance along the Klamath River in Yurok territory*~~ ***[NOTE: Not an accurate count. Can keep sentence if numbers are removed or add a sentence that says a minimum of…The Tribe has documented over 70 villages in our ancestral territory]***

The Yurok represent a socially complex hunter-gatherer population in California (Fredrickson 1984, Kroeber 1925) that used marine and salmon resources. Organizing labor to capture the short-duration salmon runs, preserving fish by smoking, then packing and storing the fish suggests a high degree of sociopolitical differentiation.

There is also evidence of a maritime expression to Yurok culture involving marine mammal hunting more than 10 miles offshore. The most telling argument for an open- ocean maritime adaptation comes from the presence of the large amount of northern fur seal fauna in the Stone Lagoon midden. Jones and Hildebrandt (1995) argued that pinnipeds were extirpated early on shore by Native Americans, who then developed watercraft to hunt offshore.

The material culture of the Yurok people includes, to this day, dugout redwood canoes, split-plank houses, storage boxes, sweathouse pillows and stools, many fishing devices, baskets and leather, shell, straw and feather garments and ceremonial regalia.

Transportation along the rivers and streams is essential to Yurok ceremonial activity. One of the most important aspects of Yurok technology was the river- and ocean-going canoe or yoch, which were carved from selected redwood trees (Sloan 2003, 2011).

There are historic accounts of expeditions traveling up to 180 miles along the coast (Sloan 2003, 2011). A typical river canoe measured 16 to 20 feet in length and 3 to 4 feet in width. River canoes were customarily paddled and/or pushed with a long pole. Yurok technology and facilities do not only serve utilitarian functions, but also include ceremonial aspects of Yurok culture. For example, facilities, such as fishing weirs, were created specifically to signify the time of sacred ceremonies (e.g., the White Deerskin and Jump ceremonies).

Fishing places along the Klamath River are owned by individuals, families, or groups of individuals. Fishing places can be borrowed, leased, inherited, or bought and sold (Sloan 2003, 2011). Some ownership rights at fishing places depended on species of fish caught at the site, while others depended on the water level (i.e., individuals owned the right to fish at a place if the river was below or above a certain level). Yurok still recognize this traditional form of resource management and use of the river. Families and individuals continue to use and own rights to fishing places on the Klamath River.

Like the Karuk, the religious and ceremonial practices highlight the Yurok relationship to the Klamath River and its associated resources. Of particular importance were the Jump, White Deerskin, Boat, and Brush Dance ceremonies. The Jump and White Deerskin ceremonies were held in late fall to give thanks for food resources abundance collected during the year and to insure a continued abundance of food resources for the next year (Sloan 2003, 2011). Affluent individuals and religious leaders conduct most ceremonies, and wealthy individuals were expected to feed salmon to everyone attending the ceremonies.

The Boat Ceremony is part of the White Deerskin Ceremony. In this ceremony, several boats filled with participants travel down the Klamath River. The participants thank the river for continuing to flow and provide resources. The Brush Dance Ceremony unfolds over a ten day period and is for the healing of a sick child or individual. This ceremony highlights the importance of Klamath River resources to Yurok. For example, baskets made of plant materials collected at the water's edge are used to hold food and ceremonial medicine; acorns are cooked in the baskets using cooking stones gathered at specific river bars; ceremonial regalia is made from various plant and animals that live along the river; ceremonial bathing is performed; and participants listen to the sounds made by the Klamath River (King 2004).

The social and ceremonial significance of the Klamath River is evident in and reinforced by Yurok traditions. For example, there are at least 77 Yurok stories that make direct reference to the Klamath River (Sloan 2003, 2011). These Yurok stories reinforce the belief that the Klamath River was created to provide Yurok with a very good place to live.

Spanish explorers and vessels traveling from the Philippines interacted with Yurok along the coast in the late 1700s. ***[NOTE: Bodega visited the Village of***

Tsuri and the Vancouver expedition followed shortly after.] *Other explorers such as Peter Skene Odgen and Jedediah Smith certainly encountered Yurok along the Klamath River in the early 1800s. Regardless, Euro American settlement and use of Yurok territory did not begin until after the discovery of gold in California in early 1850. With strikes along the Klamath and Trinity rivers, gold prospectors inundated the region affecting Yurok traditional culture (Pilling 1978). In 1851 a "Treaty of Peace and Friendship" was signed between the United States Government and the Klamath River Indians, but the United States Congress did not ratify this treaty. Subsequently, on November 16, 1855, the Klamath River Reserve, also known as the Klamath Indian Reservation, was established by Executive Order. The Order designated the reservation lands from the mouth of the Klamath River, one mile on each side extending approximately 20 miles upriver to Tectah Creek (Sloan 2003, 2011).*

Escalating conflict between Yurok and Euro Americans during the 1860s and 1870s over encroachment onto the Klamath Indian Reservation resulted in the ~~gradual~~ attempted displacement of Lower Klamath Indians further upriver (Sloan 2003, 2011). Euro Americans on the reserve resisted attempts to remove them, including eviction in 1879 by the United States Army (Sloan 2003, 2011). After decades of struggle to keep their traditional homelands, the Yurok Tribe was re-organized and was granted its own reservation in 1988. As a result of the 1988 Hoopa-Yurok Settlement Act (PL-100-580), the Yurok Indian Reservation was established.

The ancestral lands of the Yurok Tribe extend unbroken along the Pacific Ocean coast (including usual and customary off-shore fishing areas) from Damnation Creek, its northern boundary, to the southern boundary of the Little River drainage basin, and unbroken along the Klamath River, including both sides to the associated tributary watershed boundaries from the mouth upstream to the Bluff Creek drainage basin. The Yurok Tribe considers cultural resources sites along and associated with the Klamath River to be part of a larger ethnographic riverscape (King 2004, Yurok Tribe 2012).

Sites include fishing areas; a fish dam (weir) site; many different types of resource gathering sites, complex trail systems that connect villages, camps, the river, ceremonial sites, gathering areas, and other Tribes; and 47 villages with graves/cemeteries.

The Yurok Tribe is the largest tribe in California, with over 6,200 enrolled tribal members and over 300 tribal government employees. The Yurok Tribe is actively pursuing economic development and management of fisheries, forestry, and cultural programs, both on the reservation and Yurok ancestral lands.

Resighini Rancheria: *The Resighini Rancheria is located on the southern banks of the Klamath River Estuary, surrounded by the Yurok Reservation. The Rancheria is composed of Indians relocated through the Homeless Indian Act*

which include some individuals with Yurok ancestry, ~~and has~~ other homeless Indians from central California.

NOTE: Major shifts in federal Indian policy at the national level during the late 19th century exacerbated the Indian problems in California. Passage of the General Allotment Act in 1887 opened part of the limited lands in California to non-Indian settlement. In 1905 the public was finally advised of the 18 unratified treaties. Citizens sympathetic to the economic and physical distress of California Indians encouraged Congress to pass legislation to acquire isolated parcels of land for homeless California Indians. Between 1906 and 1910 a series of appropriations were passed that provided funds to purchase small tracts of land in central and northern California for landless Indians of those areas. The land acquisitions resulted in what has been referred to as the Rancheria System in California.

Land known as the Resighini Rancheria was designated by Secretarial Order and was officially declared a reservation in 1939. In 1975, a group of Indians stood together and formally created a non-traditional form of government with a constitution and bylaws which was approved and ratified by the last Indian Commissioner Bruce Thompson from the Department of Interior of the United States. However, the disastrous flooding of 1964 (see also Figure 3.6-14) led to the temporary evacuation of Resighini Rancheria.

Today, the tribal government consists of a General Council with an elected Tribal Council to operate our governmental and private tribal affairs as well as represent the tribal needs of our small membership. The Tribal Council consists of five tribal members who are elected annually by staggered two-year terms of Chairman, Vice Chairman, Secretary, Treasurer and Councilperson. Their general membership serves on boards, committees, commission and corporations to assist the Tribal Council.

Response to Comment TR19-6

Section 3.12.2.1 *Historical Resources and Tribal Cultural Resources – Environmental Setting – Tribal Cultural Chronology and Ethnography (including Historic and Pre-Historic Periods) – Northwest California Culture Area – Ethnography – Yurok* has been clarified to include additional information that did not result in changes to the impact analysis, including clarification based on the comments provided . Please refer to Volume III Attachment 1 3.12.2.1 *Tribal Cultural Chronology and Ethnography (including Historic and Pre-Historic Periods) – Northwest California Culture Area –Ethnography – Yurok* for the revisions.

Comment TR19-7

The Yurok Tribe's Environmental Program (YTEP) has reviewed the document and does not have substantive comments except to say that they support the conclusions of the DEIR and the methods used. Most, if not all of our previous

concerns with regard issues related to water quality appear to have been resolved to the best of our knowledge.

Response to Comment TR19-7
Comment noted. The comment regards agreement with the conclusions and methods in the EIR's water quality analysis.

Comment TR19-8
With regard to proposed restoration activities and construction, the Yurok Tribe fully supports the Proposed Project as described in the Draft EIR document distributed on December 2018. The tribe specifically supports the following proposed actions listed in the DEIR and the Definite Plan Appendix H including:

- *Overall Project Implementation Schedule*
- *Reservoir Drawdown Schedule*
- *Road Access and Bridge Improvements*
- *Spoils and Staging Area Development*
- *Deconstruction Activities*
- *Sediment management during reservoir drawdown including Sediment Jetting*
- *All Restoration Actions within and outside the Reservoir Footprints including: Revegetation Seeding and Planting, Habitat Restoration and Enhancement Actions, Tributary and Floodplain Connectivity Actions, and Upland Restoration components.*

Response to Comment TR19-8
Comment noted. The comment relates to Volume II Appendix B: *Definite Plan – Appendix H*.

Comment TR19-9
Page 2-8: the storage volumes given for the various project facilities are misleading because much of it is dead storage which cannot be released under normal operations. Please revise table with available storage and dead storage.

Response to Comment TR19-9
Table 2.3-1 provides built storage capacity. Section 2.3 *Proposed Project – Existing Lower Klamath Project Features* Table 2.3-1 has been revised to include a footnote on "Reservoir storage volume" which clarifies that volumes reflect the total storage volume following dam construction, not just active storage. Please refer to Volume III Attachment 1 Section 2.3 *Proposed Project – Existing Lower Klamath Project Features* for the revisions.

Additionally, please refer to Volume I Section 3.8 *Water Supply/Water Rights* (pages 3-667–3-684), where the cumulative total active storage volume of the Upper Klamath Lake is discussed, which provides 98 percent of the active water storage in the Klamath watershed.

Comment TR19-10

Page 2-20: It should be noted that Article X (10) of the Klamath River Compact states that "To deprive any individual Indian, tribe, band or community of Indians of any rights, privileges, or immunities afforded under federal treaty, agreement or statute."

Response to Comment TR19-10

Comment noted. The timeline referenced presents examples of major events associated with water-related disputes in the Klamath Basin, and the short summaries are not intended to be comprehensive. Please also see Master Response CEQ-4, which provides additional information on the Klamath River Basin Compact.

Comment TR19-11

Not sure what purpose 2.6.1 serves, given that dam removal is only peripherally related to water management. Certainly the Yurok Tribe would add 1994 to the list of water conflicts where the Klamath River flows were taken down to less than 400 cfs at Iron Gate Dam. Recommend deleting entire section as needlessly controversial and not entirely relevant. A better approach might be to sum up from a 20,000 ft level "Water management in the Klamath Basin has been controversial in the past few decades with farm shortages, commercial salmon fishery failures and uncertainty and other effects all occurring frequently." Or something similar.

Response to Comment TR19-11

Volume I Section 2.6.1 *Proposed Project – Project Background – Water Conflicts in the Klamath River Basin* presents examples of major events associated with water-related disputes in the Klamath Basin and is not intended to be a comprehensive history of water use and/or management in the basin. The section provides relevant points of context for the Proposed Project and its objectives. Text has been added prior to introducing the timeline to further explain the reason for its inclusion. Please also note that the title for Section 2.6.1 of the EIR has been revised for clarity in Volume III. Please refer to Volume III Attachment 1 Section 2.6.1 *Proposed Project – Project Background – Water History in the Klamath River Basin* for the revisions.

Comment TR19-12

Page 2-67: even if coarser sediment is only 0.5% of the total of over 12,000,000 cu. yd. that's still over 60,000 yards of coarse sediment. This is an immensely important amount of sediment for macroinvertebrates and can be more easily mobilized than the current armored condition of the bed. Furthermore, fine sediment that does settle near the removal location is important to lamprey ammocoetes and other species.

Response to Comment TR19-12
Consistent with the comment, the potential effects of increased bedload supply and transport on channel bed elevations and grain size under the Proposed Project are described in Volume II Appendix F and summarized in Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 (pages 3-765 to 3-775). Effects of more natural sediment transport process on macroinvertebrates are specifically discussed in Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-20, and effects on Pacific lamprey are discussed in Potential Impact 3.3-11. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment TR19-13
Section 2.7.6.1 (page 2-78) currently reads: "percent of Bogus Creek flow during part of each year, especially during October, November, April, and May. In spring/early summer of 2014, Bogus Creek flows were insufficient to meet the proposed full water needs of the hatchery. These results may be due to the short duration of the dataset or drought conditions between 2013 and 2017 that may not represent long-term conditions. The KRRC proposes that if Bogus Creek flows are insufficient to meet minimum operational needs while balancing flow requirements in the creek, water reuse (recirculation) from the rearing raceways could be utilized. In addition to recirculation, early release of smolts (i.e., prior to April 1) may occur to reduce water use requirements in the hatchery. The effectiveness of recirculation and early smolt release would be studied to determine whether they could be used to meet minimum operational flow and water temperature needs in the hatchery given annual variations in Bogus Creek flow and water temperature during the early release period." Comment: The above statement should more clearly state what recirculation capacity will exist at the hatchery. It should also clearly state that the "early smolt release" option will only be used after exhausting Bogus Creek diversion and recirculation options. Due to competition with natural rearing fish in the Klamath River, release of smolts early should only be done as a last resort. The above text leaves too much latitude to use recirculation OR early release of smolts.

Response to Comment TR19-13
Volume I Section 2.7 *Proposed Project – Proposed Project* summarizes information provided in the KRRC's Fish Hathery Plan, found in Section 7.8 of the Klamath River Renewal Corporation's (KRRC's) Definite Plan (see Volume II Appendix B pages 273 to 294). The Fish Hatchery Plan provides additional detail on the potential need for early hatchery releases and constraints for using recirculation. It states: "CDFW and NMFS would establish numeric trigger thresholds to determine whether CDFW would release some or all fish early (e.g., Bogus Creek 24-hour average water temperature exceeds 18 to 19 degrees C; see Figure 7.8-3)." California Department of Fish and Wildlife (CDFW) would also utilize water reuse/recirculation to extend release dates when Bogus Creek flow is low, but water temperature is sufficient to recirculate in

the raceways without exceeding trigger thresholds. With regard to the potential for early hatchery releases, please refer to response to comment ORG46-68.

Comments on the KRRC's Hatchery Plan included in their Proposed Project should be directed to the KRRC.

Comment TR19-14

Page 4-17: Suggest inserting the following language. "In 2018 and continuing into 2019 , the Bureau of Reclamation has initiated formal consultation under the ESA for the operation of the Klamath Project. The resulting BiOp is expected to govern water operations for the next 10 years from implementation. Although the Bureau of Reclamation released its Biological Assessment in late December 2018 and has stated its intention to finish consultation by April 1, 2019, it is speculative to forecast what hydrology may result from implementation of the proposed action. NMFS and USFWS may either or both require modification of the proposed action in ways that are not foreseeable at this time. Therefore, this DEIR uses current hydrology as described in the previous few paragraphs.

Response to Comment TR19-14

In March 2019, the National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS) issued a final biological opinion (2019 BiOp) for the Klamath Irrigation Project that sets the current operational flow requirements for the Klamath River. Section 4.2.1.1 *No Project Alternative – Alternative Description* has been revised to clarify how the 2019 BiOp is considered in the EIR. Please also refer to Master Response HYD-1.

Comment TR19-15

Page 4-68: The Yurok Tribe does not agree that the probability of dam removal is low for the KHP. Iron Gate Dam, for example, has no emergency spillway, has recently been raised due to an increase in the maximum probable flood estimate, and the emergency drain tunnel has never actually been used. Because the tunnel and penstock have relatively low capacities, the bulk of large flood flows must pass over the spillway, which is located immediately adjacent to the face of the dam. If the spillway should fail (as happened on Oroville Dam) there is no emergency action that can save the dam from catastrophic failure. In fact, spillway failure nearly brought the dam down in the 1964 flood, after which the spillway was lined with concrete. This concrete lining, while it is presumably inspected, is vulnerable to failure as was seen in Oroville.

Response to Comment TR19-15

Volume I Section 4.2 *No Project Alternative* (pages 4-15 to 4-74) analyzes the No Project Alternative and describes the environment should the Klamath River Renewal Corporation's (KRRC's) Proposed Project to decommission the Lower Klamath Project not proceed. The EIR does not assess the probability of dam removal absent the Proposed Project.

Volume I Section 3.6.5.3 *Flood Hydrology – Potential Impacts and Mitigation – Risks of Dam Failure* Potential Impact 3.6-6 has been revised to clarify the discussion of risks of dam failure under existing conditions, during reservoir drawdown, and dam deconstruction; as well as the most recent (2019) Division of Safety of Dams ratings and hazard classifications for the three California dams. Please refer to Volume III Attachment 1 Section 3.6.5.3 *Flood Hydrology – Potential Impacts and Mitigation – Risks of Dam Failure* Potential Impact 3.6-6 for the revisions.

Comment TR19-16

The Tribe urges the State Water Board to reconsider its finding that the restoration of the free-flowing Klamath River will permanently decrease response ability for catastrophic fire. Although reservoirs provide more options for emergency aerial water tanker response, this is a very small portion of the overall response to fire danger. Safe evacuation routes (which will be left in an improved state due to necessary upgrades for demolition activities), fuels management, and a host of other factors go into this determination. We believe that other activities (a renewed focus on fuels management, for example) can offset the loss of flatwater areas for refilling aerial tankers. It is also possible for restoration projects to deliberately include off-channel areas suitable for filling water buckets via helicopter

Response to Comment TR19-16

Volume I Section 3.21.5 *Hazards and Hazardous Materials – Potential Impacts and Mitigation* Potential Impact 3.21-8 (pages 3-1051 to 3-1054) acknowledges that water for fighting wildfires could be obtained from the Klamath River, Lake Ewauna, and Upper Klamath Lake, and that there is the potential to ameliorate the impact by, for example, providing replacement water sources.

Wildfire risk is complex, multifaceted and highly unpredictable. The State Water Board acknowledges that to the extent Project-related road improvements improve area roads, this improvement has the potential to improve ground fire response and evacuation in some situations. Any such improvement would depend on the particularities of the wildfire, the road improvements and the response, and cannot be quantified. The EIR's conservative assessment errs on the side of disclosure: "where suitable replacement water sources cannot be identified in close proximity to a fire in a location for which the reservoirs would otherwise have been the nearest water source, long-term impacts to the public's risk of loss from wildfires remain significant and unavoidable." Such a conservative approach remains appropriate in light of the number of houses abutting Very High Fire Hazard Severity Zones surrounding the currently existing reservoirs.

Improved fuel management in the basin post-dam removal, as suggested in the response, is not a feasible mitigation measure as there is no articulated path for

developing, funding and implementing such a plan, and in light of federal preemption.

Please note, on December 3, 2019, the Klamath River Renewal Corporation (KRRC) filed an updated water quality certification application with the State Water Board that identifies that the KRRC will develop an updated Fire Management Plan with the intent to avoid a material net increase of fire risk as compared to baseline conditions in the Project area, and to enhance both short and long-term fire prevention, detection, and suppression in the Klamath River Basin. These commitments improve the likelihood that the risk conservatively identified in the EIR will be eliminated. However, due to the ongoing nature of the analysis to support the ultimate fire risk maintenance and reduction goals of the Fire Management Plan, in combination with federal preemption, the State Water Board does not rely on this commitment to change the significance determination.

Please also refer to Master Response HAZ-2 and CEQ-2.

Comment TR19-17

The Yurok Tribe has reviewed the DEIR and has found it to be a thorough and sound document, above comments notwithstanding. The DEIR appropriately uses the voluminous material generated in previous environmental analysis efforts for the FERC relicensing itself as well as the Secretarial Determination EIS that was a product of the first version of the KHSA.

The full dam removal project, as well as the partial removal alternative, would be the largest fisheries restoration project in the history of the United States, and would represent a major boost to the economy of the west coast. It is also a very important step toward protecting the Yurok Tribe's federally reserved fishing rights. Additionally, this type of landscape-scale restoration effort is essential for providing for diverse Tribal, farming, and environmental interests to peacefully coexist in the Klamath Basin. We urge the timely implementation of this project as soon as possible.

Response to Comment TR19-17

Comment noted. The comment references the overall quality of the EIR and describes potential benefits of dam removal.

2.3.4 Organizations

This section presents written comments received on the Draft EIR from organizations and the State Water Board's responses to those comments. Written comments and responses in this section are organized alphabetically by organization name. To determine whether your comment is associated with an affiliation type other than organizations, please refer to Table 2-1 or Table 2-2.

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American Rivers, Mark Busto

Comment ORG48-1

I write in support of the conclusions of the draft EIR. The Klamath is an historic, iconic river that used to support large runs of steelhead and salmon that cannot recover without removal of the dams. Here in the State of Washington, we know first-band the tremendous impact that dam removal can have on the health of a river with the removal of the two dams on the Elwha River. I urge you to adopt the Draft EIS and keep the project on track.

Response to Comment ORG48-1

Thank you for your comment. Please also refer to Master Response GEN-1.

American Rivers, California Trout Incorporated, Trout Unlimited, Sustainable Northwest, Steve Rothert, Curtis Knight, Brian Johnson, Greg Block

Comment ORG27-1

American Rivers, California Trout, and Trout Unlimited [SNW?] submit these comments on the Draft Environmental Impact Report (DEIR) for the Lower Klamath Project License Surrender (FERC Project No. 14803).

American Rivers is a national river conservation organization founded in 1973 to restore and protect our rivers for the benefit of people, fish and wildlife. We have 15 offices around the country including Oregon and California, with 110,000 supporters including more than 10,000 in California and Oregon. Our members use and enjoy the Klamath River, which has been one of our highest national priorities for two decades.

California Trout is a statewide conservation organization whose mission is to ensure resilient wild fish in healthy waters for a better California. California Trout was founded in 1971 and has over 7,500 members statewide. California Trout operates offices in San Francisco, San Diego, Ventura, Mammoth Lakes, Arcata, Davis and Mt. Shasta. California Trout's Mt. Shasta office is located in Siskiyou County where three of the four Klamath dams, providing a local presence in the community. California Trout members use and enjoy the Klamath River in the areas surrounding the Project for recreational, aesthetic, and educational purposes, including sport-fishing for trout, steelhead and salmon.

Trout Unlimited (TU) is the largest and oldest sportsmen's organization dedicated to the conservation of trout and salmon and their habitats in North America. TU has some 14,000 members in California and Oregon who rely on the Klamath River for sportfishing opportunities and as vital habitat for salmon and steelhead. We have offices in Mt. Shasta, Klamath Falls, Emeryville, Ft. Bragg, Truckee, and Carmel Valley. Our members use and enjoy the Klamath River, which, historically, was the third most productive watershed for salmon and steelhead on the West Coast.

Sustainable Northwest is a conservation non-profit working at the intersection of economy, environment, and community, pioneering natural resource solutions that work for people and nature. For well over a decade, Sustainable Northwest has been working with stakeholders to form agreements over the Basin's long-standing water resource challenges. We believe dam removal is a key step to resolving longstanding disputes in the Klamath Basin and is critical to improving the long-term water quality issues facing the health of the river and the community it supports.

American Rivers, California Trout, Trout Unlimited, and Sustainable Northwest are active participants in finding durable solutions for the Klamath River fisheries and communities. AR, CalTrout, and TU have actively participated in PacifiCorp's dam relicensing proceeding beginning in 2000 and with tribes and agencies coordinated our efforts during the Energy Policy Act proceeding in 2006 that up held the federal government prescriptions for volitional fish passage, and Sustainable Northwest has been active in various collaborative projects for water and fish for the same period of time. Our groups have been actively involved in settlement negotiations and the four groups are signatories to the Klamath Hydroelectric Settlement Agreement (KHSA). Our groups are also represented on the Board of the Klamath River Renewal Corporation.

The KHSA is a remarkable multi-party agreement between stakeholders with divergent interests in the Klamath Basin to resolve decades of litigation and other controversies in the region over the future of the Klamath River. Under the agreement, the parties agreed to facilitate the physical removal of all or part of each of the Lower Klamath Project dams to achieve a free-flowing condition and volitional fish passage along the Klamath River below the Keno Dam. Critically, the agreement provides that the proposed removal of the Lower Klamath Project facilities would be completed in a manner that achieves site remediation and restoration and with the implementation of measures to avoid or minimize downstream impacts.

The undersigned strongly support the proposed project to remove four dams (J. C Boyle, Copco No. 1; Copco No. 2, and Iron Gate) and associated facilities that comprise the Lower Klamath Project pursuant to the terms of the KHSA. The purpose of the proposed project is to restore free-flowing river conditions and volitional fish passage for salmon and steelhead along more than 400 stream-miles of historic spawning habitat upstream of the dams on the Klamath River. Our support for other measures in the Klamath Basin to improve water quality and security for both people and fish – including collaborative water supply, economic redevelopment and habitat restoration projects in the upper basin – is just as strong.

The DEIR confirms that implementation of the proposed project will meet water quality objectives. It is the only alternative that does this and achieves the

project purpose. The DEIR further confirms that the project will contribute to the restoration of native anadromous and other fish species; and benefit the local economy by providing commercial and fishing job opportunities. As the Oregon and California Public Utility Commissions have found, the project will also benefit PacifiCorp's ratepayers, as the costs of removal of the dams would be less than the upgrades that would otherwise be necessary to relicense the dams.

The environmental analysis of this project required under the California Environmental Quality Act (CEQA) underscores the scientific rationale for removing the dams. Numerous fish species—some of which are listed under federal or state Endangered Species Acts—use the Klamath Basin during all or phases of their life histories. The dams harm river ecosystems and aquatic life and provide little no benefit power generation and no benefit for water supply. They block passage to upstream tributaries and mainstem habitat that salmon, steelhead and other native fishes require for population recovery and for sustaining now at-risk recreational, commercial and tribal fisheries.

We support the DEIR conclusion that the environmentally superior alternative is the proposed project. As the Draft EIR finds, the removal of the Lower Klamath Project's dams would provide a wide range of beneficial impacts, including: short- and long-term improvements in water quality that would promote substantial progress towards achievement of water quality objectives; long-term benefits to aquatic species listed under the Endangered Species Act; long-term beneficial effects on riparian habitat and listed species that rely on such riparian habitat; and long-term benefits for Native American tribes that depend on the Lower Klamath River for fisheries and ceremonial purposes. Removing the Klamath dams will improve spawning opportunities and reduce the incidence of fish disease that has resulted in massive fish die-offs in some years. Moreover, per the DEIR, impacts related to release or migration of sediment will be temporary while the benefits long-term for improved water quality are considerable.

Restoring the Klamath River and its fisheries could help facilitate resolution of long-term water conflicts in the Klamath Basin, watershed-scale environmental and habitat restoration, and a beneficial ripple effect for fisheries in both the river and marine environments. Recovering the Klamath's legendary runs of salmon and steelhead is key to revitalizing fishing-based communities and cultures in this region and to bolstering the regional economy more broadly.

KRRC appreciates the State Water Board's detailed examination of a number of other alternatives that potentially would meet some, but not necessarily all, of the proposed project's objectives. Restoration of free-flowing river conditions per the proposed project will provide the maximum benefits to the Klamath River's water quality and ecosystem.

In summary, we concur with the key findings of the DEIR that the proposed project is the environmentally superior alternative. It is the only option that fully

meets the project purpose and meet the water quality objectives. We urge the Water Board to certify the EIR and issue the water quality certification required under Sec. 401 of the Clean Water Act for the proposed project.

Response to Comment ORG27-1
Thank you for your comment. The State Water Board is not a signatory to the Klamath Hydroelectric Settlement Agreement (KHSA) or the Amended Klamath Hydroelectric Settlement Agreement.

Please also refer to Master Response GEN-1.

Endangered Habitat League, Dan Silver

Comment ORG35-1
Endangered Habitats League (EHL) appreciates the opportunity to comment. For your reference, EHL is a Southern California regional conservation group.

We support for the full removal of the lower four Klamath River dams.

The DEIR supports dam removal as the best option for water quality. Removal is also best for fisheries, yet removal will not affect agriculture. The dams are also not needed for flood control.

All evidence points to removal of all four dams.

Response to Comment ORG35-1
Thank you for your comment. Please also refer to Master Response GEN-1.

Friends of Del Norte, Eileen Cooper

Comment ORG36-1
Thank you for the opportunity to express our full support for the alternative that will removal all four dams on the Klamath River. The benefits to the vitality of our fishery and local economy cannot be overstated:

The removal would "…advance the long-term restoration of natural fish populations in the Klamath Basin, including having a significant beneficial effect on commercial fisheries and associated significant beneficial economic impact on the coastal commercial fishing industry." (Environmental Impact Report)

The EIR report brings more good news for the Crescent City Harbor. Although dam removal will unlock some sediment trapped in the reservoirs, Crescent City Harbor should not be affected, with the DEIR stating:

"…it is expected that the amount of sediment released during the year of drawdown and dam removal would be similar to that transported by the Klamath

River to the Pacific Ocean in a year with average flow, much less than that transported by the Klamath River in a wet year…."

We appreciate all the hardwork and persistence by our community to make this dream come true.

Response to Comment ORG36-1
Thank you for your comment. Please also refer to Master Response GEN-1.

Institute for Trade, Standards and Sustainable Development, Inc., Lawrence Kogan

Comment ORG44-1
I write out of conscience, as the former counsel retained during 2016 by two local Oregon and California state instrumentalities, the Klamath Irrigation District, Klamath Falls, Oregon, and the Siskiyou County Board of Supervisors, Yreka, California, and as the former counsel retained during 2016-2017, by a private citizens-operated nonprofit organization, the Siskiyou County Water Users Association. Each of these entities, during my tenure as retained counsel, was integrally involved in the public debate surrounding the removal of the above-referenced dams and decidedly against their removal.

The ITSSD and I thank the California State Water Resources Control Board for the opportunity to participate in this open stakeholder process, and hereby submit the attached comments for the Board's review.

Please don't hesitate to contact us should you have any questions.

Response to Comment ORG44-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment ORG44-2
There is no genuine material difference between the substance of the discussion about dam reservoir sediments in the December 2018 "Draft Environmental Impact Report for the Lower Klamath Project License Surrender" prepared by Stillwater Sciences, and the September 2011 CDM report which Stillwater Sciences helped prepare, entitled, "Screening-Level Evaluation of Contaminants in Sediments from Three Reservoirs and the Estuary of the Klamath River, 2009-2011." In both reports, the authors omit material information about the toxicity of the reservoir sediments at each of the four PacifiCorp owned and operated Klamath River dams slated for removal (John C. Boyle, Copco 1, Copco 2 and Iron Gate).

More specifically, there is little to no information about the hazards such sediments would pose to human health and welfare when they are released upon dam removal, and there are no bona fide human health risk assessment-related data of the potential exposure from dam reservoir sediments at each of the four

Klamath River dams. This strongly suggests that USEPA has performed no human health risk assessments at all which the California State Water Resources Control Board ("SWRCB") or the California Environmental Protection Agency ("EPA") has publicly disclosed. Rather there are only perfunctory data of screened contaminants in dam reservoir sediments which were gathered and publicly disclosed by the U.S. Department of Interior's Fish and Wildlife Service.

Response to Comment ORG44-2
Please refer to Master Response WQ-6.

Comment ORG44-3
Indeed, the legal pathway the former Obama administration had used to initiate this process – i.e., the Clean Water Act § 401 certification process – had intentionally been chosen because the U.S. Department of Energy's Federal Energy Regulatory Commission ("FERC") would retain jurisdiction over this process to assure a favorable dam removal outcome. This was and remains a pure case of 'the ends justifying the means,' no matter the projected wildlife losses dam sediment release upon removal would engender, and completely without regard to the potential risks to human health and welfare that dam sediment releases would pose.

Had the proper legal pathway been selected – the Clean Water Act §§ 303(d) process – EPA would have retained jurisdiction over the calculation by California of the total maximum daily load for the lower Klamath River, including the dam reservoirs, and EPA would have been required to conduct human health risk assessments to evaluate the potential human exposure to sediments released at each of the four dam reservoirs. This would have especially been the case if EPA had determined that any one or more of the dam reservoirs constituted a Superfund site under the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA").

It is quite remarkable that the State of California EPA has not yet admitted to the members of the public how USEPA had previously conditioned its prior approval of the North Coast Regional Water Quality Control Board's December 2010 TMDLs for the Klamath River on the State's quiet agreement to treat the incremental impairments it had calculated from the dams as something other than a TMDL load allocation.

In sum, the California EPA, rather than the SWRCB should be the primary agency involved in evaluating the pros and cons of dam removal, and the process should be one of addressing each dam's contribution to the total maximum daily load of the impaired lower Klamath River, rather than one of water quality certification relating to FERC dam license transfer and termination and hydroelectric decommissioning. The State of California has unnecessarily continued to deceive the public in favor of its political agenda of dam removal, and to deny it the material facts concerning the potential hazards to human

health and welfare the release of toxic sediments from the four Klamath River dam impoundments would trigger upon removal.

Response to Comment ORG44-3
Please refer to Master Response CEQ-2 and WQ-5.

Comment ORG44-4
Historic and Recent Sources of Toxic Contamination in the Upper Klamath Basin

During the 2004, the National Research Council issued a report describing the historic human activities that shaped the Klamath River Basin and ultimately endangered and threatened fish in the Basin. These activities included significant cattle ranching and pasturing in Klamath County, Oregon during the 1950's and 1960's with only slight declines in the 1990's and increased cattle production intensity by 2002. "In 1998, the Environmental Protection Agency's Index of Watershed Indicators estimated that at least 110,000 acres of the watershed had been converted to irrigated pasture or other agricultural activities." "The effects of grazing in the watershed were probably profound but are impossible to quantify. […] Grazing can mobilize nutrients and sediments, both of which are of concern in the upper Klamath basin."[1]

These activities also included substantial commercial logging over more than two-thirds (e.g., 73%) of the upper Klamath Basin which subjected the forest land to severe erosion.[2] Logging had accelerated during the late 1910's because of national demand for ponderosa pine, and by 1918, "large amounts of reservation timber were being sold to private parties." "[B]y 1920, annual harvest rates had increased to 120 million board ft.[,…and p]eak lumber production occurred in 1941, when 22 lumber mills processed a total of 808.6 million board ft within the upper basin. Harvest has dropped to about 400 million board ft in recent year."[3]

During 2012, the U.S. Geological Survey issued a report documenting the historical contamination of the Klamath River. It stated that "[d]ocumented contaminant impacts within the Klamath Basin date back to at least the 1960's when wildlife deaths were linked to organochlorine pesticides (such as dichlorodiphenyltrichloroethane [DDT]) that were commonly applied to the National Wildlife Refuges and surrounding agricultural land."[4] "Organochlorines (OCs) are a class of pesticide introduced in the 1940s that experienced widespread and heavy use through the subsequent 20 to 30 years. DDT, aldrin, dieldren, toxaphene, chlordane, and heptachlor were among the most commonly used compounds, and their popularity was due, in part, to their high insect toxicity, relatively low acute mammalian toxicity, and their persistence in the environment." [5]

Subsequent research on the environmental effects of these compounds, however, revealed that many were highly bioaccumulative and non-degrading. As the result, "they caused significant impacts to upper trophic level fish, birds,

and mammals."[6] "Organochlorine use in the Upper Basin was widespread from the 1940s to the 1960s, with some applications of a few compounds continuing into the 1970s."[7] "The last applications of DDT, toxaphene, and dieldrin reported in the Klamath basin (California side) were in 1971, 1982, and 1976, respectively. […] However, dicofol (which commonly contained DDT and DDE as contaminants) was used until 1981."[8] "[T]wo major pesticide classes, organophosphate and carbamate insecticides, emerged as major constituents of post-1960s pest management in agricultural lands of the Klamath Basin." Although there was increased use of "a suite of herbicides, fungicides, and fumigants" for pest control during this period, "there is[, however,] limited information on their distribution and pathways through the Klamath basin ecosystem."[9]

The USGS report further documented how, in 1988, mercury (Hg) distribution had been quantified "in abiotic and biotic matrices in the Upper Klamath Basin. Although aqueous concentrations were less than reporting limits, sediment concentrations of total [mercury] Hg (THg; inorganic + [methylmercury] MeHg) were similar to geometric mean values for soils in the Western United States, with the exception of sediments downstream of the Link River Dam, which had concentrations that exceeded the rest of the basin by at least 4-fold."[10] Moreover, the USGS report documented anthropogenic sources of arsenic in the upper Klamath basin including industrial processes and wood preservatives. "The environmental toxicity of arsenic strongly depends on its speciation. The most common inorganic forms are arsenite (As (III)) and arsenate (As (V)), with arsenite being substantially more toxic. […] The inorganic speciation (and thus environmental risk) of arsenic is reliant on pH and redox conditions, with As (V) being reduced to As (III) under anoxia." [11] Since "the measured arsenic was not speciated," the environmental risks of their findings were unclear."[12] Nevertheless, "arsenic in water was highest (62 µg/L) at Lower Klamath Lake unit 12C (range <1–62 µg/L, median = 7 µg/L, N=18) and arsenic in bottom sediment was highest at Klamath Straits Drain at pumping plant FF (range 0.6–16 µg/g, median = 6.3 µg/g, N=13)."[13]

Additionally, the report expressed uncertainty regarding the extent of major lead sources in the Klamath basin. "It is currently unclear if there are any major lead sources in the Klamath Basin, but some evidence exists for substantial lead exposure in wildlife in the area."[14]

The USGS report also documented more recent sources of contamination in the Klamath basin. For example, it states that "use of numerous pesticides, combined with the active management of irrigation and drain water present the possibility of pesticide exposure in fish and wildlife species through overspray, runoff, and dissolution and transport." (emphasis added).[15] "Pesticide use on the lease lands averages approximately 52,125 kg of active ingredient per year across more than 30.8 km2 of agricultural land."[16] "Annual pesticide use patterns likely reflect a combination of changes in (1) use requirements or restrictions, (2)

type of crops grown, (3) pest outbreaks, and (4) water availability. Herbicide and fungicide applications have seen steady decreases since the late 1990s, from 7,000 to 8,000 kg of active ingredient per year to just more than approximately 4,000 kg of active ingredient per year in 2009 (fig. 6). Conversely, fumigant use has increased sharply over that time period from less than 10,000 to more than 90,000 kg of active ingredient per year."[17] "Some chemical classes, such as chloronitrile (fungicide), organophosphates (insecticides), phenoxycarboxylic acid (herbicide), and triazinone (herbicide) have seen relatively consistent annual use between 1998 and 2009. […A] handful of classes, such as arylphenoxypropionate (herbicide/fungicide), biopesticide bacterium (insecticide), carbamates (insecticide), carboximide (fungicide), chloroacetamide (herbicide), cyclohexidione derivitives (fungicide), dithiocarbamates (fumigant), halocarbons (fumigant), and strobilurin (fungicide) have seen a steady or recent increase in their use ."[18]

"Importantly, the leased lands within the Refuge boundaries represent only a very small proportion of total agricultural activity in the Basin. Within the Upper Basin alone, agriculture accounts for nearly 2,000 km2 of land area of which 68 km2 are the lease lands. Moreover, 80 percent of the agriculture in Klamath and Siskiyou Counties and 27 percent of the agriculture in Modoc County occurs within the boundaries of the Klamath Basin." (emphasis added).[19]
"Additionally, much of the irrigated cropland surrounding the refuge is hydrologically connected to the refuge via canals that are part of the Klamath Project (National Research Council, 2004). Farmers within those adjacent and nearby agricultural properties are not restricted in their pesticide use in the same ways as those that use the leased lands. Thus, there exists the possibility for wildlife and fish within the Refuge boundaries to be exposed to chemicals that are not approved for refuge use. In fact, in 2008 and 2009 there were a total of 189 different chemicals reportedly used as pesticide in those three counties, and only 41 of them (22 percent) were approved for refuge use (table 6). […] Moreover, some of those compounds were either used at exceptionally high rates (for example, methyl bromide), or are particularly toxic (for example, acrolein, diazinon, ethoprop, etc.). Thus, it is important to consider ecological exposure potential for these compounds as well."[20]

"Elemental analysis of recent sediment cores taken from the three major upstream reservoirs, and the Klamath Estuary, show relatively low concentrations of chromium and nickel within the reservoir sediments, and substantially more elevated concentrations in the sediments from the Estuary (fig. 20). Conversely, arsenic and lead data in reservoir sediments were substantially more elevated than in the estuary." (emphasis added).[21]

The report, moreover, reveals that "based on EPA databases, there are at least 2 superfund sites, 8 brownfields, 3 pesticide producers, 3 major NPDES dischargers, and 21 minor NPDES dischargers that are identified within the Basin (fig. 21). These sites are associated with a broad range of contaminants,

including: petroleum products, asbestos, volatile organic compounds (VOCs), lead and other heavy metals, dioxins, polyaromatic hydrocarbons (PAHs), and other organic contaminants (fig. 22). The extent to which contaminants from these potential sources reach the surrounding environment is unclear, but there is a possibility that at least some of these sites result in exposure of the Basin's biological resources. Further, human population centers are often situated adjacent to water resources and are frequently associated with various contaminants they may enter the environment, but the specific compounds are not readily documented and potential effects of exposure to biota are not well understood." (emphasis added). [22]

Response to Comment ORG44-4

Section 3.2.5.7 *Water Quality – Potential Impacts and Mitigation – Inorganic and Organic Contaminants* Potential Impact 3.2-13 (pages 3-139 through 3-151) includes analysis of inorganic and organic contaminants relevant to the Proposed Project and includes the following EIR citations; Eagles-Smith and Johnson (2012), CDM (2011), USEPA (2010), and Shannon & Wilson, Inc. (2006). Please refer to Volume III Attachment 1 Section 3.2.5.7 Potential Impact 3.2-13 *Water Quality – Potential Impacts and Mitigation – Inorganic and Organic Contaminants* Potential Impact 3.2-13 for the revisions.

Section 3.2.4.7 *Water Quality – Impact Analysis Approach – Inorganic and Organic Contaminants* (pages 3-73 through 3-74) includes a determination of potential toxicity and bioaccumulation with respect to aquatic species and humans under the Proposed Project. Please refer to Volume III Attachment 1 Section 3.2.4.7 *Water Quality – Impact Analysis Approach – Inorganic and Organic Contaminants* for the revisions.

Comment ORG44-5

Looking upstream from the mouth of the Klamath River at the Pacific Coast, the Iron Gate Dam, completed in 1962, is located between river mile (RM) 190.1 and RM 196.9 (encompassing a total of approximately 7 RM). The Iron Gate hydroelectric dam reservoir "impounds a reservoir of 944 surface acres," "contains about 50,941 acre-feet of total storage capacity (at elevation 2,328.0 feet) and 3,790 acre-feet of active storage capacity."[23] *It has "a maximum depth of 162 feet."*[24] *The Iron Gate dam has been operational for approximately 56 years, and thus its large reservoir/impoundment, contains 56 years' worth of accumulated sediment.*

Copco 2 Dam, completed in 1925, is located between RM 198.3 and RM 198.6 (encompassing a total of approximately 1/3 RM). The Copco 2 hydroelectric dam reservoir "is about 0.25 miles long and has a relatively small storage capacity of 73 acre-feet."[25] *The Copco 2 dam has been operational for approximately 93 years, and thus, its reservoir/impoundment contains 93 years' worth of accumulated sediment.*

Copco 1 Dam, completed in 1918, is located between RM 198.6 and RM 203.1 (encompassing a total of approximately 4.5 RM). The Copco 1 hydroelectric dam reservoir "impounds a reservoir of 1,000 surface acres," "contains approximately 33,724 acre-feet (40,000 acre-feet26) of total storage capacity at elevation 2,607.5 feet and approximately 6,235 acre-feet of active storage capacity. The normal maximum and minimum operating levels of the reservoir are at elevations 2,607.5 and 2,601.0 feet, respectively."27 It has a maximum depth of 115 feet.28 The Copco 1 Dam has been operational for approximately 100 years, and thus, its large reservoir/impound contains 100 years' worth of accumulated sediment.

John C. Boyle Dam, completed in 1958, is located between RM 220.4 and RM 228.3 (encompassing a total of approximately 8 RM).[29] The John C. Boyle hydroelectric dam reservoir impounds "420 surface acres of water," "contains approximately 3,495 acre-feet of total storage capacity and 1,724 acre-feet of active storage capacity."[30] It's "maximum depth is about 40 feet."[31] The John C. Boyle dam has been operational for approximately 61 years, and thus, its reservoir/impoundment contains 61 years' worth of accumulated sediment.

PacifiCorp has not frequently or recently reported about the composition of the sediment at the bottom of the four dam reservoirs/impoundments; it has reported, however, about the reservoir water quality. During 2004, PacifiCorp reported that both Copco and Iron Gate reservoirs are dominated by thermal stratification, where water temperature, pH, and chlorophyll are lower at lower reservoir surface levels in both reservoirs.[32] The 2004 report notes that, "[h]owever, Copco reservoir has a much higher concentration of ammonia, orthophosphate, total phosphorous and TKN [Kjeldahl nitrogen]" in the upper reservoir surface water levels. In "Iron Gate reservoir those constituents are the same concentration in both" the upper and lower reservoir surface water levels.[33]

And, in 2012, PacifiCorp similarly reported about the variations in water temperature in the John C. Boyle reservoir's upper and lower surface water levels,[34] and about the nutrients load in the upstream and downstream ends of said reservoir. According to the 2012 report, "J.C. Boyle is not appreciably retaining (reducing) nutrient [nitrogen and phosphorous] levels under typical conditions. This is in contrast to the larger downstream Copco and Iron Gate reservoirs which retain (reduce) significant amounts of the annual load of nutrients that flow into those reservoirs."[35] The report also notes that the John C. Boyle reservoir experiences low dissolved oxygen levels at the deeper portions near the bottom, and receives organic matter input that reduces dissolved oxygen levels primarily from upstream sources.[36] "J.C. Boyle reservoir is eutrophic because of the large nutrient load from upstream sources and seasonally warm temperatures."[37]

The 2012 report also relays that the Copco reservoir complex experiences seasonal water temperature stratification, "acts as an annual net sink for both total nitrogen and total phosphorous," and produce "[n]uisance bloom-forming

blue-green algae […] in the summer." "Sustained Microsystis blooms in Copco reservoirs are consistent with the potentially elevated levels of inorganic nitrogen (ammonia) and organic matter in influent waters."[38] The report admits that the Copco reservoir "bears the burden of accepting and processing the water quality that is ultimately borne out of Upper Klamath Lake and any agricultural and municipal/industrial return flows."[39]

Moreover, the 2012 report concedes that Iron Gate reservoir "is eutrophic largely due to nutrient inputs (organic and inorganic) from upstream sources."[40] It also admits that, "[a]t times, the upstream conditions from Upper Klamath Lake and Keno reservoir may produce large quantities of organic matter and can increase the nutrient fluxes into both Copco and Iron Gate reservoirs substantially."[41] "[M]eteorological conditions, hydrology, and upstream water quality conditions playing important roles in the species timing, and magnitude, persistence, and duration of algal standing crop."[42] According to the report, "Iron Gate reservoir is the second relatively large mainstem reservoir on the Klamath River below Upper Klamath Lake. Iron Gate reservoir receives large hydraulic and nutrient loads from the inflowing Klamath River. The result of these substantial upstream loads is a eutrophic reservoir."[43]

Only the U.S. Environmental Protection Agency, ("EPA"), and neither the U.S. Department of Interior Fish and Wildlife Service, nor the Federal Energy Regulatory Commission, is responsible for enforcing the provisions of the U.S. Clean Water Act ("CWA") in waters of the United States ("WOTUS") within the State of California. If California State water quality standards are inadequate to protect a WOTUS (e.g., the Klamath River that flows from southern Oregon through northern California on its way to the Pacific Ocean) via imposition of point source (i.e., discrete conveyance (pipe or tunnel)) pollution effluent limitations or permitting adjustments, then California must identify and list the Klamath River as "impaired," pursuant to CWA§ 303(d). California would then be required, pursuant to CWA § 303(d)(1)(A), to identify the Klamath River and, pursuant to CWA § 303(d)(1)(C), to determine the "total daily maximum load" ("TMDL") for each problematic pollutant in said river. The TMDL, generally is the calculation of the maximum amount of each such pollutant that can occur in the waterbody (i.e., the Klamath River) without causing it not to meet State water quality standards.[44]

Pursuant to USEPA rules, the California's TMDL for the Klamath River must allocate the necessary reductions to one or more pollution sources, including nonpoint sources, in order to implement the State's applicable water quality standards.[45] See Pronsolinoz v. Nastri, 291 F.3d 1123, 1139 (9th Cir. 2002). Nonpoint sources of pollution are non-discrete sources, including, for example, sediment run-off from timber harvesting or agriculture. 291 F.3d at 1126. They must be part of the TMDL calculation. 291 F.3d at 1139, citing Alaska Center for the Environment v. Browner, 20 F. 3d 981, 985 (9th Circ. 1994) (holding that "Congress and the EPA have already determined that establishing TMDLs is an

effective tool for achieving water quality standards in waters impacted by non-point source pollution.").

Furthermore, California is authorized to determine TMDLs also with respect to waterbodies that are affected mostly, if not, entirely by nonpoint source pollution. Pronsolinoz v. Nastri, 291 F.3d at 1139. In fact, USEPA has directed states, including California, to calculate TMDLs for waterbodies and watersheds where nonpoint source pollution arises from different land use activities upstream from a dam.[46] "Soil erosion has been determined to be the major source of suspended solids, nutrients, organic wastes, pesticides, and sediment that combined form the most problematic form of NPS pollution."[47]

It is well-known that upstream agricultural and urban land use can "contribute to contaminant and sediment loads [of dam] reservoirs," and that dam operations "can determine the fate of" pollutants accumulated in reservoir sediment, and "potentially downstream as water is released from the dam." (emphasis added).[48] And, techniques, such as "selective withdrawal, can enable near-surface and below-surface withdrawals of warmer and cooler reservoir waters, respectively, to accommodate the temperature and water quality needs of fish populations in the summer and winter months."[49] However, these techniques offer no guarantee against downstream discharges of contaminated and polluted reservoir sediments potentially threatening human health and welfare.

USEPA has emphasized, for example, how dams act as barriers to the flow of water and to the materials the water transports, which can impact water quality both in the dam's impoundment/reservoir and downstream from the dam.[50] The longer the period of time waters and materials are retained in a dam reservoir and are prevented from flowing freely downstream, the more significantly the chemical and physical qualities of that retained water will change.[51] "Water held in a small basin behind a run-of-river dam may undergo minimal alteration," while "water stored for months or even years behind a large storage dam can undergo drastic changes that impact the downstream environment " (emphasis added) and population centers when released. [52]

According to USEPA, "[a] storage dam that impounds a large reservoir of water for an extended time period will cause more extensive impacts to the physical and chemical characteristics of the water than a smaller dam with little storage capacity."[53] "The nature and severity of impacts will depend on the location in the river or stream, in relation to the upstream or downstream side of the dam, the storage time of the impounded water, and the operational practices at the dam." (emphasis added).[54] Physical changes include changes in instream water velocities, timing and duration of flows, flow rates, sediment transport capacities, turbidity, temperature and dissolved gases. Chemical changes include changes in nutrients, alkalinity and pH, metals and other toxic pollutants, and organic matter. And, physical and chemical changes can be interrelated. "For example, changes in temperature may result in changes in dissolved oxygen levels or

changes to pH may result in changes to nutrient dynamics and the solubility of metals."[55]

As USEPA has found, "[w]hen the stream flow behind a dam slows, the sediment carrying capacity of the water decreases and the suspend sediment settles onto the reservoir bottom. Any organic compounds, nutrients, and metals that are absorbed to the sediment also settle and can accumulate in the reservoir bottom."[56] *The longer the holding time in the reservoir, and the more planktonic algal growth in a reservoir, the more likely periodic episodes of turbidity from upstream storm events carrying sediment rich stormwater will result, especially "if the sediment is predominantly very fine clay particles."*[57] *In addition, the greater the depth of a reservoir, the lower the volume of water that will be exposed to solar radiation and ambient temperatures, and the greater the likelihood of thermal stratification, with reservoir surface water layers bearing different temperatures, different water quality and biological processes, and different water density gradients.*[58] *Furthermore, the impoundment of accumulated upstream nutrients can cause a dam reservoir to become eutrophic and trigger algal and aquatic plant growth that consumes oxygen and eventually dies, leaving microbially decomposed material that depletes bottom waters of dissolved oxygen and produces potentially toxic concentrations of gases such as hydrogen sulfide.*[59] *Studies show that microbial decomposition can result in increased levels ammonia and hydrogen sulfide concentrations that affect the pH of reservoir waters. "Highly acidic (or highly alkaline) waters tend to convert insoluble metal sulfides to soluble forms, which can increase the concentration of toxic metals in reservoir waters."*[60]

The key question, therefore, that must be answered for CWA purposes, is whether the pollutants and contaminants attributable to upriver nonpoint sources that have long flowed into and accumulated, aggregated and synergized in the reservoir sediments and/or water columns of the John C. Boyle, Copco 1, Copco 2 and Iron Gate Dams have incrementally impaired the water quality of the Klamath River. If the answer to this question is Yes, as it should be, then the States of Oregon and California should have properly characterized and included these dam-related impairments as a load allocation under CWA § 303(d)/40 CFR Part 130 in calculating the TMDL of the Klamath River, for purposes of ensuring that the release of pollutant-laden sediments from each dam's reservoir pursuant to the amended Klamath Hydropower Settlement Agreement ("KHSA") implementation would not adversely impact public health and welfare.

Oregon's integrated 2010 Total Maximum Daily Load (TMDL) and Water Quality Management Plan (WPMP) for the Upper Klamath and Lost River Subbasins reveals, consistent with CWA § 303(d) requirements, that the state had identified inter alia point sources and nonpoint sources and developed load allocations for nonpoint sources where the four PacifiCorp dams scheduled for removal are located.[61] *In addition, the integrated plan reveals that ODEQ and California's North Coast Regional Water Quality Control Board ("NCRWQCB") had*

cooperatively developed a TMDL that "adopt[ed] the Upper Klamath Lake phosphorus TMDL total phosphorus as a boundary condition for developing the Klamath River and lost River TMDLs."[62] ODEQ had intended for this TMDL to cover the Lost River and the Klamath Straits Drain, as well as, the Klamath River from Link River to the Pacific Ocean.[63]

In March 2010, California submitted to USEPA its 2010 Action Plan for the Klamath River64 as a CWA § 303(d) amendment to the NCRWQCB's Water Quality Control Plan ("WQCP"). The Action Plan, which had aimed to establish the Klamath River Total Maximum Daily Loads (TMDLs) addressing temperature, dissolved oxygen,[65] nutrients,[66] and microcystin[67] impairments in the Klamath River, also referenced the Lower Lost River TMDLs that USEPA had previously established.[68] The 2010 Action Plan reflected USEPA's 2008 decision, in the face of litigation,[69] to reconsider its prior approval of California's omission of microcystin toxins as an additional cause of impairment of the Klamath River segment known as "Klamath River [hydrologic unit] HU, Middle [hydrologic area] HA, Oregon to Iron Gate" from the state's 2006 CWA § 303(d) list submission.[70]

The NCRWQCB's 2010 integrated TMDL/WQMP plan, furthermore, indicated that Oregon and California had worked cooperatively and aligned with "USEPA and its contractor Tetra Tech, Inc. to develop a uniform water quality model of the basin and conduct joint analyses to ensure compatible TMDLs," with each state "establish[ing] independently the TMDLs for those portions of the basin within their respective jurisdiction."[71] This information appears to have been consistent with the Memoranda of Agreements that ODEQ and NCRWQCB had signed with USEPA Regions 9 and 10 in 2008 and 2010, respectively, to develop[72] and implement[73] the Klamath River/Lost River TMDL.

In November 2010, USEPA subsequently approved the NCRWQCB's amended WQCP, in part,[74] and clarified the scope of two Klamath River segments properly included in California's CWA § 303(d) (TMDL) list because of impairments due to sediments – the segments spanning from Scott River to Trinity River, and from Iron Gate Dam to Scott River.[75] USEPA, however, did not fully agree with how California had calculated the TMDLs for the Klamath River to address the temperature, dissolved oxygen, nutrients, and microcystin impairments identified. Principally, it disagreed with the state's categorization of these impairments as a TMDL load allocation.[76]

According to USEPA, "'the incremental impairment from a dam' occurs because river waters containing pollutants (usually nutrients) are impounded, and the resulting change in physical conditions (velocity, depth, etc.) can create conditions in the reservoir that lead to violations or increased violation of water quality standards in the reservoir."[77] USEPA also admitted that "States around the country have taken different approaches to characterizing these incremental impairments from dams" which the agency had approved. As an example, USEPA cited how the State of Washington's Spokane River Dissolved Oxygen

(DO) TMDL, which USEPA had approved, "first identified the incremental impairment from a dam and then assigned that incremental impairment to the dam operator as a 'responsibility' that would be implemented under the CWA 401 certification process."[78] USEPA then noted the complexity of calculating the extent of the Washington dam's impairment of the Spokane River's water quality.

The State first simulated the —natural DO condition of the river by leaving the dam in place and assuming no other sources of pollution; this approach was used to represent the current critical condition (i.e., the dam is there, and there are no plans to remove it). Then the incremental impairment from the dam was calculated as the difference between the current critical condition DO conditions in the reservoir and the impairments that would occur in the reservoir when phosphorus concentrations entering the lake are at minimal levels of human impact, as represented by EPA's ecoregional criterion.[79]

USEPA expressed its disagreement with California's taking of a different approach in calculating its TMDL, asserting that California incorrectly "included the incremental impairments from the Klamath River dams in its load allocation to the dam owner" - PacifiCorp.

USEPA's disagreement with California's approach, however, is based on its thinly veiled belief that the scope of a State's list of "impaired" or "threatened" waterbodies need not be the same as its obligation to do TMDLs. USEPA's position boils down to a previously withdrawn 1999 proposed regulation wherein it disingenuously reasons how it "sees great value in listing waterbodies impaired or threatened by both pollutants and pollution" (emphasis added) pursuant to CWA § 303(d)(1)(A), while requiring states to address only waterbodies "impaired" or "threatened" by pollutants under CWA § 303(d)(1)(C).[80] USEPA's logic, however, is laid bare in its explanation of why the upstream nonpoint source pollutants that have deposited themselves in the reservoirs of each of the four PacifiCorp dams for decades should not be considered a 'load' or 'wasteload' for TMDL purposes.

EPA believes that the incremental impairments from a dam, as discussed above, are not properly characterized as a 'load allocation' under CWA Section 303(d) or its implementing regulations at 40 CFR Part 130. Under CWA Section 303(d)(1)(C), a state is to develop TMDLs for 'pollutants.' EPA does not believe it is appropriate to categorize the incremental impairments from a dam of the kind described in the Final TMDL Report for the Klamath River as a 'load' or 'wasteload' allocation because the dam is not contributing impairment-causing 'pollutants' as defined in CWA Section 502(6).[81]

The slyness of USEPA's position becomes quite apparent when this explanation is compared to how Washington State's TMDL calculation had been reached. Clearly, Washington State had calculated the incremental impairment of the Spokane River attributable to nonpoint source pollutants settling in the dam

reservoir "by leaving the dam in place" (emphasis added).[82] USEPA also had ceded federal jurisdiction to FERC under the auspices of the CWA §401 water quality certification process (i.e., hydroelectric generation-related environmental matters) incident to the dam owner's application for relicensure. Furthermore, USEPA left to the State of Washington the decision regarding whether to act on the FERC-licensed dam owner's application for a water quality certificate within a reasonable time period in order to address the nonpoint source pollution issue, or to waive that right and thereby cede jurisdiction to FERC.[83]

By analogy, in the case of the Klamath River Dams, USEPA had taken the position that, there can be no load-contributing pollutants at dam reservoirs that will be/have been removed as "the anticipated endpoint" of the KHSA/Amended KHSA process.[84] Therefore, it had decided it should cede jurisdiction to FERC under the auspices of the CWA §401 water quality certification process (i.e., hydroelectric generation-related environmental matters) incident to PacifiCorp's application for license transfer to the Klamath River Renewal Corporation KRRC. USEPA also had decided to leave to the State of California the decision regarding whether to act on KRRC's prospective water quality certificate application to address water quality protection upon removal. Presumably, California recognizes that if it and KRRC were to engage in repeated withdrawal and refiling of applications for water quality certifications, as PacifiCorp had previously done, and thereby failed to provide an expeditious state decision, FERC could interpret those actions as being contrary to the public interest and to the spirit of the Clean Water Act, and thus, as a "waiver" by the State of its CWA §401 authority to require such a certificate.[85] This would result in FERC reasserting its authority to authorize the proposed activity upon license transfer.

In both cases, USEPA conveniently stepped aside and ceded jurisdiction to FERC and the State, when arguably it should have retained federal jurisdiction under CWA § 303(d) to ensure the protection of the public and the environment. The problem is that, in the present case, Klamath River dam removal will pose a genuine threat to human health and welfare which USEPA cannot ignore.

Consequently, USEPA conditioned its December 2010 approval of California's proposed TMDLs upon the NCRWQCB's agreement to characterize and treat the incremental impairments from the four Klamath River dams "as something other than a TMDL load allocation."[86] "Conditioned on this clarification of the characterization of the incremental impairments from dams, EPA concludes that the State Board's submittal meets the requirements of CWA Section 303 and the underlying regulations at 40 CFR Part 130."[87]

In light of USEPA's refusal to treat nonpoint source pollutants and contaminants accumulated, aggregated and synergized in the four Klamath River dam reservoir sediments and water columns as a separate point source of pollution, it also is likely that the agency had not considered any discharge from the four Klamath River dams as a "stormwater" discharge into navigable waters requiring

a National Pollutant Discharge Elimination System (NPDES) permit under CWA § 311 and accompanying regulations.[88]

In conclusion, without proper notice and comment required by the Administrative Procedure Act, USEPA effectively reinterpreted/changed the CWA § 303(d)/40 CFR Part 130 rules for calculating TMDLs as applied to nonpoint source dam-related impairments to water quality. It also compelled California and Oregon to calculate their jointly developed Klamath River basin TMDLs for temperature, dissolved oxygen, nutrients, and microcystin impairments consistent with that interpretation to ensure they did not reflect the incremental nonpoint source impairments arising from the John C. Boyle, Copco 1, Copco 2 and Iron Gate Dams upon planned dam removal. USEPA compelled this behavior, by otherwise refusing to approve these states' CWA § 303(d) submissions. USEPA, thereafter, in its comments approving the Interior Department Bureau of Reclamation's Draft[89] *and Final*[90] *Environmental Impact Statements/Reports for Dam Removal, expressed biased support for dam removal, without regard to the public health and welfare impacts the release of NPS pollutants and contaminants accumulated in dam reservoir sediments and water columns to the Klamath River would engender upon dam removal. USEPA also granted Interior such approval notwithstanding its "concerns regarding potential impacts to wetlands and the short-term effects on fisheries and water quality from dam deconstruction," because it "believe[d] that those concerns [could] be addressed through the implementation of mitigation measures."*[91] *USEPA, furthermore, supported the Department of Interior's assessment of the environmental benefits to be realized from the KHSA [and Amended KHSA] process*[92] *following dam removal even though those results were uncertain at best.*[93]

Response to Comment ORG44-5

Please refer to Volume I Section 2.7.2 *Proposed Project – Proposed Project – Reservoir Drawdown* (pages 2-60 to 2-69) for a discussion of the reservoir sediment deposits, including an estimate of annual sediment deposition rates for years following the United States Bureau of Reclamation's (USBR) original sediment core sampling and sediment volume estimates and a discussion of uncertainty in the estimates.

Section 3.2.2 *Water Quality – Environmental Setting* and Appendix C *Water Quality Support Technical Information* discuss the water quality in the Hydroelectric Reach, the Middle and Lower Klamath River, the Klamath River Estuary, and the Pacific Ocean Nearshore Environment under existing conditions, including the water temperature, suspended sediment, nutrient (i.e., nitrogen and phosphorus), dissolved oxygen, pH, chlorophyll-a and algal toxins, and inorganic and organic contaminant conditions measured from 2000 through 2017. Section 3.2.2.8 *Water Quality – Environmental Setting – Inorganic and Organic Contaminants* specifically discusses the inorganic and organic contaminants measured in the reservoir sediments. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality* and the final Appendix C

Water Quality Support Technical Information. Please also refer to Master Response WQ-1 for further discussion of the role of the Lower Klamath Project Dams/Reservoirs with respect to overall water quality in the Klamath River and Master Response WQ-6 for further discussion of the potential contaminants in reservoir sediments. The environmental setting information in this comment is added to the record, but does not result in changes to the EIR's description of the environmental setting, which includes a broader set of sources, including more recent sources.

Portions of this comment make assertions regarding the Environmental Protection Agency's role in Clean Water Act 303(d) listing and total maximum daily loads (TMDLs), including the Klamath River TMDL process. With respect to the comment's assertion that the existing TMDLs for the Klamath River are improperly framed with respect to non-point source pollution originating from upstream of the Lower Klamath Project, this issue relates to basin planning efforts that are not part of the Proposed Project.

Section 3.2.5 *Water Quality – Potential Impacts and Mitigation* analyzes the potential water quality impacts under the Proposed Project, including potential impacts to water bodies on the 303(d) List within the water quality Area of Analysis (see Table 3.2-3). Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Please also refer to Master Response CEQ-2 regarding the role of FERC and the State Water Board.

Comment ORG44-6

USEPA Failed to Exercise its Primary CERCLA Jurisdiction Over the Presence of the Virtually Unexamined and Unreported Decades-Old Contaminants in the Sediments of the Four Klamath River Dam Reservoir Bottoms

Since at least 2006,[94] PacifiCorp, the current owner of the four FERC-licensed Klamath River dams the former Interior Secretary had designated for removal pursuant to the Klamath Hydroelectric Settlement Agreement process, has known about the presence of nonpoint source ("NPS") hazardous substances and pollutants and contaminants attributable to various decades-long upstream Oregon-based industrial activities, which have settled, accumulated and become stored in the sediments at the reservoir bottoms and water columns of each said dam over many decades. However, PacifiCorp has apparently failed to submit the required CERCLA notification to the former and current EPA Administrators to apprise them of such substances at these sites, even though a number of these substances, including heavy metals (such as arsenic and nickel, as well as, chromium, mercury and zinc[95] and inorganic chemicals (such as dieldrin, dioxin, DDT and pentachlorophenol) appeared on the Clean Water Act and CERCLA lists of hazardous substances and would have required further EPA study.[96]

The facts reveal that samples of reservoir bottom sediments had been taken from these locations/sites during 2004-2005 and, again, during 2009-2011, as the 2011 DOI Draft and 2012 Final Environmental Impact Statements' ("DEIS" and "FEIS") discussion of sediment contaminants disclosed.[97] *PacifiCorp, therefore, knew or should have known, or should have at least suspected that some of these substances had been released when it discharged reservoir waters from the gates of its facilities. Arguably, EPA became aware of these toxic sediments only because it had participated in Interior Department Klamath Technical Management Team preliminary efforts to evaluate reservoir bottom sediments samples taken from each of the four dams, and had found that there were then "no current public health concerns from direct human exposure to reservoir sediments."*[98]

In other words, it is arguable that PacifiCorp knowingly failed to notify the USEPA Administrator of the possibility (probability) of decades of hazardous substances stored (accumulated/aggregated) in the reservoir bottoms of John C. Boyle, Copco 1, Copco 2 and Iron Gate dams.[99] *And at least one PacifiCorp consultant had previously identified the potential for CERCLA liability in connection with dam removal, and the need to consider the use of a CERLA § 122 administrative order as a possible risk mitigation tool.*[100] *It is unknown whether USEPA had ever quietly pursued the negotiation of a settlement agreement to address remedial actions PacifiCorp would need to take that also could be entered as an enforceable consent judgment.*[101] *CERCLA likely applies in this case, even though there is no record that USEPA has yet added these four PacifiCorp-owned and operated Klamath River dams to the National Priorities List (NPL), commonly known as "Superfund."*[102]

The Obama administration USEPA Administrator had been well aware that removal of the four PacifiCorp-owned and operated Klamath River dams pursuant to the Klamath Hydroelectric Agreement (Amended KHSA) process, and consequent release of nonpoint source pollutants, contaminants and hazardous substances which have accumulated and become stored in the bottom sediments of the reservoirs of these dams would pose a substantial threat to human health and welfare. CERCLA requires the USEPA Administrator to ensure that U.S. Department of Health and Human Services' Agency for Toxic Substances and Disease Registry (ATSDR")[103] *performed assessments of the health risks associated with such NPS pollutants, contaminants and hazardous substances, taking into account the potential migration of any hazardous substance or pollutant or contaminant through such surface water to downstream sources of drinking water. However, the administrative record does not reflect that USEPA or ATSDR has yet conducted any such health-related risk assessment. In fact, the draft and final versions of the Interior Secretary's environmental impact statements ("DEIS" and "FEIS"), which were intended to satisfy only the requirements of the National Environmental Policy Act ("NEPA"), clearly indicated otherwise.*

Although "[a]s part of the Klamath Dam Removal Secretarial Determination studies, a sediment evaluation [had been] undertaken during 2009–2011 to evaluate potential environmental and human health impacts of the downstream release of sediment deposits currently stored behind the dams under the Proposed Action [dam removal],"[104] "[…] special evaluations […] such as risk assessments [had…] not [been] utilized for this [the Secretarial Determination sediment] evaluation." (emphasis added).[105]

When samples were found to exceed human health screening levels, the DOI response was to rely upon Stillwater and Gathard studies claiming the risk would be minimized once the dams were removed because the chemicals were highly volatile and would evaporate or otherwise dissipate rapidly upon exposure to the air.[106]

The Obama administration's former USEPA Administrator also had failed, like the current administration's former USEPA Administrator, to conduct assessments of the indirect risks to human health posed by those hazardous substances known to have "accumulated in invertebrate tissues (i.e., acenaphthene, arsenic, benzo(a)pyrene, DDT/DDE, endosulfan I, endosulfan II, endosulfan sulfate, fluoranthene, hexachlorobenzene, lead, mercury, phenanthrene, pyrene, total PBDEs, total PCBs)" (e.g., crustaceans) that humans could potentially consume.[107] The DEIS and FEIS also clearly stated that, "fish tissue samples […] collected in Copco 1 and Iron Gate Reservoirs and analyzed for total mercury […]" exceeded federal and state criteria and guidelines.[108]

USEPA likely did not conduct assessments of human health risks directly and indirectly tied to the chemicals of concern ("COCs"), hazardous substances, pollutants and/or contaminants contained in the dam reservoir bottom sediments because the methodologies, protocols and processes USEPA had previously utilized in its Integrated Risk Information System ("IRIS") to conduct risk assessments on hazardous substances such as dichlorodiphenyltrichloroethane ("DDT"), dieldrin and pentachlorophenol[109] were then considered questionable, at best. Indeed, in 2011, the National Academy of Sciences had determined EPA's IRIS human and ecological toxicological risk assessment process had been seriously flawed and in need of substantial revision.[110]

In addition, that bore samples taken had been few in number for the total reservoirs' surface acreage and generally taken at relatively shallow depths, would seem to indicate the federal agencies intended to downplay the toxicity of the sediments containing chemicals included on the CWA and CERCLA hazardous substance lists. For example, as the Bureau of Reclamation explained, the 2009 Gathard Engineering Consulting study methods used to analyze the physical and chemical properties of the sediments [were] adequate and the number of samples collected seem[ed] reasonable for an appraisal-level analysis. Appraisal-level designs and cost estimates represent an early stage of

project development based on available data, and are used to determine whether more detailed investigations of a potential project are justified. Reclamation does not use appraisal-level cost estimates to seek Congressional authorization. Approximately 26 samples were collected in the reservoirs and none of these samples contained hazardous material based upon criteria established under the Puget Sound Dredged Disposal Analysis program. The samples were spaced throughout the reservoirs in a reasonable manner, but only one sample was collected at a depth greater than 10 feet of the sediment stored in the reservoir. Considering the size of the impoundments and the costs of removal, the Team recommends collecting additional samples for feasibility design. There would be three reasons for collecting additional samples: 1) to verify the absence of hazardous material at all sediment depths, 2) to obtain physical sediment properties at all sediment depths, and 3) to improve the estimate of the stored sediment volume. The Team believes that it is highly unlikely that hazardous materials exist in the reservoir sediment because with 26 samples collected there would have been at least some indication of contamination. However, this needs to be verified at all sediment depths and for more locations within the reservoir.[111]

It is rather unfathomable that only 26 bore samples had been taken from the reservoir bottoms of the four dams three of which cover approximately 2,400 surface acres. And although the under-detection of COCs from the few reservoir composite samples was thereafter reported as possibly giving rise to biased results,[112] *DOI (USGS)*[113] *and USEPA, nevertheless, found from the limited data on sediment quality behind the dams that the risk-based and effects-based values for dioxins did not exceed estimated regional background concentrations.*[114] *When samples were found to exceed human health screening levels, as in the case of microcystin growth in dam reservoirs, the DOI response was to claim the risk would be minimized once the dams were removed despite the presence of such toxic substances throughout the Klamath River.*

The record does not reflect, furthermore, that the USEPA Administrator had conducted, as had been required, an assessment of permanent solutions and alternative treatment technologies, or resource recovery technologies that would result in a permanent and significant decrease in the toxicity, mobility, or volume of such hazardous substances, pollutants, and contaminants.[115] *Moreover, the record does not reflect that the EPA Administrator had addressed the long-term effectiveness of various alternatives, taking specific account inter alia of the short- and long-term potential for adverse health effects from human exposure, and the potential threat to human health and the environment associated with excavation, transportation, and redisposal, or containment. Furthermore, the EPA Administrator failed to select a remedial action that is protective of human health as well as the environment.*[116]

Lastly, the record does not reflect that the USEPA Administrator had assessed the human health risks associated with the contamination or potential contamination resulting from the release upon dam removal of the nonpoint

source runoff of upstream-derived hazardous substances, pollutants and contaminants that had settled in the water columns of the four dam reservoirs, and consequently, in the reservoir's surface waters used for recreation. In addition, the Obama administration USEPA Administrator had failed to assess the potentially severe human health risks associated with the release upon dam removal of toxic microcystin[117] occurring in these reservoirs which greatly exceeded recommended federal and state thresholds,[118] and which are acknowledged as also being currently present downriver of the dams[119] and as likely to be present following the dams' removal.[120]

Response to Comment ORG44-6

Please refer to Master Responses WQ-7 and CEQ-2. Section 3.2.2.8 *Water Quality – Environmental Setting – Inorganic and Organic Contaminants* and Appendix C Section C.7 *Inorganic and Organic Contaminants* specifically discuss the inorganic and organic contaminants under existing conditions, including a summary of the inorganic and organic contaminants detected in 25 sediment cores collected during 2006 (Shannon & Wilson, Inc. 2006), the inorganic and organic contaminants detected in 37 sediment cores collected during 2009 to 2010 (USBR 2011), and the subsequent analysis of those sediment cores to evaluate potential impacts from the downstream release of reservoir sediment deposits (CDM 2011). No sediment cores were collected from the reservoirs during 2004 to 2005. Sediment cores collected by Shannon & Wilson, Inc. (2006) occurred in 2006 and the 2012 Klamath Facilities Removal Final Environmental Impact Statement/Environmental Impact Report misstated these sediment cores were collected during 2004 to 2005. While 26 locations were listed for reservoir sediment coring by Shannon & Wilson, Inc. (2006), only 25 locations had reservoir sediment samples collected and no reservoir sediment samples were collected at one location. Overall, the inorganic and organic contaminants were measured at 62 locations on and off the center of the historical river channel with on-site geologists verifying that the 37 sediment cores collected during 2009 and 2010 reached the reservoir-deposited/pre-reservoir sediment boundary to characterize the inorganic and organic contaminants throughout the entire depth of the existing reservoir sediments. The discussion in the comment of only 26 sediment cores collected from the Lower Klamath Project reservoirs neglects to consider the additional 37 sediment cores taken during 2009 to 2010 (USBR 2011). The subsequent analysis by CDM (2011) concluded from multiple lines of evidence, including the inorganic and organic contaminants detected in reservoir sediment cores, that the sediment quality of reservoirs does not appear to be notably contaminated based on the detected chemicals of potential concern in reservoir sediments and comparisons to ecological freshwater and marine Pacific Northwest Sediment Evaluation Framework (SEF), U.S. Army Corp of Engineers Dredge Material Management Program, National Oceanic and Atmospheric Administration Screening Quick Reference Tables (SQuiRT), and Oregon Department of Environmental Quality (ODEQ) bioaccumulative screening levels (SLs) along with comparisons to human health SLs, including U.S. Environmental Protection

Agency residential (total carcinogenic and total non-carcinogenic) regional screening levels (RSLs), California Environmental Protection Agency (CalEPA) Office of Environmental Health Hazard Assessment (OEHHA) California Human Health Screening Levels (CHHSLs), or ODEQ bioaccumulation (human subsistence and human general) SLs. Microcystin concentrations and growth of *Microcystis aeruginosa* in the Klamath River under existing conditions are discussed separately in Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins*, Appendix C Section C.6 *Algal Toxins and Chlorophyll-a*, and Volume I Section 3.4.2 *Phytoplankton and Periphyton – Environmental Setting* (pages 3-392 to 3-422). Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality* and the final Appendix C *Water Quality Support Technical Information*. Please also refer to Volume III Attachment 1 Section 3.4.2 *Phytoplankton and Periphyton – Environmental Setting* for revisions to this section.

Section 3.2.5.7 *Water Quality – Potential Impacts and Mitigation – Inorganic and Organic Contaminants* specifically analyzes the human (i.e., Potential Impact 3.2-13) and freshwater and marine aquatic species (i.e., Potential Impact 3.2-14) exposure to inorganic and organic contaminants under the Proposed Project due to releases of reservoir sediments during drawdown and interactions with sediment deposits remaining within the reservoir footprints after reservoir drawdown is completed. Additionally, Mitigation Measures WQ-2 and WQ-3 are specified to reduce the short-term significant impact of human exposure to inorganic and organic contaminants in the Middle and Lower Klamath River and the Klamath River Estuary to less than significant. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Comment ORG44-7

FERC Should Not Have Federal Jurisdiction Over Klamath River Dam Removal

USEPA Retained Primary Jurisdiction Over Dam Removal Under CWA and CERCLA:

The Obama administration USEPA likely recognized that the Federal Energy Regulatory Commission ("FERC") has exclusive authority, under the Federal Power Act ("FPA") (16 U.S.C. §§ 791-828c), to license all nonfederal hydropower projects located on navigable waters. "The hydropower dam relicensing process offers an opportunity to assess the balance between natural resources and the generation of electricity and to address some areas that are determined to be problematic. […] In conjunction with FPA licensing requirements, states and authorized tribes certify that discharges (including those that originate from dams) meet water quality standards under section 401 of the Clean Water Act (CWA)."[121]

On June 16, 2016, the FERC granted "PacifiCorp's May 6, 2016 motion to hold in abeyance the processing of the relicense application for the Klamath

Hydroelectric Project No. 2082,"[122] consistent with the amended Klamath Hydroelectric Settlement Agreement ("KHSA") process.[123] In its ruling, FERC noted that, consistent with the amended KHSA process, "PacifiCorp and a new entity, the Klamath River Renewal Corporation (Renewal Corporation), will jointly file on or around July 1, 2016, an application to transfer the four developments to the Renewal Corporation."[124] In addition, the agency noted that "on or around July 1, 2016, the Renewal Corporation will file an application with the Commission to surrender and remove the four dams, and applications for water quality certifications under section 401 of the Clean Water Act for dam removal with the California State Water Resource Control Board (California Water Board) and Oregon Department of Environmental Quality (Oregon DEQ)."[125]

On June 24, 2016, "with the relicensing proceeding in abeyance,[126] and consistent with Section 6.5.2 of the amended KHSA," PacifiCorp filed with FERC a request to withdraw the prior November 10, 2015 applications for water quality certification it had filed with the California State Water Resources Control Board Oregon Department of Environmental Quality to ensure the California and Oregon portions of Project No. P-2082 were in compliance with CWA § 401 and the respective state requirements.[127] Tongue-in-cheek, PacifiCorp reserved the right to reactivate these applications if the circumstances changed, apparently emboldened that FERC had previously ruled that it would not conclude that repeated withdrawal and refiling of license applications violated the letter of the Clean Water Act.[128] As previously discussed, FERC would, even under these circumstances, retain jurisdiction over the transfer of the four PacifiCorp dam licenses to KRRC, and over KRRC's eventual dam license terminations and decommissions. However, as previously discussed, it is because of USEPA's shrewd maneuver during the last presidential administration that FERC has since retained jurisdiction over the dams.

On January 29, 2019, however, the U.S. Court of Appeals for the District of Columbia Circuit ruled the repeated withdrawal and resubmission of water quality certification requests pursuant to the CWA § 401 process that had been agreed upon between PacifiCorp and the States of California and Oregon did not toll each state's one-year waiver period, and thus, did not trigger new statutory periods of review. Thus, the Court found that FERC had acted arbitrarily and capriciously when it treated each PacifiCorp resubmission of an application over the course of a decade as an independent request subject to a new period of review. "Such an arrangement does not exploit a statutory loophole; it serves to circumvent a congressionally granted authority over the licensing, conditioning, and developing of a hydropower project." Hoopa Valley Tribe v. Federal Energy Regulatory Commission, No. 14-1271 (D.C. Cir. Jan. 25, 2019), slip op. at 11.[129] According to the Court, "Congress intended [CWA] Section 401 to curb a state's dalliance or unreasonable delay." Slip op at 12 citing 115 Cong. Rec. 9264 (1969). The Circuit Court's decision directs FERC "to proceed with its review of, and licensing determination for, the Klamath Hydroelectric Project" (slip op. at 14) (i.e., with the license transfers from PacifiCorp to KRRC), and ultimately, to

KRRC's decommissioning of each dam's hydroelectric transmission, without regard for the risk to human health and welfare that the release of the accumulated toxins in the dam reservoir bottoms would create.

Notwithstanding this recent ruling, USEPA arguably should have jurisdiction over the dam removal process because of the four dam's demonstrated contribution to the impairment of the Klamath River. As the result of the decades-old aggregation of nonpoint source pollutants in each dam's reservoir bottom, the release of those accumulated toxic sediments upon dam removal seriously threatens public health and welfare, within the meaning of CWA § 303(d).

In Clark Fork and Blackfoot, LLC,[130] the FERC ruled that it no longer had jurisdiction over the 120-mile Milltown Project (dam) site located along the Clark Fork River in southwestern Montana where USEPA had designated it as a Superfund site within the meaning of CERCLA,[131] made its remedy selection upon adopting a final three-stage Record of Decision ("ROD"),[132] and the only actions to be undertaken under the proposed license amendment/USEPA ROD concerned the cessation of generation and the dismantling and complete removal of the project.[133] FERC explained that, under these circumstances, it was reasonable to conclude, consistent with CERCLA § 121(e)(1), that no license amendment tantamount to a "permit" would be necessary,[134] since all remedial and restorative actions to be undertaken pursuant to the ROD which USEPA would direct and implement, effectively "transferred […] complete regulatory control […] from the Commission to EPA."[135] According to FERC, There is therefore nothing remarkable about the constraint on our jurisdiction embodied in CERCLA section 121(e)(1). […] The cessation of generation and complete removal of the project by EPA under CERCLA transfers effective regulatory control over the entire project to EPA and leaves the Commission with nothing to regulate. The only authority we can exercise in these unique circumstances is the authority, pursuant to FPA section 6, to accept surrender of the project license. License surrender is not subject to the comprehensive development standard of section 10(a)(1), but to a broad 'public interest' standard, which is not the same thing. [fn] We continue to believe that the public interest is best served if all matters pertaining to decommissioning of the project and removal of the dam pursuant to EPA's remedy selection are addressed by EPA itself.[136]

In the present case, the amended KHSA process calls for the planned decommissioning and removal of the four Klamath River dams. In addition, PacifiCorp arguably should have, but failed, in violation of CERCLA, to notify USEPA of the presence of hazardous substances and chemicals of concern contained in the sediments and water columns of the dam reservoir bottoms that appear in the CERCLA "list of lists," in violation of CERCLA § 103(c). Furthermore, USEPA, knowing of the presence of such substances by virtue of its participation in the amended KHSA process, failed to undertake the type of thorough human health risk assessments of those substances that would have

enabled it to determine whether to properly list the dam sites as falling under the Superfund law (CERCLA), in violation of CERCLA § 105(c)(2).

Arguably, neither the Interior Department nor FERC should have exercised or had active control and influence over the dismantling and complete removal of the Klamath River dams given the potentially adverse impacts on human health and welfare the removal of the four dams will have, considering the decades-old aggregation of nonpoint source pollutants and toxic contaminants now present in the four dams' reservoir bottoms. Consequently, based on the FERC's prior ruling in Clark Fork and Blackfoot, LLC, FERC's jurisdiction over the Klamath Hydroelectric Project should terminate once it orders the transfers of the four PacifiCorp licenses to KRRC. Thereafter, USEPA should properly retain jurisdiction over all subsequent activities involving the dams which the amended KHSA process anticipates will result in their decommissioning and removal. However, since the removal plan for these dams fail to include the development of an adequate plan of remediation and restoration as prescribed by CERCLA § 121(a) and § 121 (b)(1), since USEPA had failed to previously conduct a robust human health risk assessment consistent with the Clean Water Act and the Safe Drinking Water Act,137 and since USEPA also had failed to ensure that the U.S. Interior Department had conducted a robust evaluation of the composition of the sediment bottoms of each dam's reservoir/impoundment bottom, USEPA must first conduct each such assessments before it can decide that dam removal is in the best interests of the public.

Response to Comment ORG44-7
The commenter asserts that United States Environmental Protection Agency (USEPA), rather than Federal Energy Regulatory Commission (FERC) should have jurisdiction over the proposed dam removal. The comment cites *Clark Fork and Blackfoot, LLC* 110 FERC 61160, which holds that FERC loses jurisdiction when a hydropower facility is being removed under a USEPA Comprehensive Environmental Response, Compensation, and Liability Act *(*CERCLA) remediation plan. However, the Proposed Project is not a removal proposed under a CERCLA remediation plan. *Clark Fork and Blackfoot, LLC* 110 FERC 61160 does not stand for the proposition that FERC does not maintain jurisdiction over license surrender proceedings.

The issue raised by the commenter relates to the actions of federal agencies. Comment noted. Please also refer to Master Response CEQ-2.

Comment ORG44-8
Congress Must Consent to and Ratify the Klamath Basin Agreements Before the Four Klamath River Hydroelectric Power Dams Can be Removed:

The authorization by the States of California and Oregon to remove the four Klamath River dams and their reservoirs, pursuant to the Klamath Basin agreements (i.e., the Amended KHSA process), violates Congress' authority

under Article I, Section 8 (the Commerce Clause) and Article I, Section 10, Clause 3 (the Compact Clause) of the United States Constitution, and under relevant and applicable United States Supreme Court jurisprudence.

The federal government holds at least seven (7) paramount federal interests in the Klamath River that trump, subordinate and subjugate the rights of the States of California and Oregon to effectively reallocate Klamath River water and use rights among its citizens and the adjacent Indian nations by removing these dams and reservoir-impoundments, especially, in the interest of the privately-owned PacifiCorp, a Federal Energy Regulatory Commission licensee. These paramount federal interests include: 1) the federal navigation servitude; 2) the federal assurance of affordable power; 3) federal flood control; 4) the federal irrigation project operation and management; 5) the federal regulation of environmental protection and pollution control; 6) the federal protection of fish and wildlife; and 7) the federal trust obligation to protect tribal rights.

Furthermore, Congress' and the President's prior legally valid enactment of the Klamath River Basin Compact into federal law in 1957 reaffirmed these paramount federal interests, and further established Congress' primary jurisdiction over the disposition of the four (4) Klamath River hydroelectric power dams in question, pursuant to Article VI, Clause 2 (the Supremacy Clause) of the United States Constitution.

The Klamath Basin Restoration Agreement ("KBRA"), Klamath Hydroelectric Settlement Agreement ("KHSA"), Upper Klamath Basin Comprehensive Agreement ("UKBCA"), the Amended Klamath Hydroelectric Settlement Agreement ("Amended KHSA"), Klamath Power Facility Agreement ("KPFA"), and the prior Wyden-Merkley legislation (SA 3288) collectively address the same federal interests the Klamath River Basin Compact ("KBRC"), which Congress and the President enacted into law in 1957, addressed. Since these agreements would collectively amend the 1957 KRBC, either directly through changes to the KRBC text, or indirectly, through supplements to (protocols implementing) the KRBC text, such agreements and their effective changes to the KRBC, a federal-interstate compact, require the consent and ratification of Congress and the signature of the President to enact such changes into federal law.

The memorandum of law accompanying this submission, which was dispatched recently to various members of Congress explains in detail why Congress has primary interest in and primary jurisdiction over the disposition of the four Klamath River dams in question.

Response to Comment ORG44-8

The issue raised by the commenter relates to the actions of Congress and federal agencies and does not focus on the sufficiency of the EIR in identifying and analyzing the possible impacts of the Proposed Project on the environment and ways in which the significant effects of the project might be avoided or

mitigated (CEQA Guidelines section 15204(a)). Please also refer to Master Response CEQ-4.

Klamath River Renewal Corporation, Laura Zagar, Mark Bransom

Comment ORG47-1
GENERAL COMMENTS

General Comment 1. The Proposed Project will provide more environmental benefits to the Klamath River as compared to the other action alternatives considered in the Draft EIR.

We support the Draft EIR's conclusion that the environmentally superior alternative is the Proposed Project, under which the four dams in the Lower Klamath Project would be removed to create free-flowing river conditions. See p. ES-24. As the Draft EIR finds, the removal of the Lower Klamath Project's dams will comply with applicable water quality requirements and provide a wide range of beneficial impacts, including: benefits to aquatic species listed under the Endangered Species Act; long-term beneficial effects on riparian habitat and listed species that rely on such riparian habitat; and benefits for Native American tribes that depend on the Lower Klamath River for fisheries and ceremonial purposes (Draft EIR, Executive Summary, pp. ES-9 to ES-10; ES-24 [finding that the Proposed Project as the environmentally superior alternative]).

KRRC appreciates the State Water Board's detailed examination of a number of other alternatives that potentially would meet some, but not all, of the Proposed Project's objectives. Restoration of free-flowing river conditions per the Proposed Project will provide the maximum benefits to the Klamath River's water quality and ecosystem.

Response to Comment ORG47-1
Thank you for your comments and comment noted.

Comment ORG47-2
General Comment 2. As conditions of license surrender, KRRC will implement comprehensive measures to avoid and minimize the Proposed Project's adverse environmental impacts.

While the Proposed Project will have substantial environmental benefits, we recognize that it will have adverse effects on environmental quality, absent the implementation of appropriate mitigation measures. The scope of state and local authority to require such mitigation measures is limited, because the Proposed Project is under the licensing jurisdiction of the Federal Energy Regulatory Commission (FERC) under the Federal Power Act (California v. Federal Regulatory Commission et al., 495 U.S. 490 (1990)). While regulating the Proposed Project under the non-preempted authority of Clean Water Act Section 401, the State Water Board has authority to require mitigation measures as

necessary to assure compliance with water quality objectives and related water quality requirements (Draft EIR, p. ES-11). However, it does not have jurisdiction to require mitigation of other potentially adverse impacts. Where the Draft EIR identifies potentially adverse impacts that fall outside of the State Water Board's water quality certification authority, the State Water Board has chosen to identify these impacts as significant and unavoidable impacts since they cannot ensure implementation of mitigation measures to reduce the impacts (Draft EIR, Page ES-24).

The Draft EIR does not reflect, however, that FERC and other agencies considering KRRC's applications for regulatory approvals can and should implement measures to reduce the Proposed Project's adverse effects. Such approvals include the license surrender order, the Biological Opinion under the Endangered Species Act, dredge-and-fill permit under Clean Water Act section 404, and other applicable regulatory authorizations. Before such approvals can be issued, the Proposed Project will also be subject to additional environmental review under the National Environmental Policy Act (NEPA). In addition, the Federal Power Act requires FERC to include terms and conditions in the surrender order that are determined by FERC to be necessary to protect environmental resources and public safety during project decommissioning activities and will serve the public interest.

KRRC has proposed a comprehensive set of mitigation measures for the purpose of license surrender. These measures are described in the Draft EIR as well as in KRRC's Definite Plan, attached to the Draft EIR as Appendix B. The KRRC proposes to implement these measures through the following plans or project components:

- *Risk Management Plan*
- *Draft Recreation Plan*
- *Reservoir Area Management Plan*
- *Cultural Resources Plan*
- *Water Quality Monitoring Plan*
- *Groundwater Well Management Plan*
- *Fire Management Plan*
- *Traffic Management Plan*
- *Downstream Flood Control Improvements*
- *Hazards Material Management Plan*
- *Emergency Response Plan*
- *Noise and Vibration Control Plan*
- *Aquatic Resource Measures*
- *Terrestrial Resource Measures*
- *Road Improvements*

- *Yreka Water Supply Improvements*
- *Recreation Facilities Removal and Development Plan*

We derived many of these mitigation measures from the recommendations in the Final Environmental Impact Statement/Environmental Impact Report completed by the Department of Interior and the California Department of Fish and Wildlife in 2012 (2012 EIS/EIR). KRRC then worked closely with a number of federal and state resource agencies and impacted tribes to carefully review the 2012 EIS/EIR's measures to evaluate the efficacy of those measures and to update the measures where appropriate based on additional data gained from recent dam removal projects in the Western United States.

KRRC has also committed to implement additional measures to reduce the Proposed Project's impacts. For example, we are committed to implement mitigation measures to avoid or minimize any impacts to historical and tribal cultural resources. We developed these measures with Native American tribes that requested consultation under Assembly Bill (AB) 52 (Draft EIR, Chapter 3.12). KRRC will continue to work with these and other tribes in the Klamath Basin as we complete both the National Historic Preservation Act Section 106 consultation process associated with the ongoing FERC surrender proceeding and the Tribal Cultural Resources Management Program as part of a comprehensive Historic Properties Management Plan.

Finally, KRRC is working with state and local agencies participating in the FERC process to develop agreements, referred to in the Draft EIR as "good neighbor agreements," to provide FERC with joint recommendations related to mitigation of the Proposed Project's potential impacts to the extent such impacts are not adequately addressed through KRRC's commitments or the State Water Board's required mitigation measures outlined in the Draft EIR (Draft EIR, ES-11). KRRC is working diligently to reach agreements with key state and local stakeholders in an effort to ensure that their concerns are sufficiently addressed prior to the Proposed Project's implementation.

Response to Comment ORG47-2
This comment concerns the Klamath River Renewal Corporation's (KRRC's) commitment to implement mitigation measures. Comment noted. Please also refer to Master Response CEQ-2.

Comment ORG47-3
General Comment 3. As a condition of license surrender, KRRC will address any potential increased response time and associated wildland fire risk due to implementation of the Proposed Project.

The Draft EIR finds that implementation of the Proposed Project may increase risk associated with wildland fire during the Proposed Project's construction activities and after construction is complete due to the loss of reservoirs as a

potential source of water for fire suppression crews. KRRC is committed to addressing this impact and to reduce any increase in wildland fire risk for the Klamath Basin due to the implementation of the Proposed Project. To that end, KRRC is working closely with CAL FIRE to develop effective ways that KRRC can reduce any increased wildland fire risk during the Proposed Project's construction activities, and to identify ways that KRRC can assist improving emergency response in the Klamath Basin after the Proposed Project is implemented.

KRRC has prepared a draft Fire Management Plan, which sets forth the initial framework by which KRRC will work with local emergency responders to reduce response time and any associated additional risk attributable to the Proposed Project (Draft EIR, Appendix B [Definite Plan, Appendix 01]). The Fire Management Plan details how KRRC will comply with applicable regulations and requirements set forth by the fire suppression agencies in the Proposed Project vicinity. In the draft Fire Management Plan, KRRC commits to having a designated Safety Officer who will be on-call 24 hours a day, 7 days a week who will be the primary on-site contact for emergency responders and will be responsible for implementing the fire suppression and elimination measures. The Safety Officer will be onsite during the removal of the dam facilities. The Safety Officer and KRRC's contractor will work closely with California and Oregon fire suppression agencies to develop broad scale contingency plans for fire suppression within their respective jurisdictions. During construction, KRRC will take precautionary, pre-suppression and suppression measures to ensure public safety, and will comply with applicable fire season regulations and requirements in California and Oregon (Id., p. 33-35). KRRC will carefully monitor weather patterns that may increase fire hazards during construction and will update operations and fire response plans to address changing environmental conditions while closely communicating with relevant fire suppression agencies (Id, p. 34-35). KRRC will also work closely with emergency responders to ensure that construction operations will not impede emergency vehicles or impede public access to evacuation routes.

The draft Fire Management Plan also includes a preliminary analysis concerning potential sources of replacement water that can be used by fire suppression crews to replace the reservoirs eliminated by the Proposed Project (Id., Chapter 6). KRRC recognizes that fire suppression efforts in the Klamath Basin rely on helicopter crews. As reflected in the draft Fire Management Plan, KRRC has confirmed with CAL FIRE that helicopter fire suppression will be able to draw water from the Klamath River (Id., p. 41; pers. comm., M. Hebrard, February 2019). Because the water must be a certain depth to extract water, KRRC is working with CAL FIRE to identify which specific portions of the Klamath River are suitable for extraction by helicopter crews during wildland fires (Id., p. 41). KRRC appreciates the feedback from the State Water Board that certain potential replacement measures, such as dry hydrants, will not be an effective replacement source of water. However, KRRC continues to work with CAL FIRE

to identify not only replacement sources of water, but ways in which KRRC can facilitate the reduction of overall emergency response times through communications and roadway improvements. KRRC intends to expeditiously finalize the Fire Management Plan in conjunction with our contactor, federal, state, and local fire suppression agencies, and emergency responders.

Response to Comment ORG47-3
While no text revisions are necessary to the Executive Summary, the additional clarification provided in the comment is noted.

Please also refer to additional information regarding wildfire found in Master Response HAZ-2.

Comment ORG47-4
General Comment 4. The Proposed Project will not result in the procurement of additional fossil fuel generation.

The implementation of the Proposed Project will result in the elimination of a source of hydropower, which PacifiCorp would need to replace in its portfolio. As the Draft EIR correctly concludes, the power that PacifiCorp will procure to replace the Lower Klamath Project's generation will not increase overall greenhouse gas (GHG) emissions (Draft EIR, pp. 2-727 to 730).

As a preliminary matter, PacifiCorp has already accounted for the loss of the generation from the Lower Klamath Project in its Integrated Resource Plan (IRP). Substantial evidence demonstrates that the Lower Klamath Project will not be replaced through the procurement of fossil fuel generation. However, the loss of production attributable to the decommissioning of the Lower Klamath Project loss is many, many times offset by PacifiCorp's acquisition of renewable resources. PacifiCorp's 2017 IRP states that, through the end of 2036, the updated preferred portfolio includes over 2,700 megawatts (MW) of new wind resources, 1,860 MW of new solar resources, 1,877 MW of incremental energy efficiency resources, and approximately 268 MW of direct-load control resources. The 2017 IRP contains no new natural gas resources through the 20-year planning horizon. This is the first time an IRP has not included new fossil-fueled generation as a least-cost, least-risk resource for PacifiCorp. This was reinforced in PacifiCorp's 2017 IRP Update, in which the preferred portfolio continues to assume existing owned coal capacity will be reduced by 3,650 MW through the end of 2036.

The fact that the Lower Klamath Project generation will not be replaced with newly procured fossil fuels is underscored by the energy policies in both California and Oregon. Both states have enacted aggressive renewable energy and carbon reduction goals. In addition to the goals set forth in the Draft EIR, Governor Jerry Brown signed Senate Bill (SB) 100, which accelerates the state's Renewables Portfolio Standard (RPS) to require utilities and other load serving

entities derive 60% of their energy from renewable sources by 2030. SB 100 also requires the state to obtain all of its electricity from carbon-free sources by 2045.

The State of Oregon also has a state policy to reduce GHG emissions in Oregon to meet certain GHG reduction goals by 2020 and 2050; ORS 468A.205 et seq. In 2016, Governor Kate Brown signed legislation that increased the state's RPS to require utilities to procure at least 50% of its power from renewable resources by 2040. Currently, the Oregon legislature is evaluating a number of bills to further its state policy to reduce GHG emissions. This legislation includes House Bill 2020, which would set new GHG reduction goals for 2035 and 2050 and establish a new "cap and trade" regulatory program administered by a new state agency, the Carbon Policy Office, to address GHG emissions by (1) placing a cap on the total anthropogenic GHG emissions by setting annual allowance budgets for 2021 and 2050; and (2) providing a market-based mechanism for covered entities, which includes certain electric companies, to demonstrate compliance with the program.

In light of aggressive efforts by California and Oregon to increase carbon reduction goals and PacifiCorp's stated intention to replace existing fossil fuel generation with an increasing amount of renewable energy, there is substantial evidence that the loss of the Lower Klamath Project's generation will not result in the procurement of fossil fuel generation.

Response to Comment ORG47-4
This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (Greenhouse Gas Emissions and Energy).

Comment ORG47-5
ES-5. Clarify that the timing of the drawdown at Copco No. 2 would be before breaching Copco No. 1 dam, not after.

Suggested revision (second paragraph, second sentence):

"Copco No. 2 Reservoir is substantially smaller than the other three dams and the KRRC proposes to drawdown this reservoir ~~after~~ before Copco No. 1 Dam has been breached to final grade in May of dam removal year 2."

Response to Comment ORG47-5
The Executive Summary has been clarified as requested. Please refer to Volume III Attachment 1 *Executive Summary* for the revision.

Comment ORG47-6
ES-5. To clarify, the capacity of the embankment dam crest is related to the passage of a 1 in 150 probable seasonal flow, which would be a higher standard than the annual rate (i.e., 100-year flood event).

Suggested revision (third paragraph, last sentence):

"During Iron Gate Dam removal, the embankment dam crest would be retained at a level to accommodate the passage of a ~~100-year flood event~~ 1 in 150 probable seasonal flow."

Response to Comment ORG47-6
The Executive Summary has been clarified as requested. Please refer to Volume III Attachment 1 *Executive Summary* for the revision.

Comment ORG47-7
ES-5. Clarify the first sentence to describe the sequencing of the dam removal and reservoir drawdowns.

Suggested revision (second paragraph, first sentence):

"Copco No. 1 Reservoir would be drawn down first (~~November–March of dam removal year 1~~ November of dam removal year 1 to March of dam removal year 2)[1], followed by J.C. Boyle (Oregon) and Iron Gate reservoirs (January–March of dam removal year 2)."

Response to Comment ORG47-7
The Executive Summary has been clarified as requested. Please refer to Volume III Attachment 1 *Executive Summary* for the revision.

Comment ORG47-8
ES-11. Clarify how the State Water Board's limited scope of jurisdiction restricts the scope of mitigation it may require through its water quality certification jurisdiction, resulting in a greater number of determinations of "significant and unavoidable" impacts than would actually happen during the Proposed Project's implementation. Many of these significant impacts will be reduced by the commitments that KRRC has made to fully mitigate adverse impacts of the Proposed Project to the extent feasible. In addition, many of these significant impacts will also be reduced during the additional layers of environmental review and regulatory approvals of FERC, the U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service, and the National Marine Fisheries Service. Through this extensive regulatory process, these agencies will add additional terms and conditions under which KRRC must comply in the implementation of the Proposed Project that will further reduce significant impacts identified in the EIR.

Suggested revision (last paragraph, "Significant Unavoidable Adverse Impacts")

"Below is a summary, by resource area, of impacts found to be 'significant and unavoidable' with or without mitigation (Table ES-1). Please note, many of these impacts determinations are based on the limitations of the State Water Board's jurisdiction based on the proposed issuance of a water quality certification. This is the first of many agencies' review of the Proposed Project. Before KRRC could implement the Proposed Project, the Proposed Project would undergo additional environmental review and permitting by FERC, the U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service, and the National Marine Fisheries Service. On balance, this robust federal environmental review and regulatory oversight will result in a reduction of the impacts identified by the State Water Board in this Draft EIR. Because that review has not yet occurred, however, the State Water Board has made significance determinations based only on the scope of mitigation that it can enforce, resulting in a greater number of significant and unavoidable determinations than might actually occur during the Proposed Project's implementation. These impact characterizations are thus conservative from a legal standpoint, and reflect the fact that the State Water Board, by itself, cannot ensure that the significant impacts at issue cannot be mitigated to less than significant levels. For many of these impacts, however, binding mitigation obligations imposed by other regulatory agencies will likely ensure that the impacts will ultimately be mitigated to less than significant levels.

In addition, KRRC has made a wide range of commitments to implement measures to reduce the environmental impacts of this Project. The KRRC proposes to further develop Proposed Project actions relating to certain state and local regulatory requirements for several resource areas that fall outside of State Water Board's water quality certification authority. KRRC anticipates entering into Memoranda of Understanding (MOUs or "good neighbor agreements") with certain state or local agencies, under which KRRC and the relevant agency would provide joint recommendations to FERC to include those terms and conditions in FERC's surrender order.

The State Water Board anticipates implementation of additional measures (e.g., good neighbor agreements between the KRRC and relevant state or local agencies, recommended measures in this EIR, and any modifications developed through the FERC process that provide the same or better level of protection for the resource in question) would reduce impacts. The EIR notes where such protection would eliminate the potential for a significant impact. However, the State Water Board cannot ensure implementation of good neighbor agreements, recommended measures included in this EIR, or modifications anticipated to be developed through the FERC process. Therefore, the State Water Board has identified impacts that rely on implementation of such agreements or recommended measures to reduce impacts to less than significant levels in this EIR as significant and unavoidable in this EIR."

Response to Comment ORG47-8
Please refer to Master Response CEQ-2 regarding the scope of federal preemption and the resulting impact on mitigation measures and findings of significance. The last paragraph of Volume I *Executive Summary – Summary of Proposed Project Effects, Potential Impacts, and Potential Cumulative Impacts – Significant and Unavoidable Impacts* (page ES-11) has been clarified in light of the information in Master Response CEQ-2 and the textual recommendations in the comment.

Comment ORG47-9
ES-14. Clarify under bullet one under Public Service that it is a short-term increase on response times during construction activities. It is also recommended to clarify that the potential increase in response time is unknown at this time. There are a number of factors that contribute to the severity and extent of a wildland fire. It is hard to predict whether any specific factor will contribute to the severity of a fire (pers. comm., M. Hebrard, February 2019). In addition, as conditions of license and surrender, KRRC has committed to implement Recommended Measure PS-1, which will substantially reduce impacts to emergency response time in suppressing wildland fire. KRRC will work closely with fire suppression agencies to finalize the Fire Management Plan consistent with Recommended Measure PS-1.

Suggested revision (top of page, "Public Services")

- *"Short term i~~I~~ncreases in public service response times for emergency fire, police, and medical services due to construction and demolition activities, including construction related traffic; and*
- *~~Substantial~~ Potential increase in response times for suppressing wildland fires where suitable replacement water sources cannot be identified in close proximity to a fire in a location for which the Lower Klamath Project reservoirs would otherwise have been the nearest water source."*

Response to Comment ORG47-9
The *Executive Summary – Summary of Proposed Project Effects, Potential Impacts, and Potential Cumulative Impacts – Significant Unavoidable Adverse Impacts – Public Services – Public Services* first bullet has been revised to clarify that increases in public service response times are related to short-term impacts during construction activities. Please refer to Volume III Attachment 1 *Executive Summary – Summary of Proposed Project Effects, Potential Impacts, and Potential Cumulative Impacts – Significant Unavoidable Adverse Impacts – Public Services* for the revisions. No changes were made to the second bullet because the term "substantial" reflects the standard of significance that is assessed as part of Potential Impact 3.17-2 in Volume I Section 3.17.5 *Public Services – Potential Impacts and Mitigation* (pages 3-915 to 3-919).

Comment ORG47-10

ES-24. Clarify how the State Water Board's limited scope of jurisdiction restricts the scope of mitigation it may require through its water quality certification jurisdiction, resulting in a greater number of determinations of "significant and unavoidable" impacts than would actually happen during the Proposed Project's implementation. Many of these significant impacts will be reduced by the commitments that KRRC has made to fully mitigate adverse impacts of the Proposed Project to the extent feasible. In addition, many of these significant impacts will also be reduced during the additional layers of environmental review and regulatory approvals of FERC, the U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service, and the National Marine Fisheries Service. Through this extensive regulatory process, these agencies will add additional terms and conditions under which KRRC must comply in the implementation of the Proposed Project that will further reduce significant impacts identified in the EIR.

Suggested revision (last paragraph):

"The KRRC proposes to further develop Proposed Project actions related to certain state and local regulatory requirements that fall outside of the State Water Board's water quality certification authority. The State Water Board anticipates that implementation of additional measures, ~~(e.g.,~~ measures that are ultimately recommended through the good neighbor agreements between the KRRC and relevant state or local agencies, KRRC's commitment to implement certain recommended measures in this EIR, and any modifications developed through the FERC, U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, and/or National Marine Fisheries Service processes that provide the same or better level of protection for the resource in question) would ultimately reduce many of the Proposed Project's impacts to less than significant levels.

In certain instances, the EIR notes where such protection is anticipated to eliminate the potential for a significant impact. However, the State Water Board cannot ensure implementation of good neighbor agreements, recommended measures included in this EIR, or modifications anticipated to be developed through the FERC, U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, the National Marine Fisheries Service processes. Therefore, the State Water Board has conservatively identified impacts that rely on FERC's adoption of measures included in ~~implementation of~~ such agreements, the terms and conditions that may be imposed by FERC, U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, and National Marine Fisheries Service, or recommended mitigation measures in this EIR as significant and unavoidable. As noted above, these impact characterizations are thus conservative from a legal standpoint, and reflect the fact that the State Water Board, by itself, cannot ensure that the significant impacts at issue cannot be mitigated to less than significant levels. For many of these impacts, however, binding mitigation obligations imposed by other regulatory agencies will likely ensure that the impacts will ultimately be mitigated to less than significant levels."

Response to Comment ORG47-10
Please refer to Master Response CEQ-2. Additionally, the *Executive Summary* has revised to clarify how the EIR addresses implementation of measures to reduce potential environmental impacts for resource areas that fall outside of the State Water Board's water quality certification authority. Please refer to Volume III Attachment 1 *Executive Summary* for the revisions.

Comment ORG47-11
ES-26. Table ES-1 currently distinguishes between categories of impacts that are "significant and unavoidable" and categories of impacts that are "significant and unavoidable with mitigation." This is a useful and helpful distinction. KRRC believes that Table ES-1 would be even more informative, however, if the table also identified an additional basis for differentiating amongst these significant unavoidable impacts. KRRC suggests that the table be modified to show a distinction between, on the one hand, impacts that are significant and unavoidable because the State Water Board cannot identify any mitigation measures—including any that might be beyond the State Water Board's regulatory jurisdiction—that would reduce the impacts below applicable significance thresholds; and on the other hand, impacts that the State Water Board considers significant and unavoidable simply because the Board lacks the regulatory authority to impose mitigation on its own. The table is currently misleading insofar as it portrays the Proposed Project as causing a larger number of significant unavoidable impacts than will truly exist once agencies other than the Water Board issue regulatory approvals and the KRRC develops the good neighbor agreements with relevant state and local agencies. As is clear from pages ES-9 through ES-11, the Proposed Project is, on balance, a project that is very beneficial to the environment, and in particular to long-term water quality and the long-term health of fisheries, by reestablishing a free-flowing river condition and volitional fish passage on the Lower Klamath River.

Suggested revision:

Table ES-1 should be modified to include asterisks and other symbols, defined in a key, to indicate whether particular significant unavoidable impacts are labeled as such (i) due to the Water Board's jurisdictional limitations, or (ii) due to the fact that no known mitigation—as imposed by any agency or as imposed by KRRC on itself—is available to reduce the impacts at issue to less than significant levels.

Response to Comment ORG47-11
EIR *Executive Summary* Table ES-1 does distinguish impacts that are significant and unavoidable due to jurisdictional limitations from otherwise significant and unavoidable impacts (i.e., significant impacts for which there is no known mitigation that could be implemented by any agency or Klamath River Renewal Corporation (KRRC) itself, using as asterisk at the end of the impact title. The

asterisk is defined at the end of the table as follows: "* Indicates a Significant and Unavoidable Impact that would be reduced to No Significant Impact with Mitigation if one or more Recommended Measures were to be implemented. Due to federal preemption the State Water Board cannot guarantee the implementation of Recommended Measures."

Comment ORG47-12

ES-42. Mitigation Measure TER-5 is applicable to "Potential Impact 3.5-6. Short-term and long-term impacts on culturally significant species in riparian and wetland habitats" in the short-term for the Proposed Project and other alternatives including the Partial Removal Alternative, the Two Dam Removal Alternative, the Three Dam Removal Alternative, and the No Hatchery Alternative.

Suggested revision:

Add TER-5, as revised in later comments, to Potential Impact 3.5-6 in Table ES-1.

Response to Comment ORG47-12

Under the Proposed Project there is no need for Mitigation Measure TER-5 (please refer to Volume I Section 4.4.5.1 *Alternatives – Continued Operations with Fish Passage Alternative – Terrestrial Resources – Vegetation Communities* page 4-165) because the Proposed Project includes a wetland delineation that would be conducted within the Limits of Work at the Lower Klamath Project dams and associated facilities, access and haul roads, and disposal sites, in accordance with the 1987 USACE Wetland Delineation Manual. Mitigation Measure TER-5 is only necessary under alternatives that involve construction of a fish ladder because activities associated with fish ladder construction would not otherwise include a wetland delineation. The State Water Board has modified Mitigation Measure TER-5 in response to ORG47-41. Please refer to Volume III Attachment 1 Section 4.4.5.1 *Alternatives – Continued Operations with Fish Passage Alternative – Terrestrial Resources – Vegetation Communities* for these revisions. The State Water Board has also added Mitigation Measure TER-5 to the alternatives where fish ladder construction would occur (i.e., the Two Dam Removal and Three Dam Removal alternatives). Please refer to Volume III Attachment 1 Section 4.5.5 *Alternatives – Two Dam Removal Alternative – Terrestrial Resources – Vegetation Communities* and Section 4.6.5 *Alternatives – Three Dam Removal Alternative – Terrestrial Resources – Vegetation Communities* for these revisions.

Comment ORG47-13

2-8. Since Table 2.3-1 refers to existing features, the word "modified" should be removed from the description of the diversion tunnels at Copco No. 1. The diversion tunnel at Copco No. 1 would only be modified as part of the Proposed Project.

Suggested revision (Table 2.3-1):

Under column "Copco No. 1": "Overflow spillway with larger control gate and ~~modified~~ diversion tunnel"

Response to Comment ORG47-13
Section 2.3 *Proposed Project – Existing Lower Klamath Project Features* Table 2.3-1 has been clarified as requested. Additionally, based on comment ORG46-44, Table 2.3-1 has been revised to clarify the type of feature that allows water to flow past each of the dams under existing conditions. References to diversion culverts/tunnels are no longer associated with J.C. Boyle and Copco No. 1 dams in Table 2.3-1, since these features are not functional under existing conditions. Please refer to Volume III Attachment 1 Section 2.3 *Proposed Project – Existing Lower Klamath Project Features* Table 2.3-1 for the revisions.

Comment ORG47-14
2-20. Clarify the title of Section 2.6.1 with the following language.

Suggested revision:

"2.6.1 Water ~~Conflicts~~ History in the Klamath River Basin"

Response to Comment ORG47-14
This EIR section focuses on major events associated with water-related disputes in the Klamath Basin and is not intended to be a comprehensive history of water use and/or management in the basin.

The title for Section 2.6.1 of the EIR has been revised for clarity in Volume III.

Comment ORG47-15
2-27. In Table 2.7-1, J.C. Boyle does not require any canal modifications in preparation for drawdown.

Suggested revision:

Under J.C. Boyle tasks:" ~~Modify canal and~~ Prepare for drawdown"

Response to Comment ORG47-15
Section 2.7 *Proposed Project – Proposed Project* Table 2.7-1 has been clarified as requested. Please refer to Volume III Attachment 1 Section 2.7 *Proposed Project – Proposed Project* Table 2.7-1 for the revisions.

Comment ORG47-16
2-27. In Table 2.7-1, under Copco No. 1 tasks "Modify diversion tunnel, prepare for drawdown" and "Dam modifications" are the same, and one or the other should be removed.

Suggested revision:

Table 2.7-1, under Copco No. 1: ~~Dam modifications~~

Response to Comment ORG47-16
Section 2.7 *Proposed Project – Proposed Project* Table 2.7-1 has been clarified as requested by removing references to dam modifications to prevent duplicate references. Please refer to Volume III Attachment 1 Section 2.7 *Proposed Project – Proposed Project Features* Table 2.7-1 for the revision.

Comment ORG47-17
2-27. In Table 2.7-1, revise the schedule under Copco No. 1 for "Power generation facilities demolition" to November 4 to April 14.

Suggested revision:

Under Copco No. 1: "Power generation facilities demolition" to take place November 4 to April 14 (change from October to January).

Response to Comment ORG47-17
Section 2.7 *Proposed Project – Proposed Project* Table 2.7-1 date range has been updated to be November 4 to April 14. Please refer to Volume III Attachment 1 Section 2.7 *Proposed Project – Proposed Project* Table 2.7-1 for the revision.

Comment ORG47-18
2-32. No improvements to the Access Road from Overlook Point Recreational Facility to Copco Road are envisioned for the project. This bullet point should be removed.

Suggested revision (bottom of page):

- *"Access Road from Long Gulch Recreational Facility to Lakeview Road—some road surface rehabilitation during construction.*
- ~~*Access Road from Overlook Point Recreational Facility to Copco Road—some road surface rehabilitation during construction."*~~

Response to Comment ORG47-18
Section 2.7.1.2 *Proposed Project – Copco No. 1 Dam and Powerhouse – Construction Access and Road Improvements – Road and Bridge Improvements/Replacements* has been revised to remove the reference to the

road surface rehabilitation during construction activities on the access road from Overlook Point Recreational Facility to Copco Road. For consistency, Section 3.22.2.3 *Transportation and Traffic – Environmental Setting – Road Conditions– Road and Bridge Improvement/Replacements* has also been revised. Please refer to Volume III Attachment 1 Section 2.7.1.2 *Proposed Project – Copco No. 1 Dam and Powerhouse – Construction Access and Road Improvements – Road and Bridge Improvements/Replacements* and Section 3.22.2.3 *Transportation and Traffic – Environmental Setting – Road Conditions– Road and Bridge Improvement/Replacements* for these revisions.

Comment ORG47-19

2-43. Clarify that KRRC is committed to returning the roads to their "pre-project condition."

Suggested revision (first paragraph, second sentence):

"The KRRC proposes to return roads used for the Proposed Project to an acceptable state (i.e., their pre-project condition), including mitigating any potential reduction in function attributed to the dam removal work."

Response to Comment ORG47-19

Section 2.7.1.3 *Proposed Project – Dam and Powerhouse Deconstruction – Copco No. 2 Dam and Powerhouse – Construction Access and Road Improvements* has been revised to clarify that the roads would be returned to their pre-project condition. The revision does not change any potential impact assessments, recommended measures, or significance determinations associated with road conditions in the EIR. Please refer to Volume III Attachment 1 Section 2.7.1.3 *Proposed Project – Dam and Powerhouse Deconstruction – Copco No. 2 Dam and Powerhouse – Construction Access and Road Improvements* for these revisions.

Comment ORG47-20

2-46. The first paragraph of this page describes flood release capacity. KRRC's analysis shows that the 1% seasonal flow is about 4,200 cubic feet per second (cfs) for the second half of June and less than 3,000 cfs for July through September, which is different than what is stated in the document. The flow updates should not affect the impact determination. The Proposed Project will maintain flood protection for a 1 in 150 probable flow during dam removal from June 15 to September 30.

Suggested revision (first paragraph):

"The KRRC proposes to remove Iron Gate Dam and its associated facilities following spring runoff of dam removal year 2 (approximately June 1). The embankment dam crest would be retained at a level needed for flood protection, with a minimum flood release capacity of approximately ~~7,000~~ 3,000 cfs in July (reservoir water surface elevation 2,242.3 feet) and 3,000 cfs in August and

September (reservoir water surface elevation 2,194.3 feet), in order to accommodate the passage of at least a 1 percent probable flood for that time of year. Excavation of the embankment section at Iron Gate Dam would not begin before June 1 of dam removal year 2, and it would be complete by September 30 to minimize the risk of flood overtopping. During excavation, rockfill would be temporarily stockpiled for placement on the downstream slope of a temporary cofferdam. Throughout excavation, access would be provided to the gate control house at the base of the intake tower for flow control."

Response to Comment ORG47-20
The statement has been revised in Section 2.*7.1.4 Proposed Project – Dam and Powerhouse Deconstruction – Iron Gate Dam and Powerhouse – Deconstruction Activities* has been revised to clarify the correct minimum flood release capacity for Iron Gate Dam in July. The revision does not change any potential impact assessments, mitigation measures, or significance determinations in the EIR. Please refer to Volume III Attachment 1 Section 2.*7.1.4 Proposed Project – Dam and Powerhouse Deconstruction – Iron Gate Dam and Powerhouse – Deconstruction Activities* for these revisions.

Comment ORG47-21
2-57. See comment above regarding the flow analysis conducted by KRRC. The flow for Iron Gate in July would be 4,200 cfs, not 7,700 cfs. Text should be clarified with the updated information.

Suggested revision (last paragraph):

"June – approximately ~~7,700~~ 4,200 cfs
July – approximately ~~7,000~~ 3,000 cfs
August/September – approximately 3,000 cfs"

Response to Comment ORG47-21
Section 2.7.2 *Proposed Project – Reservoir Drawdown* has been clarified as requested to indicate the correct minimum flood release capacities for Iron Gate Dam in June and July. The revision does not change any potential impact assessments, mitigation measures, or significance determinations in the EIR. Please refer to Volume III Attachment 1 Section 2.7.2 *Proposed Project – Reservoir Drawdown* for these revisions.

Comment ORG47-22
2-81. An additional location for the settling pond at the existing lower raceways at Fall Creek Hatchery should also be included in the description of the hatchery. This third location is situated within the footprint of existing infrastructure and therefore would have lesser impacts than the other sites being considered.

Suggested revision: (first paragraph, fourth sentence):

"The settling pond would be constructed on one of three ~~two~~ potential nearby sites located on Parcel B lands downstream of the Fall Creek Hatchery, including a location at the existing lower raceways at the hatchery, with a minimally buried or at-grade conveyance pipeline transporting flows from the hatchery to the settling pond."

Response to Comment ORG47-22
Section *2.7.6.2 Proposed Project – Hatchery Operations – Fall Creek Hatchery* has been revised as requested to clarify that the Proposed Project includes constructing the settling pond at one of three potential sites, including a location at the existing lower raceways at the Fall Creek Hatchery (FCH). Please refer to Volume III Attachment Section *2.7.6.2 Proposed Project – Hatchery Operations – Fall Creek Hatchery* for these revisions.

Comment ORG47-23
3-82 Significance Finding for Potential Impact 3.2-1. The Draft EIR finds that the Proposed Project will have beneficial impacts or no significant adverse impacts on water temperature, varying by Project reach, due to conversion from reservoir areas to free-flowing conditions.

Suggested revision: None. We concur.

Response to Comment ORG47-23
Comment noted.

Comment ORG47-24
3-84 Significance Finding for Potential Impact 3.2-2. The Draft EIR finds that the Proposed Project will have no significant adverse impacts on seasonal water temperature, due to morphological changes, due to conversion from reservoir areas to free-flowing conditions.

Suggested revision: None. We concur.

Response to Comment ORG47-24
Comment noted.

Comment ORG47-25
3-106 Significance Finding for Potential Impact 3.2-3. The Draft EIR finds that the Proposed Project will have no significant adverse impacts on water quality in the long term from sediment release due to conversion from reservoir areas to free-flowing conditions.

Suggested revision: None. We concur.

Response to Comment ORG47-25
Comment noted.

Comment ORG47-26
3-109 Significance Finding for Potential Impact 3.2-5. The Draft EIR finds that the Proposed Project will have no significant adverse impacts on water quality in the long term from the alteration in inorganic suspended material, due to conversion from reservoir areas to free-flowing conditions.

Suggested revision: None. We concur.

Response to Comment ORG47-26
Comment noted.

Comment ORG47-27
3-110 Significance Finding for Potential Impact 3.2-6. The Draft EIR finds that the Proposed Project will have no significant adverse impacts on water quality in the long term from the alterations in organic suspended material, due to conversion from reservoir areas to free-flowing conditions.

Suggested revision: None. We concur.

Response to Comment ORG47-27
Comment noted.

Comment ORG47-28
3-111 Significance Finding for Potential Impact 3.2-7. The Draft EIR finds that the Proposed Project will have no significant adverse impacts on water quality in the short term from the release of sediment associated nutrients, due to conversion from reservoir areas to free-flowing conditions.

Suggested revision: None. We concur.

Response to Comment ORG47-28
Comment noted.

Comment ORG47-29
3-119 Significance Finding for Potential Impact 3.2-8. The Draft EIR finds that the Proposed Project will have no significant adverse impacts on alterations in nutrients in the long term due to the removal of the dams and will have a beneficial impact on water quality due to the cessation of seasonal releases of total nutrients and the conversion from reservoir areas to free-flowing conditions.

Suggested revision: None. We concur.

Response to Comment ORG47-29
Comment noted.

Comment ORG47-30
3-124 Significance Finding for Potential Impact 3.2-9. The Draft EIR finds that the Proposed Project will have no significant adverse impacts to dissolved oxygen due to the short term increases in oxygen demand in the lower reaches, due to the removal of the dams and the conversion from reservoir areas to free-flowing conditions.

Suggested revision: None. We concur.

Response to Comment ORG47-30
Comment noted.

Comment ORG47-31
3-131 Significance Finding for Potential Impact 3.2-10. The Draft EIR finds that the Proposed Project will have long term beneficial impacts to the summer and fall variabilities in dissolved oxygen and will have no significant adverse impacts to dissolved oxygen for the daily variability due to the conversion from reservoir areas to free-flowing conditions.

Suggested revision: None. We concur.

Response to Comment ORG47-31
Comment noted.

Comment ORG47-32
3-136 Significance Finding for Potential Impact 3.2-11. The Draft EIR finds that the Proposed Project will have no significant adverse impacts to pH levels in the Hydroelectric Reach from the Oregon-California state line and the lower reaches in the short and long term and will have beneficial impacts to pH levels from Copco No.1 to Iron Gate due to the conversion from reservoir areas to free-flowing conditions.

Suggested revision: None. We concur.

Response to Comment ORG47-32
Comment noted.

Comment ORG47-33
3-139 Significance Finding for Potential Impact 3.2-12. The Draft EIR finds that the Proposed Project will have beneficial impacts to levels of chlorophyll-a and algal toxins in the short and long term due to the conversion from reservoir areas to free-flowing conditions.

Suggested revision: None. We concur.

Response to Comment ORG47-33
Comment noted.

Comment ORG47-34
3-160 Significance Finding for Potential Impact 3.2-14. The Draft EIR finds that the Proposed Project will have no significant adverse impacts to freshwater and marine aquatic species in the short and long term due to the removal of the dam and the conversion from reservoir areas to free-flowing conditions.

Suggested revision: None. We concur.

Response to Comment ORG47-34
Comment noted.

Comment ORG47-35
3-161. In Potential Impact 3.2-15, update the pre-construction activities at Iron Gate by removing "canal" in the description.

Suggested revision (first paragraph, first sentence):

"Under the Proposed Project, pre-construction activities that would potentially affect water quality include ~~canal and~~ diversion tunnel modifications, road improvements, Iron Gate and Fall Creek hatchery modifications, Yreka pipeline modifications, and dam site preparation between June and November of dam removal year 1 (Table 2.7-1)."

Response to Comment ORG47-35
Section 3.2.5.7 *Water Quality – Potential Impacts and Mitigation – Inorganic and Organic Contaminants* Potential Impact 3.2-15 has been revised to clarify the description of Proposed Project pre-construction activities at Iron Gate Dam facilities by removing "canal" from the description of activities.

For consistency, the description of the Proposed Project pre-construction activities at Iron Gate Dam facilities was also updated in Section 3.2.5.2 *Water Quality – Potential Impacts and Mitigation – Suspended Sediments* Potential Impact 3.2-4 by removing "canal" from the description of activities. Please refer to Volume III Attachment 1 Section 3.2.5 for these revisions.

Comment ORG47-36
3-166. "Short term" for the hatchery is defined in the Draft EIR as the 8-year operation period. Depending on hatchery operations, discharge water temperatures that are above the receiving water temperatures may occur for short periods, but not consistently for 8-years. Although discharge water temperature increases may occur, it is likely that they would last only a matter of hours. Short duration discharges of minimally higher temperature water would unlikely have an effect on receiving water temperatures and the effect would not

be a continuous 8-year impact. The impact is measured to the receiving water not the discharge water.

Suggested revision (first paragraph):

"While the increase in Fall Creek water temperature and subsequent potential increase in Klamath River water temperature due to hatchery discharges would be small, any increase in water temperature would exceed Thermal Plan water temperature water quality standard for COLD interstate waters, and there potentially would be a significant and unavoidable impact without mitigation on water temperature in the Hydroelectric Reach of the Klamath River due to Fall Creek Hatchery under the Proposed Project. It should be noted that although discharge temperatures may be elevated during the short term, the changes would be very short in duration and would not occur continuously during the 8-year period of operation."

Response to Comment ORG47-36
Section 3.2.5.8 *Water Quality – Potential Impacts and Mitigation – General Water Quality* Potential Impact 3.2-17 has been revised to clarify the time when elevated water temperatures in the Fall Creek Hatchery (FCH) discharges would be expected to occur under the Proposed Project. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Comment ORG47-37
3-212. Clarify text reference to Table 3.3-7. The text should refer to steelhead, not spring Chinook salmon as is currently specified.

Suggested revision (second paragraph, last sentence):

"Table 3.3-7 provides a generalized life history periodicity for ~~spring-run Chinook~~ steelhead ~~salmon~~ life stages, with additional timing provided in Appendix E.3.1.4."

Response to Comment ORG47-37
Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species – Fish – Anadromous Salmonids – Winter Steelhead* has been revised to correct the typographical error noted in the comment. Please refer to Volume III Attachment 1 Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species – Fish – Anadromous Salmonids – Winter Steelhead* for these revisions.

Comment ORG47-38
3-324. In the short term, it is likely that summer and winter steelhead would use the additional 80 miles of mainstream and tributary habitat in the Hydroelectric Reach for spawning and rearing (not just migration) beginning in the winter/spring of year 2. Spawning would primarily take place in tributaries and

possibly within riffles or newly formed side channels within the previously inundated reservoir areas. See full reference for text revisions below:

- *Hamilton, J.B., G.L. Curtis, S.M. Snedaker, and D.K. White. 2005. Distribution of anadromous fishes in the Upper Klamath River watershed prior to hydropower dams – a synthesis of the historical evidence. Fisheries, 30:10-20.*

Suggested revision (third paragraph):

"In the short term, adults could first access this reach in winter (summer steelhead) or fall (winter steelhead) of dam removal year 2. Because redband /rainbow trout (Oncorhynchus mykiss sp.) are already present in all free-flowing portions of the Hydroelectric Reach and resident O. mykiss have similar life history requirements for spawning and rearing habitats as steelhead, it is probable that steelhead will rapidly use these reaches once the habitats become accessible. Further, Hamilton et al. (2005) summarizes historical evidence of steelhead using tributary streams in the Hydroelectric Reach, including Camp Creek, Spencer Creek, Shovel Creek, Scotch Creek, and Fall Creek. Steelhead could use this reach as a migration corridor, as most sediment released from the reservoirs would likely be eroded within the first six months after reservoir drawdown (by June of dam removal year 2) and would not impede upstream movement. By late spring of removal year 2, elevated SSCs resulting from dam removal would likely have returned to low levels unlikely to impact steelhead."

Response to Comment ORG47-38
Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-10 has been revised to incorporate the recommended text. Please refer to Volume III Attachment 1 Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* for these revisions.

Comment ORG47-39
3-336. There is research that supports the conclusion that the return of anadromous species will deliver marine-derived nutrients to the Upper Klamath Basin, which could bolster the population of fish species. See suggested revision below. The full references are included here:

- *Bilby, R. E, B. R. Fransen, and P. A. Bisson. 1996. Incorporation of nitrogen and carbon from spawning coho salmon into the trophic system of small streams: evidence from stable isotopes. Can. J. Fish. Aquat. Sci. 53:164-173.*
- *Cederholm CJ, Kunze MD, Murota T., Sibatani A. 1999. Pacific salmon carcasses: Essential contributions of nutrients and energy for aquatic and terrestrial ecosystems. Fisheries 24: 6– 15.*
- *Wipfli, M. S., J. P. Hudson, and J. P. Caouette. 1998. Influence of salmon carcasses on stream productivity: response of biofilm and benthic*

macroinvertebrates in southeastern Alaska, U.S.A. Can. J. Fish. Aquat. Sci. 55:1,503-1,511.

In the long term, the return of anadromous species to the Upper Klamath Basin will deliver marine-derived nutrients (MDN), potentially bolstering the forage base for Lost River and shortnose suckers.

Suggested revision (last paragraph):

"In the long term, reservoir removal associated with dam removal under the Proposed Project would eliminate habitat availability and affect Lost River and shortnose suckers in Lower Klamath Project reservoirs. All individual suckers occurring within these reservoirs would likely be lost within the short term and would not be replaced in the long term. However, the return of anadromous species to the Upper Klamath Basin will deliver marine-derived nutrients (MDN), potentially bolstering the forage base for Lost River and shortnose suckers. The delivery of MDN by spawning anadromous fish and their resulting decomposing carcasses has been linked with the enrichment of aquatic and terrestrial ecosystems through numerous studies (Cederholm et al. 1999). MDN are utilized by stream biota through a variety of pathways and may bolster forage items for native fish species directly, such as through the consumption of eggs, fry, and flesh (Bilby et al. 1996); and indirectly by increasing primary productivity in stream ecosystems, thereby increasing the abundance and biomass of other forage items such as macroinvertebrates (Wipfli et al. 1998)."

Response to Comment ORG47-39
Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-13 has been revised to include discussion of the benefits of marine derived nutrients from adult salmon accessing habitat upstream of Iron Gate Dam. Please refer to Volume III Attachment 1 Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* for these revisions.

Comment ORG47-40
3-341. There is research that supports the conclusion that the return of anadromous species will deliver marine-derived nutrients, which could bolster the population of fish species. See suggested revision below.

Suggested revision (fourth paragraph):

"The Proposed Project would restore access for anadromous salmon and steelhead to habitat upstream of Iron Gate Dam, as described in detail above. Restoration of access would result in anadromous salmon and steelhead potentially interacting with resident redband trout and bull trout, with the potential for competition and predation. These species evolved together in the Upper Klamath Basin of the Klamath River, and co-existed prior to the construction of

dams (Goodman et al. 2011). The return of anadromous species to the Upper Klamath Basin will deliver MDN, potentially bolstering the forage base for bull trout, redband, and other native species. The delivery of MDN by spawning anadromous fish and their resulting decomposing carcasses has been linked with the enrichment of aquatic and terrestrial ecosystems through numerous studies (Cederholm et al. 1999). MDN are utilized by stream biota through a variety of pathways and may bolster forage items for native fish species directly, such as through the consumption of eggs, fry, and flesh (Bilby et al. 1996); and indirectly by increasing primary productivity in stream ecosystems, thereby increasing the abundance and biomass of other forage items such as macroinvertebrates (Wipfli et al. 1998)."

Response to Comment ORG47-40
Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-18 has been revised to clarify more information regarding marine derived nutrients. Please refer to Volume III Attachment 1 Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* for these revisions.

Comment ORG47-41
3-519. Currently, Mitigation Measure TER-1, standing alone, does not provide for unavoidable wetlands impacts. Therefore, it should be clarified that TER-1 works together with TER-5 for all action alternatives to ensure that the Project achieves the net zero loss of wetland function and value standard. Recommend including TER-5 as revised below in the comment on page 4-166 to mitigation for Potential Impact 3.5-1. For reference, our suggested revised version of TER-5 is included below.

Suggested revision (third paragraph, Potential Impact 3.5-1):

"Mitigation Measure TER-1 Establish a 20-foot buffer around delineated wetlands. The KRRC shall establish a minimum of a 20-foot buffer around all delineated wetlands potentially affected by construction impacts to ensure there will not be any significant environmental impacts to wetlands by deterring heavy machinery from traversing the wetland and preventing runoff pollution from directly entering the wetland where doing so would not result in a significant environmental impact. The buffer may be adjusted (e.g., made larger or smaller) based on site-specific conditions, as determined by a qualified biologist acceptable to USACE, as necessary to ensure adequate protection of the delineated wetlands. To the extent that impacts to wetlands cannot be avoided, KRRC shall comply with mitigation measure TER-5 to ensure no net loss of functions and values. The State Water Board has the authority to include this mitigation measure in its water quality certification for the project, and the measure is therefore feasible and used in this analysis to make a significance determination.

Mitigation Measure TER-5 − Identification, protection, and restoration of wetland and riparian habitats. The KRRC shall conduct a wetland delineation within the limits of construction in accordance with the 1987 U.S. Army Corps of Engineers (USACE) Wetland Delineation Manual (USACE 1987) and applicable Regional Supplements (i.e., Western Mountains, Valleys, and Coast Region [USACE 2010] and Arid West [USACE 2008]). The results of the wetland delineation shall be incorporated into all alternatives, except for the No Project Alternative, ~~the Continued Operations with a Continued Operations with Fish Passage Alternative design~~ to avoid and minimize direct impacts on wetlands to the maximum extent feasible, and wetland areas adjacent to the construction Limits of Work shall be fenced to prevent inadvertent entry. Where avoidance is not feasible the KRRC shall develop a restoration plan to re-vegetate all areas disturbed during construction with a goal requirement of no net loss of wetland or riparian habitat acreage or no net loss of overall functions and values. The restoration plan shall include details on revegetation native seed mixes based on existing species that will be impacted and installation techniques for container plants and seeds. Wetlands established in restored areas would be monitored for five years or until the performance criteria, as defined in the restoration plant that shall be developed, have been met."

Response to Comment ORG47-41
Section 3.5.5.1 *Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities* Mitigation Measure TER-1 has been modified as requested, except that this sentence "To the extent that impacts to wetlands cannot be avoided, Klamath River Renewal Corporation (KRRC) shall comply with mitigation measure TER-5 to ensure no net loss of functions and values" has not been added because it is not necessary. Under the Proposed Project there is no need for Mitigation Measure TER-5 because the Proposed Project includes a wetland delineation that has been conducted within the Limits of Work at the Lower Klamath Project dams and associated facilities, access and haul roads, and disposal sites, in accordance with the 1987 United States Army Corps of Engineers (USACE) Wetland Delineation Manual. Mitigation Measure TER-5 is only necessary under alternatives that involve construction of a fish ladder because activities associated with fish ladder construction would not otherwise include a wetland delineation. Please refer to Volume III Attachment I Section 3.5.5.1 *Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities* for the revisions.

Mitigation Measure TER-5 has been modified as requested. Please refer to Volume III Attachment 1 Section 4.4.5.1 *Alternatives – Continued Operations with Fish Passage Alternative –Terrestrial Resources – Vegetation Communities* for these revisions. Mitigation Measure TER-5 has been added to the alternatives where fish ladder construction will occur (i.e., the Two Dam Removal and Three Dam Removal alternatives). Please refer to Volume III Attachment 1 Section 4.5.5 *Alternatives – Two Dam Removal Alternative –Terrestrial Resources – Vegetation Communities* and Section 4.6.5 *Alternatives – Three*

Dam Removal Alternative –Terrestrial Resources – Vegetation Communities for these revisions.

Comment ORG47-42
3-530. Clarify the wording of Mitigation Measure TER-2.

Suggested revision (second paragraph, last sentence):

"These features of TER-2 will be implemented to reduce the impacts to less than significant ~~such that there is no significant impact~~ on special-status amphibians and reptiles."

Response to Comment ORG47-42
Section 3.5.5.3 *Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities* has been clarified as requested. Please refer to Volume III Attachment 1 Section 3.5.5.3 *Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities* for these revisions.

Comment ORG47-43
3-531. Clarify the wording of Mitigation Measure TER-3

Suggested revision (first paragraph, last sentence):

"These features of TER-3 will be implemented to reduce the impacts to less than significant ~~such that there is no significant impact~~ on western pond turtles."

Response to Comment ORG47-43
Section 3.5.5.3 *Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities* has been clarified as requested. Please refer to Volume III Attachment 1 Section 3.5.5.3 *Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities* for these revisions.

Comment ORG47-44
3-561. This statement appears to be missing words between "frogs" and "loosen," or otherwise requires clarification: "If suspended sediment settles further downstream, and/or foothill yellow-legged frogs are present, the presence of settled fine silt in slow moving portions of the river reaches would not likely affect the adhesion of egg masses based on foothill yellow-legged frogs loosen algae and sediment that could enhance the ability of egg masses to adhere to the substrate (Rombough and Hayes 2005)."

Suggested revision: Clarify sentence.

Response to Comment ORG47-44
Section 3.5.5.3 *Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities* has been revised to clarify the typo and sentence structure. Please refer to Volume III Attachment 1 Section 3.5.5.3 *Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities* for these revisions.

Comment ORG47-45
3-562. Based on surveys conducted in 2018, biologist noted the great blue heron colony is no longer active at Copco 1, but has now become active at the Copco Bypass. Suggest removing reference to the great blue heron colony at Copco 1, as it is no longer active.

Suggested revision:

"The loss of aquatic reservoir habitat would also reduce foraging opportunities for fish-eating birds including bald eagle, osprey, merganser, cormorant, egret, and heron ~~(including the great blue heron rookery documented at Copco No. 1 Reservoir~~ (PacifiCorp 2004b)."

Response to Comment ORG47-45
Section 3.5.5.3 *Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities* has been revised as requested. Please refer to Volume III Attachment 1 Section 3.5.5.3 *Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities* for the revisions.

Comment ORG47-46
3-567. Surveys in 2018 indicated a change in the number of turtles at Copco No. 1 and Iron Gate. See revisions below for updated information. This should not change the impact determination.

Suggested revision (third paragraph, fifth sentence):

"Surveys conducted in Copco No. 1 Reservoir in 2002 documented 12 turtles while surveys in 2018 documented ~~31 to 36~~ 42, which ~~are~~ is similar to the anticipated density estimate. Surveys conducted in Iron Gate Reservoir in 2002 documented 8 turtles, while surveys in 2018 also documented ~~17~~ 8, which is lower than the anticipated density estimates."

Response to Comment ORG47-46
Section 3.5.5.3 *Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities* has been revised to clarify the number of western pond turtles observed. Please refer to Volume III Attachment 1 Section 3.5.5.3 Terrestrial Resources – Potential Impacts and

Mitigation – Special-status Species and Rare Natural Communities for these revisions.

Comment ORG47-47

3-571. The text in the second paragraph describes the use of herbicides. During informal consultation with NMFS under Section 7 of the Endangered Species Act, additional guidance on the use of herbicides was provided by NMFS. See revised language below.

Suggested revision (second paragraph):

Include the following input KRRC received from NMFS during informal Endangered Species Act Section 7 consultation, as applicable, in a revised discussion on herbicides:

"KRRC's evaluation of herbicides for the Biological Assessment concluded that glyphosate formulation Rodeo is associated with the relatively lowest aquatic toxicity among agency-approved herbicides and should be considered if chemical control is determined to be a best practice for IEV management near or adjacent to aquatic systems, presenting less risk than the other herbicides evaluated to aquatic wildlife (including Coho salmon and their prey). Care must be taken to select adjuvants (additions like surfactants) that have low toxicity.

- *Aquatic formulations of glyphosate and imazapyr are favorable for use with adjuvants that have low toxicity.*
- *Glyphosate is effective for control of nearly all of the IEV in the action area. In addition, glyphosate has a short half-life in soil, and thus is less prone to leaching than other herbicides. For these reasons, glyphosate is recommended as the primary herbicide for control of IEV in the action area.*
- *For [Invasive Exotic Vegetation] IEV not easily controlled by glyphosate (i.e., bearded creeper), dicamba and metsulfuron may be preferable due to low average half-lives in soil compared to other herbicides."*

Response to Comment ORG47-47

The text cited in the comment is associated with Section 3.5.5.2 *Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities* Potential Impact 3.5-24. This potential impact analysis focuses on the potential for adverse impacts on terrestrial species (e.g., raptors, terrestrial mammals) as a result of herbicide use during reservoir restoration activities in the newly exposed areas of the reservoir footprints as well as in upland areas. The text revisions suggested in the comment reference herbicide application near or adjacent to aquatic systems, and they reference the potential for aquatic toxicity, which is a related but separate topic that is discussed in EIR Potential Impact 3.2-16 *Short-term impacts to aquatic biota from herbicide application during restoration of the reservoir areas* (pages 3-162 and 3-163).

Section 3.5.5.3 *Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities* Potential Impact 3.5-24 has been revised to clarify that potential impacts on aquatic biota are analyzed elsewhere in the EIR. Please refer to Volume III Attachment 1 Section 3.5.5.3 *Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities* for these revisions.

Additionally, Section 3.2.5.7 *Water Quality – Potential Impacts and Mitigation – Inorganic and Organic Contaminants* Mitigation Measure WQ-4 has been revised to clarify that Rodeo is an acceptable aquatic formulation of glyphosate and to distinguish that POEA and R-11 are surfactants that shall be avoided for the purpose of herbicide application. The other revisions suggested in the comment are unnecessary because Mitigation Measure WQ-4 is already consistent with the use of other herbicides possessing the proper characteristics that would minimize toxicity to aquatic biota. However, the guidance from National Marine Fisheries Service (NMFS) is noted and included in the record. Please refer to Volume III Attachment 1 Section 5.7 *Water Quality – Potential Impacts and Mitigation – Inorganic and Organic Contaminants* Mitigation Measure WQ-4 for these revisions.

Comment ORG47-48

3-601. In Table 3.6-4 the units for depth should be feet, not feet above mean sea level. Recommend revising table column headers.

Suggested revision:

"Average Depth" and "Maximum Depth": "(feet ~~amsl).~~"

Response to Comment ORG47-48

Section 3.6.2.2 *Flood Hydrology – Environmental Setting Basin Hydrology – Upper Klamath Basin – Upper Klamath Lake and Link River Dam* Table 3.6-4 has been slightly revised to clarify units of reservoir depth.

Comment ORG47-49

3-701. Section 3.9.4, Clarify text with following revision (note all text would be added to the 2018 EIR, but the strikeout/underline in text below indicates changes from the 2012 EIS/EIR mitigation measure):

Suggested revision (third paragraph):

"Appendix N contains an estimate of "uncontrolled emissions" and an estimate of emissions after implementation of mitigation measures that were proposed as part of the analysis in the 2012 KHSA EIS/EIR. These included Mitigation Measures Air Quality (AQ)-1 (Off-road construction equipment), AQ-2 (On-road construction equipment), AQ-3 (trucks used to transport materials), and AQ-4 (Dust control measures). <u>As conditions of license surrender, KRRC has</u>

committed to implement the following mitigation measures from Appendix N as updated below: ~~Mitigation Measures AQ-1 through AQ-3 required off-road construction equipment and on-road construction equipment and trucks to be equipped with engines that meet certain model year emissions standards. Mitigation Measure AQ-4 required dust control measures to minimize fugitive dust emissions during construction activity.~~

- *AQ-1 – For the construction activities occurring within California, any off-road construction equipment (e.g., loaders, excavators, etc.) that are 50 horsepower or greater must be equipped with engines that meet the EPA Tier 4 Final emission standards for off-road compression-ignition (diesel) engines, unless such an engine is not available for a particular item of equipment. To the extent allowed by California Air Resources Board Off-Road Diesel Fueled Fleets regulations, Tier 3 and Tier 4 interim engines will be allowed when the contractor has documented, with appropriate evidence, that no Tier 4 Final equipment or emissions equivalent retrofit equipment is available or feasible. Documentation may consist of signed written statements from at least two construction equipment rental firms.*
- *AQ-2 – Any heavy-duty on-road construction equipment must be equipped with engines that meet the MY 2010 or newer on-road emission standards.*
- *AQ-3 – Any heavy-duty trucks used to transport materials to or from the construction sites must be equipped with engines that meet the MY 2010 or later emission standards for on-road heavy-duty engines and vehicles. Older model engines may also be used if they are retrofitted with control devices to reduce emissions to the applicable emission standards.*
- *AQ-4 – Dust control measures will be incorporated to the maximum extent feasible during blasting operations at Copco No. 1 Dam. The following control measures will be used during blasting activities as applicable: Conduct blasting on calm days to the extent feasible. Wind direction with respect to nearby residences must be considered. To the extent that blasting cannot be limited to calm days, install wind fencing for control of windblown dust during blasting activities. Design blast stemming to minimize dust and to control fly rock.*
- *These updated Mitigation Measures AQ-1 to AQ-4 are more protective than those in the 2012 KHSA EIS/EIR. Even with the implementation of these mitigation measures, ~~the 2012 KHSA EIS/EIR determined~~ construction emissions from the Proposed Project would still result in significant and unavoidable impacts from NOx and PM10."*

Response to Comment ORG47-49

This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Air Quality*).

Comment ORG47-50

3-737. Paragraph 1 and Table 3.11-1: Table 3.11-1 includes Cedar Mountain fault zone but not Meiss Lake fault, which is the closest active fault to the Lower

Klamath Project and is within the Cedar Mountain fault zone. However, the text discusses the Meiss Lake fault, but not its relation to the Cedar Mountain fault zone. Recommend reconciling the table information and the text with the following revisions.

Suggested revision (first paragraph, second sentence):

"In California, the nearest active fault to the Lower Klamath Project is the Meiss Lake fault, which is part of the Cedar Mountain fault zone and approximately 5 miles east of the Klamath River near the California-Oregon State line in Siskiyou County."

In Table 3.11-1 under Fault include: "Cedar Mountain fault – Meiss Lake fault."

Response to Comment ORG47-50
Section 3.11.2.1 *Geology, Soils, and Mineral Resource – Environmental Setting – Regional Geology* has been revised to clarify that the Meiss Lake fault is part of the Cedar Mountain fault zone. Please refer to Volume III Attachment 1 Section 3.11.2.1 *Geology, Soils, and Mineral Resource – Environmental Setting – Regional Geology* for the revision.

Comment ORG47-51
3-765. Mitigation Measure GEO-1: KRRC is committed to protecting surrounding properties throughout drawdown. For example, materials will be stockpiled on-site for immediate road repairs (continuous access will be needed by KRRC and other state agencies, in addition to local residents). Potentially affected properties will be mitigated in advance (buy-out, slope reinforcement, or temporary relocation of resident during drawdown and monitoring). Additional details will be provided in the final Rim Stability Analysis.

Suggested revision (second paragraph):

"~~Following~~ Throughout drawdown activities, and when ~~once~~ the areas are safe to inspect, the KRRC shall inspect any slope failures and implement slope stabilization measures, as appropriate. Additional details will be included in the final Rim Stability Analysis prepared for the project. For any large slope failure that occurs during drawdown or the year following drawdown, KRRC will offset potential impacts by implementing the following actions:

1. Move affected structures or purchase affected property,
2. Re-align affected road segments,
3. Engineer structural slope improvements (e.g., drilled shafts or other structural elements that could be installed to resist slope movement), and
4. Revegetate affected areas."

Response to Comment ORG47-51
Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation,* Mitigation Measure GEO-1 in Potential Impact 3.11-3 has been revised to reflect changes agreed to by the Klamath River Renewal Corporation (KRRC) on March 7, 2020. Please refer to Volume III Attachment 1 Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-3 for the final Mitigation Measure GEO-1. The Klamath River Renewal Corporation's (KRRC's) agreement to the final Mitigation Measure GEO-1 supersedes the KRRC's 2019 comments proposing edits to Draft EIR Mitigation Measure GEO-1.

Comment ORG47-51.1
While the best available science suggests that there will not be significant impacts from sediment delivery to the Pacific Ocean nearshore environment, KRRC suggests including language to confirm that KRRC will have sufficient insurance coverage to the extent sediment delivery to the Pacific Ocean nearshore environment requires dredging to maintain marine navigation in, for instance, Crescent City Harbor.

Suggested revision (seventh sentence, first paragraph):

"The short-term (less than two years following dam removal) and long-term (2–50 years following dam removal) effects of the Proposed Project on sediment delivery to the Pacific Ocean would be less-than significant, given the relatively small amount of total sediment input from reservoir sediment release in comparison to the total annual naturally occurring sediment inputs to the nearshore environment. Although the best available science indicates no measurable impacts to the Pacific Ocean nearshore environment, KRRC has committed, as a condition of license surrender, to implement mitigation measures as necessary to address such impacts should they occur and to protect maritime navigation in, for instance, Crescent City Harbor."

Response to Comment ORG47-51.1
The Klamath River Renewal Corporation (KRRC) indicates in this comment that they have committed, as a condition of license surrender, to implement measures as necessary to address impacts to Pacific Ocean Nearshore Environment in the vicinity of the Klamath River mouth should they occur and to protect maritime navigation (e.g., Crescent City Harbor). The EIR does not identify significant individual or cumulative sedimentation impacts from the Proposed Project on the Pacific Ocean Nearshore Environment in the vicinity of the Klamath River mouth and Crescent City Harbor. Therefore, CEQA does not require mitigation for short- or long-term sediment deposition.

Comment ORG47-52
3-826. Clarify text describing various resources that could be eligible for inclusion on the National Register of Historic Places.

Suggested revision (last sentence, first paragraph):

"Resources identified as villages, cairns or burial sites, or other sites eligible for the National Register of Historic Places in a subsequent compilation by Cardno ENTRIX (2012) were also considered as part of this analysis."

Response to Comment ORG47-52
Section 3.12.5.1 *Historical Resources and Tribal Cultural Resources – Potential Impacts and Mitigation – Potential Impacts to Tribal Cultural Resources* has been revised as requested. Please refer to Volume III Attachment 1 Section 3.12.5.1 *Historical Resources and Tribal Cultural Resources – Potential Impacts and Mitigation – Potential Impacts to Tribal Cultural Resources* for the revision.

Comment ORG47-53
3-828. Clarify the sentence describing historic artifacts that are present in the Hydroelectric Reach from the Oregon-California state line to Copco No. 1.

Suggested revision (second sentence, first paragraph):

"Historic period refuse scatters, ~~an~~ historical hotel ruin sites, historical ranching sites, and historic roads are also present."

Response to Comment ORG47-53
Section 3.12.5.1 *Historical Resources and Tribal Cultural Resources – Potential Impacts and Mitigation – Potential Impacts to Tribal Cultural Resources* has been revised as requested. Please refer to Volume III Attachment 1 Section 3.12.5.1 *Historical Resources and Tribal Cultural Resources – Potential Impacts and Mitigation – Potential Impacts to Tribal Cultural Resources* for the revision.

Comment ORG47-54
3-832. Include Copco No.1 to make the sentence on existing TCRs more specific to that dam.

Suggested revision (first sentence, third paragraph):

"There is at least one TCR that was present at Copco No. 1 before dam construction that would be potentially impacted."

Response to Comment ORG47-54
Section 3.12.5.1 *Historical Resources and Tribal Cultural Resources – Potential Impacts and Mitigation – Potential Impacts to Tribal Cultural Resources* has been revised as requested. Please refer to Volume III Attachment 1 Section 3.12.5.1 *Historical Resources and Tribal Cultural Resources – Potential Impacts and Mitigation – Potential Impacts to Tribal Cultural Resources* for the revision.

Comment ORG47-55

3-838. Include Shasta Indian Nation to the list of tribes with TCRs in the Area of Analysis Subarea 1. Resources from other tribes are not known to be in this area.

Suggested revision (first sentence, fifth paragraph):

"Tribal cultural resources known to the Shasta Nation and Shasta Indian Nation to be within the Area of Analysis Subarea 1 include resources identified in PacifiCorp (2004a) and Daniels (2006), as updated by Confidential Appendix Q, Attachment 4."

Response to Comment ORG47-55

Section 3.12.5.1 *Historical Resources and Tribal Cultural Resources – Potential Impacts and Mitigation – Potential Impacts to Tribal Cultural Resources* has been revised to refer to the Shasta people rather than to a specific Native American entity. Please refer to Volume III Attachment 1 Section 3.12.5.1 *Historical Resources and Tribal Cultural Resources – Potential Impacts and Mitigation – Potential Impacts to Tribal Cultural Resources* for the revision.

Comment ORG47-56

3-913. Potential Impact 3.17-1 – Suggested revision to reflect the commitments that KRRC intends to implement to reduce the risk of increased public services response times for emergency fire, police, and medical services due to the Proposed Project's construction and demolition activities.

Suggested revision (last paragraph):

"The Proposed Project could result in a significant impact if it results in substantial increases in emergency response times within the Area of Analysis. KRRC has committed to developing a Traffic Management Plan, a draft of which is attached as Appendix O2 to the Definite Plan (Appendix B of this Draft EIR). ~~In general, development of an adequate Traffic Management Plan (Traffic Management Plan)~~ This Traffic Management Plan would mitigate the potential short-term impacts of construction-related traffic and therefore minimize changes to public service response time. Under the Proposed Project, demolition and construction areas would be closed off to the public to reduce hazards. Due to the rural nature and low concentration of roads in the area, most existing roads are currently used, and would continue to be used, by emergency responders and for evacuation routes in the event of fire or other emergencies. The use of these roads for construction activities could interfere with emergency response and evacuation. The potential for substantial interruptions to road access for property owners within the public services Area of Analysis during construction activities would not be a significant impact since alternative routes are or would be made available as part of the proposed Traffic Management Plan ~~(Traffic Management Plan)~~ (Section 3.22 Transportation and Traffic). The KRRC's

Traffic Management Plan is a specialized program tailored to minimize impacts by applying a variety of techniques, including the following:

- *Public Information – use of telephone hotlines, a Traveler Information System via the Project website, local community outreach (meetings, newsletters, etc.), press release(s), and local news media, as appropriate, to ensure the public have easy access to current or upcoming interruptions to the local or state road network*
- *Motorist Information – use of portable changeable message signs, stationary mounted signs, and highway advisory radio to provide advanced notice to motorists of potential traffic delays throughout the project sites and associated access routes*
- *Incident Management – traffic procedures to be adopted in the case of an incident on a road or highway, developed in collaboration with local and state agencies, and in accordance with local and state requirements*
- *Construction Strategies – scheduling of road closures and notifying the public of detours; planning signage and traffic control, including with respect to work zones and construction vehicles; scheduling haul trips to avoid peak hours; identifying emergency detours; managing potential safety hazards from haul vehicles and dust; and providing access for pedestrians and bicycles.*

As a condition of license surrender, the ~~major objectives of the~~ KRRC is committed to ensure that the Traffic Management Plan ~~are to~~ will maintain efficient and safe movement of vehicles through the construction zone covered by activities in the Definite Plan and to provide public awareness of potential impacts to traffic on both haul routes and access roads to the four dams and associated facilities. The Traffic Management Plan outlines the structure and key requirements that would be incorporated by the KRRC's contractor into a final Traffic Management Plan. The final Traffic Management Plan would be informed by KRRC's contractor's specific means and methods for construction~~, and input received from relevant local jurisdictions,~~ which could refine the approach to access and traffic management. KRRC proposes that the final Traffic Management Plan would meet applicable regulatory permit requirements, as well as applicable state and local ordinances, as appropriate (Appendix B: Definite Plan – Appendix O2). By reducing the potential for traffic incidents during construction and demolition activities, implementation of the final Traffic Management Plan would reduce the potential for increased public services response times for emergency fire, police, and medical services.

Construction activities would involve staging and stockpiling areas and equipment that would be kept on-site for the duration of construction. The Limits of Work (Figures 2.7-2 and 2.7-4) would include activities that may result in accidental spills of flammable liquids or use of equipment that generates heat, such as welding, grinding, torch-cutting, gas and diesel generators. Other construction activities could result in open sparks or flame in vegetated open space that could further aggravate the risk of fire. Emergency and Security

services would be provided by the construction contractor, therefore the Proposed Project would not increase the need for emergency services or the number of emergency responders. What is important for the reduction of impacts is that all construction workers have the knowledge and resources to respond to emergencies and all emergency preparation and work are overseen by a designated health and safety manager, which is proposed as part of the Proposed Project. In addition, the Proposed Project (Appendix B: Definite Plan) proposes that responding agencies and departments are made aware of the activities during the construction period so that they can implement their existing regulatory framework, establish an emergency contact process, and include inspections as needed throughout the process.

In particular, the Proposed Project includes a Hazardous Materials Management Plan (Appendix B: Definite Plan – Appendix 03) to address the management of hazardous materials during Project construction. The Hazardous Materials Management Plan identifies potential hazardous materials that may be encountered at J.C. Boyle, Copco No. 1 and No. 2, and Iron Gate dams and their powerhouses, and the anticipated sampling, testing, abatement, and disposal of hazardous materials. KRRC will update the Hazardous Materials Management Plan, as appropriate, based on the Phase I-Environmental Site Assessment visits and interviews and the Phase II Site Investigation, if needed. The Final Hazardous Materials Management Plan will be submitted to the State Water Board Deputy Director for review and approval. By reducing the potential for hazardous materials incidents during construction and demolition activities, implementation of the Final Hazardous Materials Management Plan would reduce the potential for increased public services response times for emergency fire, police, and medical services.

Mitigation Measure HZ-1 and Recommended Measure TR-1 would reduce the potential impacts related to construction activities since these measures require that the KRRC and its contractor(s) for the Proposed Project submit the additional documentation/details included in the final Emergency Response Plan, Fire Management Plan, Traffic Management Plan, and a Hazardous Materials Management Plan, and they work with applicable agencies prior to the start of construction. Implementation of these two measures would reduce the potential for a short-term increase in personal and public health and safety risks due to the Proposed Project as related to emergency response services. There would be no long-term impacts due to the Proposed Project construction-related activities since the construction would be completed in the short term."

Response to Comment ORG47-56

This comment is generally consistent with Mitigation Measure TR1 – Traffic Management Plan and contains additional statements already in Klamath River Renewal Corporation's (KRRC's) Definite Plan (Volume II *Definite Plan – Appendix O-2 Traffic Management Plan*). The State Water Board acknowledges KRRC's commitment to addressing any potential for impacts to public services

due to construction related traffic as a condition of license surrender. Additionally, as noted by KRRC in their comment and elsewhere in the EIR, KRRC will be coordinating efforts with emergency service providers as part of their Emergency Response Plan (ESP), Fire Management Plan (FMP) and Hazardous Materials Management Plan (HMMP). Potential Impact 3.17-1 has been revised to reflect that Recommended Measure TR-1 has been changed to Mitigation Measure TR-1. Please also refer to Master Response CEQ-2.

Please also refer to Master Response HAZ-1.

Comment ORG47-57

3-919. Though outside of the State Water Board's jurisdiction, as a condition of the license surrender, KRRC is committed to working with CAL FIRE to update the Fire Management Plan and to implement Recommended Measure PS-1.

Suggested revision (last paragraph):

"Recommended Measure PS-1 − Fire Management Plan. The KRRC and/or its Contractor(s) shall develop a post-dam removal Fire Management Plan in consultation with the CAL FIRE Siskiyou Unit. The Fire Management Plan shall identify long-term water sources for helicopter and ground crews (including construction and use of proposed dry hydrants, dip ponds, or other alternatives). After reaching agreement on the Fire Management Plan with CAL FIRE Siskiyou Unit, the KRRC and/or its Contractor(s) shall submit the Final Fire Management Plan to the CAL FIRE Siskiyou Unit and implement any portions of the plan for which the KRRC has identified responsibilities. As a condition of license surrender, KRRC is committed to complying with this mitigation measure to reduce any increased challenges in responding to wildland fire in the Klamath Basin due to the implementation of the Proposed Project."

Response to Comment ORG47-57

Please refer to Master Response HAZ-2. While no text revisions are necessary to Recommended Measure PS-1, the additional clarification provided in the comment is noted.

Comment ORG47-58

3-1010. The discussion of Potential Impact 3.20-4 did not incorporate the requirement to conduct project-specific review for individual recreation projects through the use of a checklist authorized by CEQA Guidelines Section 15168(c). In addition, KRRC would implement all applicable mitigation measures set forth in the Draft EIR related to the construction of any new recreational facilities.

Suggested revision:

"As described previously, the Proposed Project involves the development and implementation of a plan to construct new recreational facilities and river access

points along the restored river channel between the California-Oregon border and Iron Gate Dam following dam removal activities. Replacement of recreation facilities would not necessarily be 'like for like', but rather would be designed to accommodate similar levels, if different types of use. This would require the creation of new gravel roads, parking areas and other improvements for vehicle and visitor access to and use of the new river-based recreation sites, which could result in construction-related impacts to the environment, including potential impacts to water quality, terrestrial resources, and historical and/or tribal cultural resources.

While new recreation facilities are part of the Proposed Project, the final location, size, and design of the facilities are still under development. ~~and will be the subject of subsequent approvals. It is thus too soon to conduct a meaningful environmental analysis of the replacement facilities. However, construction and operation of new recreational facilities would undergo any environmental review necessary for the subsequent approvals .~~The recreation plan takes a programmatic approach to developing recreational facilities and mitigating any impacts attributable to these developments. New recreational facilities are being evaluated in a process that includes California and Oregon state officials, Siskiyou County, Klamath County, the Bureau of Land Management, PacifiCorp, economic development organizations including chambers of commerce, tourism organizations, recreation businesses, local communities, and the broader public. A Final Recreation Plan will be submitted to FERC, and this plan will include any new recreation facilities that are proposed by KRRC. The Final Recreation Plan will be subject to environmental review under NEPA, and mitigation measures will be determined by FERC. If implementation of this plan (at FERC's direction) requires any further state or local approvals, then written checklists will be prepared pursuant to CEQA Guidelines Section 15168, subdivision (c) to ascertain whether formal site-specific environmental review for individual recreational projects will be necessary. Such individual projects shall be subject to applicable best management practices and mitigation measures required by FERC, applicable mitigation measure in this EIR such as Mitigation Measures WQ-1, TER-1 through TER-3, and TER-5, TCR-1 through TCR-3, and any other measures required by an agency with jurisdiction over those individual recreational projects. ~~and any impacts of the construction and operation of the facilities would be mitigated, if feasible, to levels that comply with all applicable laws, regulations, and environmental standards. Because this component of the Proposed Project would not be approved until a later date, for the purposes of this EIR the impacts of this component are not significant.~~ The potential environmental impacts of these new recreational facilities will be reviewed at a project level in subsequent evaluations prior to their development."

Response to Comment ORG47-58

Please refer to Master Response REC-2 for a discussion of how new recreational facilities are considered in the EIR given that the Klamath River Renewal Corporation's (KRRC's) Recreation Plan takes a programmatic approach to

developing these facilities and mitigating any impacts attributable to their development.

Comment ORG47-59

3-1034. Include other treated wood such as wood utility poles as noted in Tables 2.7.3, 2.7.5 and 2.7.7 into this section to maintain consistency.

Suggested revision (last paragraph, fourth sentence):

"The dams and hydroelectric facilities within the Proposed Project area may also include items such as transformers, batteries, bushings, oil storage tanks, bearing and hydraulic control system oils, lead bearings, soils or other material contaminated with lead from the use of lead-based paints or plumbing and 700 tons of creosote-treated wood in the wooden stave penstock at Copco No. 2 Dam, as well as wood utility poles (see also Appendix B: Definite Plan – Appendix O3)."

Response to Comment ORG47-59

Section 3.21.2.3 *Hazards and Hazardous Materials – Environmental Setting – Contaminants/Contaminated Sites* has been revised as requested. Please refer to Volume III Attachment 1 Section 3.21.2.3 *Hazards and Hazardous Materials – Environmental Setting – Contaminants/Contaminated Sites* for the revisions.

Comment ORG47-60

3-1050. KRRC commits to working with all federal, state, and local fire suppression agencies to reduce any potential risk of wildland fire attributable to the implementation of the Proposed Project. As CAL FIRE has confirmed, helicopter crews can extract water on the Klamath River and KRRC is working with CAL FIRE to identify specific locations in the Klamath River that are suitable for such extraction. KRRC also proposes changes that better reflect feedback from CAL FIRE regarding the potential impacts of the Proposed Project's implementation on wildland fires in the Klamath Basin. Finally, KRRC agrees with and commits to implement the Recommended Measure PS-1.

Suggested revision (fifth paragraph):

"The Proposed Project would result in the removal of one readily available water source for wildfire services or increased emergency response times if other sources of water are not as readily available. Under the Proposed Project, removal of the Copco No. 1, Copco No. 2, and Iron Gate reservoirs would remove a long-term water source for fire suppression crews after the reservoirs are removed. Absent the identification of replacement sources of water, ~~T~~the removal of the reservoirs could increase turn-around time for helicopters or ground crews refilling with water for fire abatement purposes. However, the initial response times for existing aircraft with fire retardant would not be changed by the loss of the reservoirs. Following dam removal, CAL FIRE has confirmed

that helicopters and ground crews would still be able to extract water from the Klamath River (both the current channel and the channel reaches to be exposed in the current reservoirs following drawdown), Lake Ewauna, and Upper Klamath Lake. Retrieving water directly from the Klamath River is consistent with how wildfires are suppressed along the Klamath River downstream of Iron Gate Dam under current conditions. Ground crews would be adversely affected unless access to Klamath River water continues to be supported under the Proposed Project. Loss of the reservoirs would not affect the use of fire retardant, which is loaded onto aircraft at regional airports (i.e., Redding, Montague, Klamath Falls) and then applied directly to wildfire sites.

With respect to Klamath River access, most helicopter water tanks require three feet of water depth to fill properly, so only deeper pools in the Klamath River would be able to be used by helicopters. CAL FIRE uses the closest available water source that is suitable for fire-fighting, where suitability is determined by local conditions including water flow, depth of pool (2- to 3-foot minimum), amount of debris in pool, shoreline vegetation, and surrounding terrain. Rotor blade length and the length of bucket lines are also determinants, since there must be a safe amount of space to enter and exit the pool site. Individual pilots use their discretion to determine the closest and safest locations from which to withdraw water. KRRC is working with CAL FIRE to assist in mapping exact locations along the Klamath River that are suitable for water extraction during a wildfire based on applicable parameters, which will be included in the final Fire Protection Plan.

Analysis of aerial photos (Google Maps 2018) suggests the presence of pools with suitable conditions for helicopter filling in the currently free-flowing reaches of the Middle and Upper Klamath River, particularly in the reaches between Copco No. 1 and J.C. Boyle reservoirs and downstream of Iron Gate Dam. While source water would be available in the Klamath River in pools located in the river reaches exposed following reservoir drawdown, the travel time involved in accessing the newly formed pools ~~would be~~ may be greater than that for the existing Lower Klamath Project reservoirs because retrieval of water from relatively smaller, more narrow, river pools is more difficult than dipping directly from the broad water surface of a lake or reservoir, and only one helicopter at a time would have access to a given river pool versus multiple helicopters that can draw at one time from a large reservoir. Thus, response and travel times between water fills for helicopter crews ~~would be expected to~~ could increase with the loss of the reservoirs. Wildfires can spread at a rapid speed, and involve high risks. There are a number of factors that contribute to the severity and extent of a wildland fire. It is hard to predict whether any specific factor will contribute to the severity of a fire. In an abundance of caution, the State Water Board finds that ~~A~~any amount of additional response time compared with existing conditions could result in a substantial increased risk of loss, injury, or death involving wildland fires and this would be a significant impact.

To compensate for the loss of reservoir water supply, the Proposed Project includes providing alternate water supply through dry hydrants that would be accessible to ground crews following removal of the dams. Flows in the Klamath River and tributaries are not expected to substantially change post-dam removal, as compared to current flows, and firefighting ground crews could still use the river as a water supply as long as physical access to water is provided. A dry hydrant is a passive, unpressurized system, with a screened intake placed in the channel above the channel bed. An above-ground fire hose is used to connect the intake to truck-mounted pumps (Figure 3.17-1). Placement of the dry hydrant must be in a location of satisfactory depth (during dry conditions), flow rate, and channel stability. The Definite Plan states that dry hydrants are commonly used as water supply for fighting fires in rural areas, and typical dry hydrants and fire truck pumps can supply over 1,500 gallons per minute, which is sufficient for rapid filling of typical water tankers and firefighting apparatus (Appendix B: Definite Plan – Appendix O1).

To assist ground-based firefighting efforts, the Fire Management Plan proposes the development of eight sites near the Copco No. 1 Reservoir and four sites near the Iron Gate Reservoir for installation of permanent dry hydrants from which water trucks and fire engines could draw directly from the Klamath River and larger tributaries (Figures 3.17-2 and 3.17-3). The Proposed Project also includes an evaluation of the potential for riverine pool features to be used for helicopter water filling and development of an associated map of resources that can be used by air-based firefighting crews.

The proposed dry hydrants are likely to be of limited use for firefighting compared with existing conditions because only ground crews can access them (i.e., they are of no use to aerial crews that can access the reservoirs under existing conditions). Hook-ups to the dry hydrants would require standard specifications and existing CAL FIRE pumper trucks would require special equipment such as hard suction lines (a flexible hose would collapse) to successfully draft from the dry hydrants. The ground crews would need to be able to get close to the river to draft from the dry hydrants because firetrucks typically can only lift water over short vertical distances (i.e., 10 to 14 feet, with a maximum 15-foot height from the intake) and drafting from bridges may require too much lift. Decreased response time associated with dry hydrants as compared with aerial crew access of reservoir water via helicopters would be a significant impact since it would increase the risk of loss, injury, or death involving wildland fires. Direct withdrawal from the river using a boat ramp, pumping stations equipped with pumps connected to wells or deep pools in the river, above-ground storage tanks with ready access for transferring water to pumper trucks, are likely to be better options than the dry hydrants proposed by KRRC because these alternatives would be easier to use and thus would reduce ground crew response time. Section 3.17 Public Services includes Recommended Measure PS-1 that requires the KRRC or the Contractor's Safety Officer for the Proposed Project to submit a final Fire Management Plan after reaching agreement with CAL FIRE

Siskiyou Unit on a long-term water source replacement for helicopter and ground crews (including construction and utilization of proposed dry hydrants, dip ponds or other alternatives). KRRC commits to complying with this mitigation measure to reduce any risk in wildland fire in the Klamath Basin due to the implementation of the Proposed Project."

Response to Comment ORG47-60
Please refer to Master Response HAZ-2. While no text revisions are necessary to the identified paragraph, the additional clarification of Klamath River Renewal Corporation's (KRRC's) intentions to reduce risk of wildfires in the comment is noted.

Comment ORG47-61
3-1060. Copco Road description should be updated. The road is approximately 32 feet wide (paved), not 27 feet wide as written.

Suggested revision (fifth sentence):

"Copco Road is a paved, two-lane road in generally good pavement condition between I-5 and Ager Road with few pavement cracks or ruts and is approximately 32 27 feet wide."

Response to Comment ORG47-61
Section 3.22.2.1 *Transportation and Traffic – Environmental Setting – Traffic Flow – Roadways – Copco Road has been revised to clarify that Copco Road* at the designated section is 32 feet rather than 27 feet wide. Please refer to Volume III Attachment 1 Section 3.22.2.1 *Transportation and Traffic – Environmental Setting – Traffic Flow – Roadways – Copco Road* for this revision.

Comment ORG47-62
3-1073. KRRC is committed to implementing the Recommended Measure TR-1 and recommends the following revisions to the language of the measure.

Suggested revision (second paragraph):

"Recommended Measure TR-1 – Transportation and Traffic.

A. The KRRC and/or its contractor(s) shall develop a final Traffic Management Plan (TMP) that provides:

1. Implementation details consistent with all applicable regulatory requirements including the latest version of the Caltrans California Manual on Uniform Traffic Control Devices (MUTCD,Caltrans 2018b), Caltrans Traffic Management Plan (TMP) Guidelines, Oregon Department of Transportation (ODOT) Oregon Supplement to the MUTCD, Federal Highway Administration MUTCD, ODOT Traffic Control Plans Design Manual, and ODOT TMP Project Level Guidance

Manual. KRRC will coordinate ~~and coordination~~ with the noted agencies (Caltrans, ODOT, Siskiyou and Klamath County Public Works and Sheriff's Departments, California Highway Patrol and Oregon State Police, CAL FIRE, Oregon Department of Forestry [ODF] Fire Division, and other emergency response agencies) as part of the detailed design phase and prior to start of construction. Potential conflicts with bicycle and pedestrian use, as well as transit and school bus service, need to be addressed in the Traffic Management Plan. KRRC has proposed Memoranda of Understanding to Siskiyou County and to Klamath County (i.e., good neighbor agreements) to jointly develop and recommend to FERC additional terms and conditions of the Traffic Management Plan that address local interests. The final version of the Traffic Management Plan, after coordination with the above referenced agencies, shall be received by the State Water Board prior to the start of construction.

2. Each road, bridge, and culvert improvement project included in the Proposed Project, or any other road, bridge, or culvert improvement project that is identified as necessary for the Proposed Project, shall be constructed consistent with the latest version of the Caltrans Highway Design Manual (Caltrans 2018c), Caltrans Standard Plans, and Caltrans Standard Specifications, or ODOT Highway Design Manual, ODOT Standard Drawings and Standard Details, and ODOT Standard Specifications, or equivalent, and shall not conflict with any applicable plan, ordinance, or policy regarding performance of the transportation system, traffic safety and/or congestion management within the Area of Analysis. Construction shall not begin until all final designs for road, bridge, and culvert improvement projects included in the Proposed Project have been received and approved, as necessary, by the county and other responsible agencies.

3. The KRRC shall be responsible for repairing and/or rehabilitating ~~any Siskiyou County roadways~~ Copco Road, Ager Beswick Road, Daggett Road, and Lakeview Road within the traffic and transportation Area of Analysis that are damaged or otherwise adversely impacted by Proposed Project activities, such that they are in a condition equal to or better than they were before dam removal activities.

B. The KRRC and/or its construction contractor(s) shall develop an Emergency Response Plan with details and procedures to be put in place to help prevent incidents, to ensure preparedness in the event incidents occur, and to provide a systematic and orderly response to emergencies through coordination with emergency response agencies, as described in Appendix B: Definite Plan − Appendix O4."

Response to Comment ORG47-62

Section 3.22.5 *Transportation and Traffic – Potential Impacts and Mitigation* Recommended Measure TR-1 has been changed to Mitigation Measure TR-1 and the terms have been clarified as requested, with the exception of item no. 3, which remains the same. Limiting road repairs to a few roads does not fully

address the extent of the potential impact. Any road that is impacted by the Proposed Project should be restored to equal or better than pre-project conditions. Please refer to Volume III Attachment 1 Section 3.22.5 *Transportation and Traffic – Potential Impacts and Mitigation* for this revision.

Comment ORG47-63
3-1077. Potential Impact 3.22-3. Appendix K of the Definite Plan indicates that improvements and upgrades are not anticipated (in some sections where poor pavement condition has been observed) but pavement rehabilitation may be required during or post-construction. The pavement rehabilitation may be used to help mitigate for increase in potential hazards or incompatible uses.

Suggested revision (sentences 8 and 9):

"These sections of roads may not be up to a standard for the transportation of construction equipment, adequate for emergency response, or in a condition adequate for future use after dam removal activities have been completed; however, as described in Appendix K of the Definite Plan, there will be pavement rehabilitation as part of the Proposed Project, which will address the deficiencies in the existing road conditions to the extent necessary."

Response to Comment ORG47-63
Section 3.22.5 *Transportation and Traffic – Potential Impacts and Mitigation* has been clarified as requested. Please refer to Volume III Attachment 1 Section 3.22.5 *Transportation and Traffic – Potential Impacts and Mitigation* for this revision.

Comment ORG47-64
3-1077. Clarify Potential Impact 3.22-5 with respect to safety.

Suggested revision (third sentence, first paragraph):

"If an unacceptable level of risk to non-motorized users is deemed to persist, KRRC's contractor will arrange appropriate detours to allow safe and adequate continued movement for such users ~~to allow continued movement for such users~~ (Appendix B: Definite Plan – Appendix O2)."

Response to Comment ORG47-64
Section 3.22.5 Transportation and Traffic – Potential Impacts and Mitigation has been clarified as requested. Please refer to Volume III Attachment 1 Section 3.22.5 Transportation and Traffic – Potential Impacts and Mitigation for this revision.

Comment ORG47-65
3-1198. In Section 3.24.13, update section references for clarity.

Suggested revision (last paragraph, first sentence):

"Existing conditions for paleontologic resources are as described in Section 3.13.2 3.14.2 [Paleontologic Resources] Environmental Setting. The majority of bedrock deposits within the Area of Analysis for paleontologic resources are not fossil-bearing units. Two mapped geologic units that contain paleontologic resources are present within the Area of Analysis: (1) the unnamed diatomite deposit at Copco No. 1 Reservoir; and (2) the Hornbrook Formation. The diatomite deposit is determined to be of Low Paleontologic Potential. The fossils in the Hornbrook Formation are documented to include megafossils and microfossils, but it is not known if the fossil abundance varies spatially within this geologic unit. The Klamath River cuts across the Hornbrook Formation in the region of Hornbrook, California, along approximately three river miles (Figure 3.13-2). Sub-units within the Hornbrook formation are described in Section 3.13.2 ~~3.14.2~~ [Paleontologic Resources] Environmental Setting. Section 3.13.2 ~~3.14.2~~ also includes consideration of major past or ongoing projects that have impacted, or currently impact, paleontologic resources."

Response to Comment ORG47-65
Section 3.24.13 *Cumulative Effects – Paleontologic Resources* has been clarified as requested. Please refer to Volume III Attachment 1 Section 3.24.13 *Cumulative Effects – Paleontologic Resources* for this revision.

Comment ORG47-66
3-1202. Potential Impact 3.24-53, Recommend re-wording title for clarification.

Suggested revision (last paragraph):

"Potential Cumulative Impact 3.24-53 Short-term and long-term effects to forestry resources from the combination of the Proposed Project and wildfire."

Response to Comment ORG47-66
Section 3.24.15 *Cumulative Effects – Agriculture and Forestry* has been clarified as requested. Please refer to Volume III Attachment 1 Section 3.24.15 *Cumulative Effects – Agriculture and Forestry* for this revision.

Comment ORG47-67
4-93. In Section 4.3.17, clarify to reflect the commitments that KRRC will implement, as conditions of license surrender, to reduce the risk of increased public services response times for emergency fire, police, and medical services due to the Proposed Project's construction and demolition activities. Commitments apply to all alternatives except the No Project Alternative.

Suggested revision (third sentence):

"Implementation of Mitigation Measure HZ-1 (Section 3.21 Hazards and Hazardous Materials) would reduce impacts for reasons described under the Proposed Project. ~~However,~~ In addition, KRRC has developed a draft Traffic Management Plan that includes mitigation and other protective measures that would be implemented to reduce impacts to public services (Appendix B: Definite Plan – Appendix 02). The final Traffic Management Plan would be informed by KRRC's contractor's specific means and methods for construction and input received from relevant local jurisdictions, which could refine the approach to access and traffic management. KRRC has proposed Memoranda of Understanding to Siskiyou County and to Klamath County (i.e., good neighbor agreements) to jointly develop and recommend to FERC additional terms and conditions of the Traffic Management Plan that address local interests. KRRC is committed to ensuring that the final Traffic Management Plan meets applicable regulatory permit requirements, as well as applicable state and local ordinances. In addition, KRRC has committed to coordinate the implementation of the Traffic Management Plan and Emergency Response Plan to reduce impacts. Overseeing development and implementation of the final Traffic Management Plan and final Emergency Response Plan does not fall within the scope of the State Water Board's water quality certification authority. While the State Water Board expects that the Traffic Management Plan and Emergency Response Plan will be finalized and implemented, the State Water Board cannot require their implementation. Accordingly, while the State Water Board anticipates that implementation of Mitigation Measure HZ-1 and Recommended Measure TR-1 would reduce impacts to public services, because it cannot require implementation of Recommended Measure TR-1, it is analyzing the impacts under this alternative as significant and unavoidable."

Response to Comment ORG47-67

Please refer to Master Response CEQ-2 for a discussion of why the text of the Final EIR has been revised to reflect that Recommended Measure TR-1 is now Mitigation Measure TR-1. Please also refer to Volume III Attachment 1 Section 3.22.5 *Transportation and Traffic – Potential Impacts and Mitigation* Potential Impacts 3.22-1 through 3.22-5 for the revisions.

Please also refer to Master Response HAZ-1.

Comment ORG47-68

4-166. As a preliminary matter, Mitigation Measure TER-5 should apply to all action alternatives to ensure no net loss of wetlands. Currently, Mitigation Measure TER-1, standing alone, does not provide for unavoidable wetlands impacts. Therefore, it should be understood that TER-1 works together with TER-5 to ensure that the Project achieves the net zero loss of wetland function and value standard.

Suggested revision:

"Mitigation Measure TER-1 Establish a 20-foot buffer around delineated wetlands. The KRRC shall establish a minimum of a 20-foot buffer around all delineated wetlands potentially affected by construction impacts to ensure there will not be any significant environmental impacts to wetlands by deterring heavy machinery from traversing the wetland and preventing runoff pollution from directly entering the wetland where doing so would not result in a significant environmental impact. The buffer may be adjusted (e.g., made larger or smaller) based on site-specific conditions, as determined by a qualified biologist acceptable to USACE, as necessary to ensure adequate protection of the delineated wetlands. To the extent that impacts to wetlands cannot be avoided, KRRC shall comply with mitigation measure TER-5 to ensure no net loss of functions and values. The State Water Board has the authority to include this mitigation measure in its water quality certification for the project, and the measure is therefore feasible and used in this analysis to make a significance determination.

Mitigation Measure TER-5 – Identification, protection, and restoration of wetland and riparian habitats. The KRRC shall conduct a wetland delineation within the limits of construction in accordance with the 1987 U.S. Army Corps of Engineers (USACE) Wetland Delineation Manual (USACE 1987) and applicable Regional Supplements (i.e., Western Mountains, Valleys, and Coast Region [USACE 2010] and Arid West [USACE 2008]). The results of the wetland delineation shall be incorporated into all alternatives, except for the No Project Alternative, ~~the Continued Operations with a Continued Operations with Fish Passage Alternative design~~ to avoid and minimize direct impacts on wetlands to the maximum extent feasible, and wetland areas adjacent to the construction Limits of Work shall be fenced to prevent inadvertent entry. Where avoidance is not feasible the KRRC shall develop a restoration plan to re-vegetate all areas disturbed during construction with a ~~goal~~ requirement of no net loss of wetland or riparian habitat acreage and functions. The restoration plan shall include details on revegetation native seed mixes based on existing species that will be impacted and installation techniques for container plants and seeds. Wetlands established in restored areas would be monitored for five years or until the performance criteria, as defined in the restoration plan that shall be developed, have been met."

Response to Comment ORG47-68
Please see response to ORG47-41.

Comment ORG47-69
4-238. In Section 4.5.17, clarify to reflect the commitments that KRRC intends to implement to reduce the risk of increased public services response times for emergency fire, police, and medical services due to the Proposed Project's construction and demolition activities. Commitments apply to all alternatives except the No Project Alternative.

Suggested revision (second paragraph):

"Mitigation Measure HZ-1 would reduce impacts. In addition, the KRRC is developing a Traffic Management Plan to identify mitigation and other protective measures that would be implemented to reduce impacts to public services. It would also be appropriate for the final Traffic Management Plan to include Recommended Measure TR-1. The final Traffic Management Plan would be informed by KRRC's contractor's specific means and methods for construction and input received from relevant local jurisdictions, which could refine the approach to access and traffic management. KRRC has proposed Memoranda of Understanding to Siskiyou County and to Klamath County (i.e., good neighbor agreements) to jointly develop and recommend to FERC additional terms and conditions of the Traffic Management Plan that address local interests. KRRC is committed to ensuring that the final Traffic Management Plan meets applicable regulatory permit requirements, as well as applicable state and local ordinances. In addition, KRRC has committed to coordinate the implementation of the Traffic Management Plan and emergency response plan to reduce impacts. Overseeing development and implementation of the Traffic Management Plan does not fall within the scope of the State Water Board's water quality certification authority. While the State Water Board expects that this plan will be finalized and implemented, at this time the plan is not finalized, and the State Water Board cannot require its implementation. Accordingly, while the State Water Board anticipates that implementation of Mitigation Measure HZ-1 would reduce impacts to public services, because it cannot require implementation of Recommended Measure TR-1, it is analyzing the impacts under this alternative as significant and unavoidable."

Response to Comment ORG47-69
Please refer to response to comment ORG47-67.

Comment ORG47-70
4-296. In last sentence of Section 4.6.17, change impact numbers to 3.17-1 through 3.17-3.

Suggested revision:

"Thus, for reasons described in Section 3.17.5 [Public Services] Potential Impacts and Mitigation, impacts and associated mitigation measures from increased public service response times for emergency fire, police, and medical services due to construction and demolition activities, elimination of a long-term water source for wildfire services substantially increasing the response time for suppressing wildfires, and potential effects on schools services and facilities would be the same under the Three Dam Removal Alternative as those described for the Proposed Project ~~(Potential Impacts 3.5-1 through 3.5-3)~~ (Potential Impacts 3.17-1 through 3.17-3)."

Response to Comment ORG47-70
Section 4.6.17 *Alternatives – Three Dam Removal Alternative – Public Services* has been clarified as requested. Please refer to Volume III Attachment 1 Section 4.6.17 *Alternatives – Three Dam Removal Alternative – Public Services* for the revisions.

Comment ORG47-71
4-320. In last sentence of Section 4.7.17, change impact numbers to 3.17-1 through 3.17-3.

Suggested revision:

"Thus, for reasons described in Section 3.17.5 [Public Services] Potential Impacts and Mitigation, impacts and associated mitigation measures from increased public service response times for emergency fire, police, and medical services due to construction and demolition activities, elimination of a long-term water source for wildfire services substantially increasing the response time for suppressing wildfires, and potential effects on schools services and facilities would be the same under the Three Dam Removal Alternative as those described for the Proposed Project ~~(Potential Impacts 3.5-1 through 3.5-3)~~ (Potential Impacts 3.17-1 through 3.17-3)."

Response to Comment ORG47-71
Section 4.7.17 *Alternatives – No Hatchery Alternative – Public Services* has been clarified as requested. Please refer to Volume III Attachment 1 Section 4.7.17 *Alternatives – No Hatchery Alternative – Public Services* for this revision.

League of Women Voters, Andrew Muse-Fisher, Helen Hutchinson, Rollin Richmond

Comment ORG25-1
The League of Women Voters of California (LWVC) and the League of Women Voters of Humboldt County, California (LWVHC) strongly support the removal of four dams on the Klamath River. The removal of the four dams will effectively improve water quality for humans, fish, and other wildlife and comply with the Clean Water Act water quality objectives. The improved water quality will also provide for the cultural and economic interests of Native Americans, recreational anglers, and the commercial fishing fleet of northern California.

Response to Comment ORG25-1
Thank you for your comment. Please also refer to Master Response GEN-1.

Comment ORG25-2
This support of the proposed project of the Draft EIR is founded on the LWVC's and LWVHC's positions on natural resources, specifically water. The LWVC's position:

- *protect the natural environment in areas of both water origin and water use*
- *reserve stream flows for protection of fish and wildlife habitat and other in-stream uses*
- *encourage off-stream storage; discourage additional on-stream dams*
- *provide for assessment of economic, social, and environmental costs and benefits of water projects*

The LVCHC's position: coordinated interagency planning and action are critical to successful management and to the accomplishment of the following objectives:

- *rivers and streams should be left in their natural states whenever possible, with each case considered on its own merits.*
- *total watershed management, including preservation and restoration should be coordinated by qualified professionals so the economic interests, aesthetic issues, and health concerns can exist in harmony in our county and our future water supply can be provided adequately.*

Response to Comment ORG25-2
Please refer to Master Response GEN-1.

Comment ORG25-3
The State Water Resources Control Board has identified the following Proposed Project objectives, as required under CEQA Guidelines, section 15124, subdivision (b):

In a timely manner:

1. Improve the long-term water quality conditions associated with the Lower Klamath Project in the California reaches of the Klamath River, including water quality impairments due to Microcystis aeruginosa and associated toxins, water temperature, and levels of biostimulatory nutrients.

2. Advance the long-term restoration of the natural fish populations in the Klamath Basin, with particular emphasis on restoring the salmonid fisheries used for subsistence, commerce, tribal cultural purposes, and recreation.

3. Restore volitional anadromous fish passage in the Klamath Basin to viable habitat currently made inaccessible by the Lower Klamath Project dams.

4. Ameliorate conditions underlying high disease rates among Klamath River salmonids. The objectives further the underlying purpose of the Proposed Project (removal of four dams), which is the timely improvement of water quality related to the Lower Klamath Project within and downstream of the current Hydroelectric Reach and the restoration of anadromous access upstream of Iron Gate Dam (the current barrier to anadromy).

These objectives align with the League's positions, and we are pleased to support the Water Board's Draft EIR.

Response to Comment ORG25-3
Please also refer to Master Response GEN-1 and GEN-2.

Mount Shasta Bioregional Ecology Center, Arielle Halpern

Comment ORG26-1 and ORG40-1
On behalf of the Mount Shasta Bioregional Ecology Center, I am writing to voice our support for the removal J.C. Boyle, Copco No. 1, Copco No. 2 and Iron Gate Dams on the Klamath River. The removal of these dams is a critical step in enhancing healthy human-environmental systems in the Klamath Bioregion. The Klamath Bioregion a biodiversity hotspot and one of the four most diverse conifer forests in the world. Benefits including reducing the mortality of juvenile salmonid populations, reducing salmonid diseases, including P. minibicornis and C Shasta. The above challenges are a result of high temperatures, low water flows, and high densities of fish attempting to access upstream habitat currently blocked by the dams. High temperatures and low flows also contribute to toxic blue green algae blooms during summer months which affect wildlife, recreation, and aesthetics.

Response to Comment ORG26-1 and ORG40-1
Thank you for your comment. Please also refer to Master Response GEN-1.

Comment ORG26-2 and ORG40-2
Opponents of dam removal state effects on groundwater/irrigation and energy as potential detrimental results of dam removal. As the DEIR states, the proposed project would have no significant impact on groundwater and irrigation as most agriculture in the area uses diversions from Klamath tributaries.

Response to Comment ORG26-2 and ORG40-2
Comment noted. Please also refer to Master Responses WSWR-1 and GRW-1. This comment also pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Greenhouse Gas Emissions and Energy*).

Comment ORG26-3 and ORG40-3
Dams are not used for water supply or for flood control.

Response to Comment ORG26-3 and ORG40-3
Please refer to Master Response WSWR-1 and FLD-1.

Comment ORG26-4 and ORG40-4
According to the Hydropower Technical Benefits Report, the total installed capacity of the four Klamath River hydropower plants is 169 MW, average summer capacity is 55.9 MW and winter dependable capacity is 66.6 MW: These

dams run dependably at approximately 30% of their total capacity. The $400 million dollars it would have taken to upgrade the fish passage and water quality systems and obtain a new operational license from FERC was not cost effective relative to the amount of hydropower these dams generate. Renewables and efficiency measures can replace the energy input without contributing to climate change. A study by the California Energy Commission and the Department of the Interior found that removing the dams and compensating for the loss of power production with efficiency measures and other sources would save PacifiCorp customers up to $285 million over 30 years.

Response to Comment ORG26-4 and ORG40-4
Comment noted. This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Greenhouse Gas Emissions and Energy*).

Comment ORG26-5 and ORG40-5
Once again, we would like to voice our support for the removal of the Klamath dams.

Response to Comment ORG26-5 and ORG40-5
Comment noted.

Native Fish Society, Wild Fish Conservancy, Patagonia Inc., Fly Water Travel, University of Montana, Stoecker Ecological, Conrad Gowell, Jake Crawford, Mark Sherwood, Kurt Beardslee, Jamie Glasglow, Hans Cole, Charles Gehr, Jack Stanford, and Matt Stoecker

Comment ORG33-1
Thank you for the opportunity to engage in the environmental review of the Lower Klamath dam removal. Please see the attached request to extend the public comment processes for the Lower Klamath Project draft environmental impact report (EIR). Our partners all agree that the existing comment period is insufficient to review and comment on the documents associated with the project. We respectfully request that you extend the public comment period for an additional 30 days in order for us, and other members of the public, to fully participate in the review of the presented alternatives.

Please let us know that you have received this request and whether or not an extension can be granted.

Response to Comment ORG33-1
Thank you for your comment and for your participation in the environmental review process. CEQA Guidelines section 21091 subdivision (a) requires a minimum 45-day public review period for an EIR. The Lower Klamath Project Draft EIR was released on December 27, 2018 and the public comment period ended February 26, 2019.

Comment ORG33-2

The Native Fish Society, Wild Fish Conservancy, Patagonia, Inc., Fly Water Travel, Jack Stanford, and Matt Stoecker respectfully requests a 30-day extension of the public comment period for the Lower Klamath Project License Surrender submitted to the California State Water Resources Control Board. The originally allotted comment period is insufficient for the scope and importance of this process. I sincerely hope you will consider granting us, and members of the public additional time so we can adequately participate in review of the alternatives presented.

Response to Comment ORG33-2

Please refer to response to comment ORG33-1.

Comment ORG33-3

The Native Fish Society (NFS) is a 501(c)3 conservation non-profit, dedicated to utilizing the best available science to advocate for the protection and recovery of wild, native fish and promote the stewardship of the habitats that sustain them. NFS has 3,300 members and supporters and 89 River Stewards, and 11 Fellows that help safeguard wild fish in their homewaters across the Pacific Northwest. NFS has five River Stewards that live, work, and recreate in the Klamath watershed in both California and Oregon. Furthermore, NPS River Stewards, Staff, and Supporters live, work, and recreate in the Klamath basin who are interested in the recovery of threatened and sensitive populations of wild, native fish.

Wild Fish Conservancy is a 501 (c)3 non-profit that is dedicated to the recovery and conservation of the region's wild fish ecosystems. Through science, education, and advocacy, WFC promotes technically and socially responsible habitat, hatchery, and harvest management to better sustain the region's wild-fish heritage.

Patagonia, Inc. is an outdoor clothing and gear company dedicated to using business to inspire and implement solutions to the environmental crisis. This includes a 40-year hist01y supporting grassroots campaigns and local groups working to remove dams, restore habitat and protect wild rivers and wild fish.

Fly Water Travel is a team of fishing and travel experts exclusively dedicated to arranging trips to the world's fi nest fi shing destinations. Fly Water supports fishing businesses in the Klamath basin and clients who travel to the Klamath waters bed to experience healthy runs of wild, native fish and the clean water necessary for their survival.

Jack Stanford is a Professor Emeritus at the Flathead Lake Biological Station with the University of Montana, where for over 45 years his research focused on the ecology of Pacific Rim salmon rivers.

Stoecker Ecological is a biological consulting firm that specializes in salmon and steelhead restoration across the West Coast.

Response to Comment ORG33-3
Please refer to Master Response GEN-2.

Comment ORG33-4
An extension request from February 26th, 2019 to March 26th, 2019 is being requested in order to provide adequate time for the our organizations, businesses, members and the public to effectively engage in the commenting process and to provide ample time to review the lengthy documents with a thorough review.

Response to Comment ORG33-4
Please refer to response to comment ORG33-1.

Native Fish Society, Wild Fish Conservancy, Patagonia Inc., Fly Water Travel, University of Montana, Stoecker Ecological, World Salmon Forum, Jake Crawford, Conrad Gowell, Mark Sherwood, Kurt Beardslee, Jamie Glasgow, Yvon Chouinard, Hans Cole, Charles Gehr, Jack Stanford, Matt Stoecker, and Bruce McNae

Comment ORG34-1
Please see the following three attachments with comments concerning the Lower Klamath Project License Surrender No. 2016122047. Thank you for the opportunity to submit the following comments.

1. Native Fish Society Group Comments on Draft Environmental Impact Report for the Lower Klamath Project License Surrender No. 2016122047. These comments are submitted in support of the below document.

2. Shute, Mihaly, & Weinberger, LLP comments representing Native Fish Society on the Draft Environmental Impact Report for the Lower Klamath Project License Surrender (State Clearinghouse No. 201622047).

3. Group Comments previously submitted during the project scoping dated July 23, 2018.

Finally, supporting literature for the referenced documents are included in this dropbox folder, and we will mail a thumb-drive of the supporting materials to the State Water Resources Control Board office.

Please confirm receipt of this email, and contact me directly with any questions or further discussion.

Response to Comment ORG34-1
The State Water Board received the three attachments associated with the cover email, as well as the items provided via “dropbox".

Comment ORG34-2
Thank you for the opportunity to provide comments on the Draft Environmental Impact Report for the Lower Klamath License Surrender Project (“Project”).

We are submitting the following comments that fully support the proposed decommissioning of all four Lower Klamath Project dams and the license surrender, which will improve the biological conditions in the Klamath watershed to benefit sensitive and threatened wild, native fish species, as well as the human and environmental communities who depend on the health of these iconic fish species. Our coalition of scientists, businesses, and conservation groups stress support for decommissioning the four Lower Klamath Dams (Iron Gate, Copco 1 & 2, and J.C. Boyle). Decommissioning all four dams is critical to the recovery and long-term protection of these iconic fish species that provide important subsistence for tribal fisheries, economies for commercial and sport fishing communities along the California and Oregon coast, and sustains the many plants and animals dependent on the return of marine nutrients that contribute to overall watershed health.

Our concerns are centered on the significant environmental impacts that would result from the Project’s proposed hatchery operations, and the lack of description for how the proposed hatchery operations would contribute to the recovery of the watershed’s imperiled fish species. As noted in the DEIR No Hatchery Alternative, the proposed hatchery operations post-dam decommissioning would be detrimental to imperiled Chinook and recovering coho populations and could jeopardize their ability to respond to the benefits of dam decommissioning. As stated in the DEIR, “In the long term, removal of the Lower Klamath Project dams under the No Hatchery Alternative would increase habitat availability, restore a more natural flow regime and seasonal variation in water temperature, improve water quality, and reduce the likelihood of fish disease and algal toxins” which will be beneficial to fall-run Chinook, spring-run Chinook, and coho salmon in the Klamath basin (see DEIR 4-301-324).

Under the No Hatchery Alternative, ceasing hatchery operations along with decommissioning all four Lower Klamath Dams is the superior environmental alternative that will contribute to the long-term restoration of wild salmon and steelhead that are able to benefit from the newly accessible habitat and improved river conditions without the competition from hatchery releases. Importantly, the No Hatchery Alternative is feasible and environmentally superior to the proposed Project, and meets all the Project objectives.

In light of these and the following concerns, we offer our support of the attached comments submitted by SHUTE, MIHALY & WEINBERGER LLP represented by

the Native Fish Society, and urge the State Board to consider and adopt the No Hatchery Alternative. Together, we have a keen interest in the certification and decommissioning of the Project, and our collective organizations, members, partners, and clients have been deeply involved in past and ongoing wild salmon and watershed restoration projects in California, Oregon, and Washington.

Native Fish Society is a 501(c)3 conservation non-profit, dedicated to utilizing the best available science to advocate for the protection and recovery of wild, native fish and promote the stewardship of the habitats that sustain them. NFS has 3,300 members and supporters and 89 River Stewards that help safeguard wild fish in their homewaters across the Pacific Northwest. NFS has five River Stewards that live, work, and recreate in the Klamath watershed in both California and Oregon. Furthermore, NFS River Stewards, Staff, and Supporters live, work, and recreate in the Klamath basin who are interested in the recovery of threatened and sensitive populations of wild, native fish.

Wild Fish Conservancy is a 501(c)3 non-profit that is dedicated to the recovery and conservation of the region's wild fish ecosystems. Through science, education, and advocacy, WFC promotes technically and socially responsible habitat, hatchery, and harvest management to better sustain the region's wild-fish heritage.

Patagonia is an outdoor clothing and gear company dedicated to using business to inspire and implement solutions to the environmental crisis. This includes a 40-year history supporting grassroots campaigns and local groups working to remove dams, restore habitat and protect wild rivers and wild fish.

Fly Water Travel is a team of fishing and travel experts exclusively dedicated to arranging trips to the world's finest fishing destinations. Fly Water supports fishing businesses in the Klamath basin and clients who travel to the Klamath watershed to experience healthy runs of wild, native fish and the clean water necessary for their survival.

Jack Stanford is a Professor Emeritus at the Flathead Lake Biological Station with the University of Montana, where for over 45 years his research focused on the ecology of Pacific Rim salmon rivers.

Stoecker Ecological is a biological consulting firm that specializes in salmon and steelhead restoration across the West Coast.

World Salmon Forum is bringing together a coalition of scientists, advocates, and foundations dedicated to sustaining wild salmon in response to the dramatic declines in Atlantic and Pacific wild salmon populations facing the imminent risk of extinction.

In conclusion, we submit our comments in support for the Lower Klamath Project decommissioning and license surrender, but remain concerned about the environmental impacts of the proposed Project's hatchery operations at Iron Gate and Fall Creek. We offer our support for the comments submitted by SHUTE, MIHALY, & WEINBERG, LLC represented by Native Fish Society, and urge the State Water Board to consider and adopt the No Hatchery Alternative.

For any follow up, please contact Jake Crawford, Native Fish Society by phone at 503-344-4218 or email: jake@nativefishsociety.org

Response to Comment ORG34-2
As the commenters note, this cover letter is introductory to more specific comments attached. To the extent this cover letter includes topics that warrant further response, these are addressed in responses to the more detailed following comments, ORG34-4 through ORG34-16.

Comment ORG34-3
This firm represents the Native Fish Society on matters relating to the proposed Lower Klamath License Surrender Project ("Project"). On behalf of our client, we have reviewed the Draft Environmental Impact Report ("DEIR") and respectfully submit these comments to help ensure that agency decision-makers fully comply with the California Environmental Quality Act ("CEQA"), Public Resources Code § 21000 et seq., and the CEQA Guidelines, California Code of Regulations, Title 14, § 15000 et seq. ("Guidelines"). This letter follows a comment letter dated July 23, 2018 submitted by the Native Fish Society together with a coalition of scientists, conservation groups, and interested business entities on the Project scoping document. This letter incorporates those July 23, 2018 comments as if fully set forth herein, as well as the references cited therein.

As discussed in those prior comments, the Native Fish Society supports the proposed decommissioning and license surrender, which will improve the biological conditions in the Klamath watershed to benefit sensitive and threatened wild, native fish species. However, it remains concerned about the significant environmental impacts that would result from the Project's proposed hatchery operations and seeks to ensure that those impacts are eliminated or mitigated to the extent feasible, as required by CEQA.

We are pleased to see that the State Water Resources Control Board ("State Board") has taken our client's prior comments into consideration such that the DEIR reveals many of the environmental impacts of the proposed hatchery operations and also considers a "No Hatchery Alternative." However, the DEIR should be corrected and/or augmented to reflect important information regarding hatchery operations, as set forth below. But even based on the information the DEIR currently reveals, it is clear that the proposed Project's hatchery operations would result in significant impacts that can and should be avoided by eliminating those hatchery operations. The No Hatchery Alternative is clearly feasible and

environmentally superior to the proposed Project, and meets all the Project objectives. Therefore, the Native Fish Society urges the State Board to consider and adopt the No Hatchery Alternative.

Response to Comment ORG34-3
This comment is introductory to more specific comments. To the extent this paragraph includes topics that warrant further response, these are addressed in responses to the more detailed following comments, ORG34-4 through ORG34-16.

Comment ORG34-4
CEQA's most fundamental requirement is that an EIR contain an accurate, complete, and consistent project description. See County of Inyo v. City of Los Angeles (1977) 71 Cal.App.3d 185; see also CEQA Guidelines § 15124. Moreover, CEQA defines a "project" as "the whole of an action." CEQA Guidelines § 15378. As explained in McQueen v. Board of Directors of the Midpeninsula Regional Open Space District (1988) 202 Cal.App.3d 1136, "'[p]roject' is given a broad interpretation in order to maximize protection of the environment." Id. at 1143. As the Supreme Court has explained, this rule ensures "that environmental considerations do not become submerged by chopping a large project into many little ones—each with a potential impact on the environment—which cumulatively may have disastrous consequences." Bozung v. Local Agency Formation Comm. (1975) 13 Cal.3d 263, 283-84. Without a complete and consistent project description, an agency and the public cannot be assured that all of a project's environmental impacts have been revealed and mitigated.

Response to Comment ORG34-4
Volume I Section 2 *Proposed Project* (pages 2-1 to 2-114) is consistent with CEQA Guidelines section 15124 regarding the requirements for a project description.

Consistent with CEQA Guidelines section 15378, the whole of the Klamath River Renewal Corporation's proposed action is analyzed in the EIR, which includes operation of the hatchery for eight years following the decommissioning of Iron Gate Dam, as discussed in Volume I Section 2.7.6 *Proposed Project – Proposed Project – Hatchery Operations* (pages 2-77 to 2-84).

Comment ORG34-5
While the DEIR provides some information regarding proposed hatchery operations, the information is incomplete and at times confusing. To begin, it is unclear the role the hatchery operations are playing with respect to the decommissioning Project. The DEIR reveals that the hatchery operations were initially incorporated as mitigation for dam's blockage of fish passage and habitat. DEIR at 3-247. While hatchery operations may have been adopted for such a mitigation purpose while the dams were in place, those purposes no longer exist

when the dams are removed and, as the DEIR recognizes, the hatchery operations can work at cross-purposes to re-establishing a long-term viable native fish population. See, e.g., DEIR at 4-304, 4-305 ("Negative hatchery effects due to competition, leading to displacement and lower growth, are well documented."), 4-307 ("[H]atchery returning adults can have substantial detrimental effects on native populations. As such, a reduction in hatchery returns … would be a benefit for fall-run Chinook salmon over the long term."). Thus, the hatchery operations do not appear to meet any of the current Project objectives, and in fact would likely hinder most of those objectives, which are to:

1. Improve the long-term water quality conditions associated with the Lower Klamath Project in the California reaches of the Klamath River, including water quality impairments due to Microcystis aeruginosa and associated toxins, water temperature, and levels of biostimulatory nutrients.

2. Advance the long-term restoration of the natural fish populations in the Klamath Basin, with particular emphasis on restoring the salmonid fisheries used for subsistence, commerce, tribal cultural purposes, and recreation.

3. Restore volitional anadromous fish passage in the Klamath Basin to viable habitat currently made inaccessible by the Lower Klamath Project dams.

4. Ameliorate conditions underlying high disease rates among Klamath River salmonids.

Response to Comment ORG34-5

Consistent with CEQA Guidelines section 15378, the EIR analyzes the whole of the proposed action, and the proposal's ability to meet the project objectives. Considering whether the hatchery operations in isolation from other components of the Proposed Project meet the project objectives is using the incorrect scale for the evaluation. However, it is worth noting that the EIR Executive Summary evaluates the ability of both the Proposed Project and the No Hatchery Alternative to meet the proposed project objectives.

The EIR appropriately summarizes the information provided regarding the hatchery operations component of the Proposed Project.

Comment ORG34-6

The DEIR alludes to the hatchery operations as on-going mitigation, but largely addresses them as part of the proposed Project. The DEIR should clarify whether hatchery operations are intended as on-going mitigation and, if so, which Project impacts the hatchery operations are intended to mitigate. Because, as discussed further below, hatchery operations result in potentially significant impacts in many areas including water quality, aquatic resources, and tribal cultural resources, they are not appropriate mitigation. Alternatively, if the hatchery operations are considered part of the proposed Project, the DEIR

should clarify which Project purpose or objective they fulfill, as the record shows hatcheries do not further any of the listed Project objectives.

Furthermore, the DEIR lacks necessary detail regarding the hatchery operations themselves. For example, the DEIR states, "[i]t is currently unclear whether the Iron Gate Hatchery facility would be decommissioned in place, demolished, or partly or fully repurposed after the eight-year operational period." DEIR at 2-78. The same uncertainty is identified for the facilities at the Fall Creek Hatchery. DEIR at 2-82. Each of these potential outcomes would result in differing and potentially significant environmental impacts. Therefore, the DEIR should be clear as to what will happen to the hatchery facilities at the end of the eight year period, and what the decommissioning, demolition, or repurposing would entail. Given that the hatchery operations are proposed to continue only for eight years after decommissioning (DEIR at 2-77 to 2-78), there is no reason that the ultimate outcome could not be identified now. Moreover, given the identified significant impacts of hatchery operations, should hatchery operations for any reason not cease after eight years, as analyzed in the DEIR, the State Board and/or other responsible agencies would need to conduct further environmental review and could no longer rely on the EIR's analysis. See Public Resources Code § 21166.

Likewise, the DEIR lacks detail about the location, construction, and operation of hatchery operation facilities, including the diversion, pumps, filtration system, and spawning building for Iron Gate Hatchery, and all the Fall Creek powerhouse and hatchery infrastructure. See DEIR at 2-78 to 2-83. Instead, the DEIR gives only approximations and/or guesses as to these components, and also as to the procedures to be followed if there is not enough surface water to divert for hatchery operations. Additional detail is necessary for an accurate analysis of the facilities' environmental impacts, including to water supply, aquatic resources, and tribal cultural properties that exist in and around the Project area.
The EIR should be revised to provide these necessary details so that the public and decision-makers can adequately assess the Project's impacts.

Response to Comment ORG34-6
The EIR does not allude to hatchery operations as ongoing CEQA mitigation for the Proposed Project or the alternatives. As part of the existing conditions description, Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Fish Hatcheries* states that Fall Creek Hatchery (FCH) was built in 1919 by the California Oregon Power Company in Fall Creek as compensation for the loss of spawning grounds that occurred with the construction of Copco No. 1 Dam and Iron Gate Hatchery was originally constructed in 1962 as mitigation for blockage of fish passage caused by the construction of Iron Gate Dam. The Proposed Project is a restoration project that removes the dams and includes eight years of reduced-level hatchery operations. Please refer to Volume III Attachment 1 for the final

Section 3.3 *Aquatic Resources*. Please also refer to response to comment ORG34-5.

With respect to the potential for future hatchery operations beyond eight years following dam decommissioning, the demolishing of hatchery structures, or the decommissioning of the hatchery in place, the EIR is not required to speculate (CEQA Guidelines section 15145). There is currently no proposal to operate the hatcheries beyond eight years, and there are technical and financial impediments to doing so. However, the Klamath Hydroelectric Settlement Agreement (KHSA) anticipates making a determination regarding hatchery operations after dam removal; the Fall Creek facilities are intended to operate primarily as a conservation hatchery for threatened coho salmon; and stakeholders have expressed concern with hatchery closure. The rate of fisheries recolonization would likely also play a role in any decision whether to extend hatchery operations, remove facilities permanently, or to decommission facilities in place. Therefore, it would be speculative for the EIR to assume that any of these outcomes would occur. To the extent that the long-term disposition of the hatcheries involves activities not analyzed in this EIR, such actions would be subject to separate environmental review.

The detail provided in the EIR regarding the hatchery components of the Proposed Project are provided in sufficient detail to analyze the potential environmental impacts of the proposed changes to hatchery operations, as required under CEQA. Please find assessments of the noted potential hatchery impacts in the following sections:

- Volume III Attachment Section 3.2.5.8 *Water Quality – Potential Impacts and Mitigation – General Water Quality* Potential Impact 3.2-17;
- Volume III Attachment 1 Section 3.3.5.6 *Aquatic Resources – Potential Impacts and Mitigation – Fish Hatcheries;*
- Volume III Attachment 1 Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-7 through Potential Impact 3.3-10, Potential Impact 3.3-23, and Potential Impact 3.3-24;
- Volume I Section 3.5.5 *Terrestrial Resources – Potential Impacts and Mitigation* Potential Impact 3.5-25 through Potential Impact 3.5-27 (pages 4-314 to 3-574);
- Volume I Section 3.8.5 *Water Supply/Water Rights – Potential Impacts and Mitigation* Potential Impact 3.8-1 (pages 3-676 to 3.679), with revisions in Volume III Attachment 1 Section 3.8.5 *Water Supply/Water Rights – Potential Impacts and Mitigation*; and
- Volume III Attachment 1 Section 3.12 *Historical Resources and Tribal Cultural Resources – Potential Impacts and Mitigation* Potential Impact 3.12-9.

Comment ORG34-7

An EIR's central purposes are to identify a project's significant environmental effects and to evaluate ways of avoiding or minimizing them. Public Resources Code §§ 21002.1(a), 21061. Thus, the alternatives analysis lies at "[t]he core of an EIR." Citizens of Goleta Valley v. County of Santa Barbara (1990) 52 Cal.3d 553, 564; CEQA Guidelines § 15126.6. As the Supreme Court has explained, "Without meaningful analysis of alternatives in the EIR, neither the courts nor the public can fulfill their proper roles in the CEQA process." Laurel Heights Improvement Assn. v. Regents of University of California (1988) 47 Cal.3d 376, 404 (Laurel Heights I). Furthermore and critically, CEQA prohibits public agencies from approving projects as proposed if a feasible alternative would substantially lessen their significant environmental effects. Berkeley Keep Jets Over the Bay Committee v. Board of Port Com'rs (2001) 91 Cal.App.4th 1344, 1354 (quoting Public Resources Code § 21002).

Response to Comment ORG34-7

Lower Klamath Project EIR presents a range of reasonable alternatives to the Proposed Project. Volume I Section 4.1 *Alternatives Selection/Overview* (pages 4-1 to 4-15) discusses 17 potential alternatives in relation to the Proposed Project's underlying purpose and objectives, six of which are examined in detail. Of these six alternatives, two involve removal of all four Lower Klamath Project dams, and four involve two or three dams remaining in place. Potential impacts and beneficial effects are identified for each of these alternatives in the EIR and each will be fully considered by the State Water Board before certifying the EIR (CEQA Guidelines section 15090).

Comment ORG34-8

Here, the DEIR's alternatives analysis properly includes a "No Hatchery Alternative," which is the proposed Project without the eight years of hatchery operations at Iron Gate Hatchery and Fall Creek Hatchery, and would include the removal of the Iron Gate Hatchery. Further, the DEIR properly concludes that the No Hatchery Alternative is feasible and meets Project purposes and objectives. See DEIR at 4-2.

However, the DEIR includes some equivocal language, which should be corrected. In the Executive Summary, the DEIR states:

> *The No Hatchery Alternative would further the underlying purpose and objectives, although the alternative would not meet Objective 2 (to advance the long-term restoration of the natural fish population in the Klamath Basin, with particular emphasis on restoring the salmonid fisheries used for subsistence, commerce, tribal cultural purposes, and recreation) as quickly as under the Proposed Project.*

DEIR at ES-20 (emphasis added); see also DEIR at 4-6 ("The [No Hatchery] alternative would further the underlying purpose and most of the project

objectives, although it is not clear at a screening level the extent to which the alternative would meet Objective 2."). *However, elsewhere the DEIR clearly states that the No Hatchery Alternative would be more beneficial and quicker than the proposed Project in achieving long-term survival and recovery of native fish species. See, e.g., DEIR at 4-304 to 4-311, 4-319; see also Native Fish Society et al., July 23, 2018 Comments on Project Scoping Document. For example, the DEIR states that the No Hatchery Alternative "would likely increase the rate at which Chinook salmon develop traits adapted to their new habitats upstream of Iron Gate Dam (Goodman et al. 2011). This could increase survival of natural-origin Chinook salmon at a faster rate than with continued hatchery operations under the Proposed Project." DEIR at 4-307 (emphasis added). Likewise, the DEIR states "ending hatchery operations as part of dam removal may result in a more rapid increase in the adult coho salmon population as compared with the Proposed Project." DEIR at 4-311 (emphasis added). Indeed, a scientific paper reviewing the most recent science from NOAA/ National Marine Fisheries Service regarding hatcheries found that there are "no clear-cut examples in which a reintroduction employing hatchery releases yielded a self-sustaining naturalized population." Anderson et al. (2014), "Planning Pacific Salmon and Steelhead Reintroductions Aimed at Long-Term Viability and Recovery," North American Journal of Fisheries Management 34:72–93, at p. 85. Thus, the No Hatchery Alternative clearly meets Objective 2, and would be superior to the proposed Project with respect to this Objective. The DEIR should be amended to reflect this fact.*[1]

Response to Comment ORG34-8

The statement cited in the comment from Volume I *Executive Summary* page ES-20 appears to be the commenters' core concern. This statement is a summary-level comparison of the difference between the Proposed Project and the No Hatchery Alternative in the anticipated long-term timeframe for achieving Objective 2 of the Proposed Project - successful restoration of natural fish populations, with a particular emphasis on restoring the salmonid fisheries. Please also refer to Master Response AQF-2 and the response to comment ORG42-16.

Please note that the sentence on page 4-6 that is referenced in the comment is from Volume I Section 4.1.1.1 *[Alternatives Selection/Overview] Alternatives Selection – Alternatives Carried Forward for More Detailed Analysis*, which provides the rationale for the alternatives that were selected for further analysis in the EIR. It is a preliminary, not a post-analysis, conclusion regarding feasibility and the ability of the alternatives to meet the Proposed Project's purpose and objectives; the EIR then goes on to analyze the alternative in detail in Volume I Section 4.7 *No Hatchery Alternative* (pages 4-301 to 4-323).

Volume I Section 4.7 *No Hatchery Alternative* (pages 4-301 to 4-323) includes a detailed analysis of the No Hatchery Alternative, and finds no significant impacts on aquatic resources.

Fisheries experts note both positive and negative impacts of hatcheries on fisheries, including with in the Klamath River Basin. For example, the Chinook Salmon Expert Panel convened to attempt to answer specific questions related to the Proposed Project compared with existing conditions (Goodman et al. 2011), noted that hatchery production under the Proposed Project has impacts related to disease and competition and natural spawning fish, as well as the beneficial effect of increased abundance for commercial and tribal harvest. Similarly, PacifiCorp and CDFW (2014) evaluates positive and negative hatchery impacts for coho salmon in the Klamath River. Consistent with these analysis, the analysis in the EIR discloses both positive and negative influences of hatchery operations on various salmonid populations and their anticipated recolonization rates. The elimination of hatchery produced fall-run Chinook salmon and coho salmon under this alternative would likely result in a reduction in adult returns post-dam removal for an indeterminate period of perhaps one to five years (i.e., short-term), before the benefits of dam removal are realized. In contrast, under the Proposed Project, both hatchery returns and returns from newly accessible habitat would occur in the short-term, increasing the abundance of total adult returns (natural and hatchery origin) available for harvest and recolonization. Ultimately, the combined salmon population under the Proposed Project is anticipated to increase the rate of recolonization of fall-run Chinook salmon and coho salmon into newly accessible habitat, providing increased resiliency to unforeseen environmental disturbance or other threats to the populations, and more rapid realization of the other benefits of increased habitat access to these populations (e.g., hatchery operations under the Proposed Project would increase population abundance relative to the No Hatchery Alternative).

For spring-run Chinook salmon, the EIR analysis of the No Hatchery Alternative notes that since spring-run are not currently produced at a hatchery, the hatchery only has impacts on the population, without benefits. The Proposed Project does not include an active reintroduction plan for spring-run Chinook salmon. Please note that Oregon Department of Fish and Wildlife (ODFW) has drafted an *Implementation Plan for the Reintroduction of Anadromous Fishes into the Oregon Portions of the Upper Klamath Basin* (T. Wise, ODFW, pers. comm., 2018). ODFW's draft plan includes active reintroduction of spring-run Chinook salmon into tributaries of the Upper Klamath Lake (T. Wise, ODFW, pers. comm., 2019). The EIR does not rely on implementation of this plan, because its timing, funding and implementation are too preliminary and uncertain. However, should it be implemented, it is anticipated that it would accelerate spring-run Chinook salmon recolonization.

The commenter cites Anderson et al. (2014) to state that "there are no clear-cut examples in which a reintroduction employing hatchery releases yielded a self-sustaining naturalized population." However, the examples cited in Anderson et al. (2014) are mostly reintroduction programs for Atlantic salmon, and they are all programs in which hatchery releases within formally inaccessible habitat were

the sole mechanism of reintroduction. In contrast, under the Proposed Project hatchery production would be continued for only eight years, dam removal would remove passage barriers, and the primary mechanism of reintroduction would be "natural colonization" (highlighted by Anderson et al. 2014) from salmon (including naturalized and hatchery strays) volitionally accessing former habitat. Examples of hatchery production contributing to successful reintroduction in conjunction with volitional passage include the White Salmon River, Washington, following removal of Condit Dam (Allen et al. 2016), and the Elwha River, Washington, following removal of Elwha Dam and Glines Canyon Dam (Weinheimer et al. 2018).

In addition, as described in Volume I Section 4.7.12 *Alternatives – No Hatchery Alternative – Historical Resources and Tribal Cultural Resources* (pages 4-318 to 4-319), in the short-term the No Hatchery Alternative would reduce the amount of fall-run Chinook and coho salmon present for California Native American tribes that currently use salmon in their diet and consider salmon to be an important part of their culture. This potential short-term impact to the fishery would be greater under the No Hatchery Alternative than under the Proposed Project, because under the Proposed Project the hatcheries would continue to supplement natural adult returns (albeit at a reduced rate of production) until after seven generations or cohorts of fish have been hatched with the benefit from expanded habitat and improved water quality conditions. The short-term reduction in the fishery due to elimination of hatchery-produced fall-run Chinook and coho salmon under the No Hatchery Alternative would represent a material impairment of the Klamath Riverscape as a resource and a substantial restriction of tribal access to the fishery relative to existing conditions. As stated in Volume I *Executive Summary* (page ES-20) the No Hatchery Alternative would not meet Proposed Project Objective 2 (In a timely manner, to advance the long-term restoration of the natural fish population in the Klamath Basin, with particular emphasis on restoring the salmonid fisheries used for subsistence, commerce, tribal cultural purposes, and recreation) as quickly as under the Proposed Project.

The Executive Summary has been revised to clarify how the EIR analysis considers the short-term reduction in the fishery due to elimination of hatchery-produced fall-run Chinook and coho salmon under the No Hatchery Alternative relative to existing conditions. Please refer to Volume III Attachment 1 Executive Summary for the revisions.

As stated in Volume I *Executive Summary* (page ES-24), in identifying the environmentally superior alternative for the Lower Klamath Project EIR, it makes sense to evaluate the degree of restoration benefit that the alternatives provide above the current degraded basin condition, as well as the duration and severity of negative impacts, in the context of a project that is intended to provide timely improvement of water quality and the restoration of anadromous fish access upstream of Iron Gate Dam. In looking at the range of benefits and impacts the

State Water Board has identified the Proposed Project as the environmentally superior alternative.

Comment ORG34-9

As set forth more fully below, the DEIR properly reveals that the No Hatchery Alternative would reduce the Project's significant impacts. As discussed below, the No Hatchery Alternative would likely reduce the Project's impacts even further than analyzed in the DEIR. However, even based on the DEIR's analysis alone, it is clear that, because the No Hatchery Alternative is a feasible alternative that would substantially lessen the Project's significant impacts, the State Board cannot approve the Project as proposed and should instead consider and approve the No Hatchery Alternative.

The table below summarizes the DEIR's comparison of environmental impacts between the No Hatchery Alternative and the proposed Project with continued hatchery operations at Iron Gate and the start up of hatchery operations at Fall Creek. As shown, the No Hatchery Alternative reduces or eliminates the Project's significant impacts in numerous impact categories, including water quality, aquatic resources, phytoplankton and periphyton, terrestrial resources, air quality, greenhouse gas (GHG) emissions, tribal cultural resources, aesthetics, recreation, traffic, and noise. Except for one short-term impact discussed below, the No Hatchery Alternative produces the same impacts as the proposed Project in all other impact categories, thereby rendering the No Hatchery Alternative an environmentally superior alternative overall.

Summary of the DEIR's Reported Environmental Impacts of the Project (with Hatchery Operations) as Compared with the No Hatchery Alternative ("NHA")

Environmental Impact	***Impact Comparison***
Water Quality	*The NHA would reduce impacts relative to the Proposed Project, as it would eliminate effluent discharges from Iron Gate Hatchery.* The NHA would eliminate a significant and unavoidable impact of the proposed Project for water temperature and dissolved oxygen in Fall Creek downstream of the proposed Fall Creek Hatchery (Impact 3.2-17). DEIR at 3-171, 4-304.*
Aquatic Resources	*The NHA would reduce impacts to aquatic resources by eliminating a source of the spread of fish disease, removing well-documented competitive pressure between hatchery-derived and natural origin fish, reducing straying, and increasing the sustainability of natural spawning fish populations. The NHA would also eliminate any potential impacts to aquatic resources from diversions from Bogus Creek and Fall*

Environmental Impact	***Impact Comparison***
	Creek necessary for hatchery operations. DEIR at 4-304 to 4-313.
Phytoplankton and Periphyton	*The NHA would reduce impacts to phytoplankton and periphyton conditions relative to the Proposed Project, as it would cease nutrient discharges from Iron Gate Hatchery and would not start discharges from Fall Creek hatchery.* DEIR at 4-313.*
Terrestrial Resources	*Same. Any short term loss of hatchery fish under the NHA could be offset by alternative food sources and would not significantly impact wildlife; long-term benefits of the NHA "would result in an increased prey base and would be beneficial" to terrestrial resources. DEIR at 4-315 to 4-316.*
Flood Hydrology	*Same*
Groundwater	*Same**
Water Supply/Water Rights	*Same*
Air Quality	*"[U]nder the No Hatchery Alternative, operational emissions from the hatcheries would be lower (zero) than those under existing conditions," and would eliminate proposed operational emissions.* DEIR at 4-317 (emphasis added).*
Greenhouse Gas Emissions	*Same regarding construction impacts; for operational impacts the NHA emissions would be lower (zero) than the proposed Project/ existing conditions.* DEIR at 4-318.*
Geology, Soils, and Mineral Resources	*Same*
Historical Resources and Tribal Cultural Resources	*The NHA would (1) be beneficial relative to the proposed Project by returning the Iron Gate Hatchery to more natural conditions in the short term (2) eliminate potential significant impacts to tribal cultural resources from construction of Fall Creek Hatchery (Impact 3.12-1), (3) result in a short term reduction in the fishery and substantial short-term restriction of tribal access to the fishery relative to existing conditions,* and (4) would result in an increase in an availability of salmon species for tribes and thus beneficial in the long-term. DEIR at 4-318 to 4-319.*
Paleontological Resources	*Same*
Land Use and Planning	*Same*

Environmental Impact	***Impact Comparison***
Agriculture and Forestry Resources	*Same*
Population and Housing	*Same**
Public Services	*Same*
Utilities and Service Systems	*Same*
Aesthetics	*The NHA is beneficial relative to the Proposed Project, as it would return/keep areas to/in natural conditions. DEIR at 4-321.*
Recreation	*Same. Any short term loss of hatchery fish under the NHA would not significantly impact recreational opportunities; the NHA would result in "long-term beneficial effects on the scenic quality, recreation, fisheries and wildlife of the California Klamath River wild and scenic river segment." DEIR at 4-322.*
Hazards and Hazardous Materials	*Same**
Transportation and Traffic	*The NHA would result in reduced traffic compared with the proposed Project because there would be no traffic from construction at Fall Creek or hatchery operations. DEIR at 4-323.*
Noise	*The NHA would result in reduced noise compared with the proposed Project because there would be no noise from construction at Fall Creek or hatchery operations. DEIR at 4-323.*

DEIR 4-301 to 4-323.

**As explained below, the DEIR likely understates the benefits of the NHA as compared to the proposed Project and/or overstates any short-term impacts of the NHA.*

Response to Comment ORG34-9

Contrary to the assertion in the comment, the EIR does not determine that the No Hatchery Alternative would substantially lessen the potential impacts of the Proposed Project. The significant impacts of a project and feasible alternatives under CEQA are determined by comparison to the existing condition. The comment's comparison of the No Hatchery Alternative to the Proposed Project, on the other hand, primarily includes assertions that the No Hatchery Alternative would result in greater improvements from the existing condition than the Proposed Project, not that it would reduce negative impacts of the Proposed Project. As discussed in Volume I Section 4.7.2 *Alternatives –No Hatchery Alternative – Water Quality* (pages 4-304 to 4-305) the No Hatchery Alternative

would eliminate potential less-than-significant variations in water quality (i.e., water temperature, suspended material, nutrients, biochemical oxygen demand, and inorganic and organic contaminants [water treatment chemicals]), from Iron Gate Hatchery during the eight years following dam removal, where these variations are part of the existing condition (CEQA baseline). The continuation of these less than significant water quality variations for eight years under the Proposed Project is not a reduction in an environmental impact relative to the Proposed Project, as asserted by the comment, because the Proposed Project does not cause an impact compared to existing conditions. The EIR discloses that the potential significant and unavoidable impacts to water quality (water temperature and dissolved oxygen) in Fall Creek and the Klamath River that would occur for eight years following dam removal under the Proposed Project would not occur under the No Hatchery Alternative (Volume I Section 4.7.2 *Alternatives – No Hatchery Alternative – Water Quality* [pages 4-304 to 4-305]).

With respect to the comment's assertions regarding fish disease, competitive pressure, and potential straying, please refer to response to comment ORG34-8. Regarding the comment's assertion that the No Hatchery Alternative would eliminate any potential impacts to aquatic resources from diversions from Bogus Creek and Fall Creek necessary for hatchery operations, as described in Volume I Section 4.7.3 *Alternatives – No Hatchery Alternative – Aquatic Resources* [pages 4-305 to 4-313]), please note that the No Hatchery alternative would result in no change relative to existing conditions. Further, please note that under the Proposed Project there would be no significant impact with mitigation on anadromous salmonid populations due to short-term and long-term Bogus Creek flow diversions for the Iron Gate Hatchery (Section 3.3.5 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-23), and there would be no significant impact on anadromous salmonid populations due to short-term and long-term Fall Creek flow diversions for the Fall Creek Hatchery (FCH) (Potential Impact 3.3-24). Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Regarding phytoplankton and periphyton conditions, as discussed in Volume I Section 4.7.4 *Alternatives – No Hatchery Alternative – Phytoplankton and Periphyton* (pages 4-313 to 4-314) the No Hatchery Alternative would eliminate potential less-than-significant discharges of nutrients from Iron Gate Hatchery during the eight years following dam removal, where these discharges are part of the existing condition (CEQA baseline). The continuation of these less than significant discharges for eight years under the Proposed Project is not a reduction in an environmental impact relative to the Proposed Project, as asserted by the comment, because there is no impact under existing conditions. As stated in the EIR, decreases in hatchery nutrient releases would not necessarily result in a beneficial effect on phytoplankton or periphyton conditions downstream of the hatchery discharge. The EIR discloses that the potential significant and unavoidable impacts to water quality (water temperature and

dissolved oxygen) in Fall Creek and the Klamath River that would occur for eight years following dam removal under the Proposed Project would not occur under the No Hatchery Alternative (Volume I Section 4.7.2 *Alternatives – No Hatchery Alternative – Water Quality* [pages 4-304 to 4-305]).

With respect to reduced operational air quality, greenhouse gas emissions, and energy under the No Hatchery Alternative, because existing conditions are the baseline against which impacts are measured, the current operational emissions are not significant CEQA impacts (please also refer to *Recirculated Portions of the Draft EIR* Section 4.7.9 *Air Quality* [page RE-4-22]).

Because the Lower Klamath Project dams and associated facilities would be removed in the same manner under the No Hatchery Alternative as the Proposed Project, potential construction-related impacts and associated mitigation measures under the No Hatchery Alternative are generally the same as those described for the Proposed Project, except for the differences discussed in Volume I Section 4.7 *Alternatives – No Hatchery Alternative* (pages 4-301 to 4-323). Where the comment notes that the No Hatchery Alternative would reduce short-term construction-related impacts associated with the Proposed Project (i.e., air quality, greenhouse gas emissions, energy, historical resources and tribal cultural resources, transportation and traffic, noise), please note that the significant impacts of a project and feasible alternatives under CEQA are determined by comparison to the existing condition.

The comment notes that the No Hatchery Alternative would have the same impacts as the Proposed Project (i.e., terrestrial resources, flood hydrology, groundwater, water supply/water rights, geology/soils, and mineral resources, paleontological resources, land use and planning, agriculture and forestry resources, population and housing, public services, utilities and service systems, recreation, and hazards and hazardous materials). Comment noted.

Where the comment notes that the No Hatchery Alternative is beneficial relative to the Proposed Project because it would result in more natural aesthetic conditions, please note that Section 3.19.3 *Aesthetics – Significance Criteria*, Section 3.19.4 *Aesthetics – Impact Analysis Approach*, and Section 4.7.19 *Alternatives – No Hatchery Alternative – Aesthetics* have been revised to clarify the baseline used for the EIR aesthetic resources analysis. In Section 3.19.3 *Aesthetics – Significance Criteria* the first significance criterion has been modified to remove the objectives associated with the Class III Visual Resource Management (VRM) designation and to more clearly identify how a shift in VRM classification relative to the baseline (i.e., existing conditions) is treated in the analysis. The modified criterion also explicitly acknowledges how the analysis was applied in areas where the VRM analysis was not conducted. Additionally, Section 3.19.4 *Aesthetics – Impact Analysis Approach* and Section 4.7.2 *Alternatives – No Hatchery Alternative – Aesthetics* have been revised to align with the clarified significance criteria and to remove any reference to natural

conditions, since this is not the CEQA baseline. Please refer to Volume III Attachment 1 Section 3.19.3 *Aesthetics – Significance Criteria*, Section 3.19.4 *Aesthetics – Impact Analysis Approach*, and Section 4.7.2 *Alternatives – No Hatchery Alternative – Aesthetics* for the revisions. For additional discussion of the aesthetics baseline, please refer to responses to comments ORG46-321, ORG46-323, ORG46-324, ORG46-325, ORG46-330, and ORG46-331.

The potential significant and unavoidable impacts to water quality (water temperature and dissolved oxygen) in Fall Creek and potentially the Klamath River would not occur under the No Hatchery Alternative, whereas these impacts would occur for eight years following dam removal under the Proposed Project. However, note that the elimination of hatchery produced fall-run Chinook salmon under the No Hatchery Alternative would delay the attainment of one of the Project Objectives, namely the timely restoration of the natural fish populations in the Klamath Basin, with particular emphasis on restoring the salmonid fisheries used for subsistence, commerce, tribal cultural purposes, and recreation. As discussed in Volume I Section 4.7.12 *Alternatives – No Hatchery Alternative – Historical Resources and Tribal Cultural Resources*, elimination of hatchery produced fall-run Chinook salmon under the No Hatchery Alternative would likely result in a reduction (averaging 35 percent, potentially ranging from 19 to 50 percent based on existing conditions) in adult returns in the fall beginning in post-dam removal year 3 and continuing for an indeterminate period of perhaps one to five years (i.e., short-term), before the benefits of dam removal are realized (please also refer to Volume I Section 4.7.3 *Alternatives – No Hatchery Alternative – Aquatic Resources*, Potential Impact 3.3-7). The elimination of hatchery produced coho salmon would likely result in a reduction in adult returns for a period of one to five years before the benefits of dam removal are realized (please also refer to Volume I Section 4.7.3 *Alternatives – No Hatchery Alternative – Aquatic Resources* Potential Impact 3.3-9). This potential impact to the fishery would be greater under the No Hatchery Alternative than under the Proposed Project, because under the Proposed Project the hatcheries would continue to supplement natural adult returns (albeit at a reduced rate of production) until after seven generations or cohorts of fish have been hatched with the benefit from expanded habitat and improved water quality conditions. The short term reduction in the fishery due to elimination of hatchery-produced fall-run Chinook and coho salmon under the No Hatchery Alternative would represent a material impairment of the Klamath Riverscape as a resource and a substantial restriction of tribal access to the fishery relative to existing conditions. A lack of access to native food sources, including an inability to get salmon due to poor river condition, is primary among the reasons that Klamath Basin Native community food assistance users report a reliance on food assistance, with 70 percent of all surveyed households reporting that they rarely or never have access to their desired foods including salmon (Sowerwine et al. 2019). The potential for the reduction in fish available for tribal harvest results in a potentially significant short-term impact on the Klamath Riverscape as a tribal cultural resource (Potential Impact 3.12-9).

As described in Potential Impact 3.2-17, the temporary exceedances of the water quality standards for temperature at Fall Creek Hatchery are expected to be small (-0.5 – 2.2° F) and to occur intermittently, rather than constantly. Any temporary exceedances of the dissolved oxygen standards resulting from Fall Creek Hatchery are expected to be infrequent under the Proposed Project.

In this instance, in light of the objectives of the Proposed Project, and the degree of harm from the different significant impacts, the significant impact to the tribal fishery as a contributing factor to the Klamath Riverscape is of greater relative weight than the significant impact to water quality. Thus, while both alternatives would confer significant environmental benefits, the Proposed Project is the environmentally superior alternative.

Comment ORG34-10

The benefits of the No Hatchery Alternative are likely even greater than revealed in the DEIR (and as summarized above). This is because the DEIR does not quantify many of the impacts of the existing hatchery operations, which would be eliminated under the No Hatchery Alternative. For example, the DEIR concludes that Iron Gate's hatchery discharges under existing conditions have a less than significant impact on water quality and phytoplankton and periphyton conditions, but does not quantify the relevant factors. DEIR at 4-304, 4-313. Elsewhere, the DEIR admits that "Iron Gate Hatchery currently exceeds its TMDL allocation of zero net discharge of nitrogen, phosphorous and biological oxygen demand" (DEIR at 3-164), but does not specify by how much. According to the State Board's Investigative Order R1-2017-0051, "Review of current hatchery sampling data shows that the Facility discharges approximately 2,500 lbs of nitrogen per year, 500 lbs of phosphorus per year and 14,000 lbs of organic matter per year measured as Biochemical Oxygen Demand (BOD). This represents 0.03% of the overall loading of nitrogen and phosphorus and 0.02% of the overall loading of organic matter to the Klamath River every year." Available at https://www.waterboards.ca.gov/northcoast/board_decisions/adopted_orders/pdf/2017/17 _0051_IronGate_13267.pdf.

Likewise, the DEIR fails to recognize that hatcheries use a substantial amount of formalin and other chemicals in hatchery operations. Thus, by eliminating hatchery operations, the No Hatchery Alternative would result in reduced impacts from hazards and hazardous materials. "The chemicals and aquaculture drugs the Facility uses, or can use, for the treatment and control of disease include oxytetracycline, florfenicol, formalin, providine-iodine complex, hydrogen peroxide, potassium permanganate, and sodium chloride. Chemicals and aquaculture drugs used for anesthesia include MS-222/Finquel, and carbon dioxide." Id.

The DEIR also fails to quantify operational GHG or other air pollutant emissions from Iron Gate Hatchery. DEIR at 4-317 to 4-318. Further, the DEIR fails to

analyze the relationship of water diversions for hatchery operations to groundwater levels (DEIR at 4-316) and fails to recognize population and housing impacts that may stem from operating the two hatcheries for eight additional years (DEIR at 4-320).

The DEIR should be augmented to include this additional information. Were the DEIR to fully detail the impacts of current and proposed hatchery operations, the benefits of the No Hatchery Alternative would undoubtedly be even more apparent. However, even the analysis the DEIR now contains demonstrates the environmental superiority of the No Hatchery Alternative.

Response to Comment ORG34-10

The comment cites Volume I Section 4.7.2 *Alternatives – No Hatchery Alternative – Water Quality* (page 4-304) and Section 4.7.4 *Alternatives – No Hatchery Alternative – Phytoplankton and Periphyton* (page 4-313), which present the analysis of potential water quality and periphyton/phytoplankton impacts under the No Hatchery Alternative. The existing condition (CEQA baseline) for these environmental parameters for the current hatchery discharges is described in Section 3.2.5.8 *Water Quality – Potential Impacts and Mitigation – General Water Quality* Potential Impact 3.2-17. Because existing conditions are the baseline against which impacts are measured, the current operation is not a significant CEQA impact.

Section 3.2.5.8 *Water Quality – Potential Impacts and Mitigation – General Water Quality* Potential Impact 3.2-17 has been revised to provide additional information about Iron Gate Hatchery's current operations, including specification of the total nitrogen, total phosphorus, and organic matter discharges from Iron Gate Hatchery; the specific chemicals and aquaculture drugs used at Iron Gate Hatchery; and the existing requirements for the hatchery to ensure that chemicals are properly stored and disposed of and that any accidentally spilled materials are contained, cleaned, and disposed of properly. Please refer to Volume III Attachment 1 Section 3.2.5.8 *Water Quality – Potential Impacts and Mitigation – General Water Quality* Potential Impact 3.2-17 for the revisions. Additionally, *Section 3.21 Hazards and Hazardous Materials* has been revised to add a reference to Potential Impact 3.2-17. Please refer to Volume III Attachment 1 *Section 3.21 Hazards and Hazardous Materials* for this revision.

Section 4.7.4 *Alternatives – No Hatchery Alternative – Phytoplankton and Periphyton* has been revised to add a reference to Potential Impact 3.2-17. Please refer to Volume III Attachment 1 Section 4.7.4 *Alternatives – No Hatchery Alternative – Phytoplankton and Periphyton* for this revision.

With respect to the comment's concern about GHGs, this topic pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (Greenhouse Gas Emissions and Energy).

Section 4.7.7 *Alternatives – No Hatchery Alternative – Groundwater* has been revised to clarify that the proposed surface water diversions for the hatcheries under the Proposed Project are non-consumptive and the points of diversion and points of return are not located near any groundwater wells (i.e., the point of diversion and point of return for Fall Creek Hatchery (FCH) would be located along Fall Creek between Iron Gate Reservoir and Fall Creek Dam, as shown in Volume I Section 3.7 *Groundwater – Environmental Setting – Local Groundwater Conditions*, Figure 3.7-9 [page 3-655], and the point of diversion and point of return for Iron Gate Hatchery would be located along Bogus Creek near the confluence with the Klamath River as shown in Volume I Section 3.7 *Groundwater – Environmental Setting – Local Groundwater Conditions*, Figure 3.7-10 [page 3-655]). Please refer to Volume III Attachment 1 Section 4.7.7 *Alternatives – No Hatchery Alternative – Groundwater* for the revisions.

Section 4.7.16 *Alternatives – No Hatchery Alternative – Population and Housing* has been revised to clarify that eliminating the need for hatchery operational staff under this alternative would be inconsequential with respect to population and housing. Please refer to Volume III Attachment 1 Section 4.7.16 *Alternatives – No Hatchery Alternative – Population and Housing* for the revisions.

Comment ORG34-11

It also appears evident that the No Hatchery Alternative is feasible, which is defined by CEQA as "capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social, and technological factors." Guidelines § 15364. Because the Project calls for only eight years of hatchery operations, ceasing those operations upon decommissioning instead would not seem to pose any additional economic, legal, social, or technological impediments, and the DEIR does not reveal any. Indeed, hatchery operations can be costly and thus ceasing such operations sooner would have economic benefits.

Response to Comment ORG34-11

This comment asserts that the No Hatchery Alternative appears to be feasible under CEQA, and to have potential economic advantages in reduced hatchery construction costs. Comment noted. Please see Volume I Section 4.1 *Alternatives Selection/Overview* (page 4-1), Section 4.1.1 *Alternatives – Alternatives Selection* (pages 4-1 to 4-2), and Section 4.1.1.1 *Alternatives – Alternatives Selection – Alternatives Carried Forward for More Detailed Analysis – No Hatchery Alternative* (page 4-6) for the Draft EIR's preliminary assessment of the No Hatchery Alternative as a feasible alternative.

Comment ORG34-12

Further, as discussed, the No Hatchery Alternative is environmentally beneficial. The only potential negative impact the DEIR notes for the No Hatchery Alternative that would not be present with the proposed Project is a short-term loss of catch that could impair tribal access to the fishery relative to existing

conditions. DEIR at 4-319. However, this potential short-term impact should not render the alternative infeasible for at least two reasons. First, CEQA considers a project to have a significant environmental impact if it "achieve[s] short-term, to the disadvantage of long-term, environmental goals." Public Resources Code § 20183(b)(1). As discussed, the DEIR here makes clear that removing hatchery operations is superior to the proposed Project in achieving the long-term stability of the fishery. DEIR at 4-319; supra pp. 5-6. Thus, the State Board should not jettison an alternative that is clearly environmentally superior over the long-term due to one potential short-term impact. Second, it is not clear that the impact should be considered significant even in the short-term. The DEIR elsewhere finds that any short-term impacts from the loss of hatchery fish would be offset by improved conditions for native fish from hatchery removal, including less mortality from disease, less competition, less straying, and better adaptation. See, e.g., 4-304 to 4-313. The DEIR fails to explain why any short-term impacts would not similarly be offset for tribes accessing the fishery.

Response to Comment ORG34-12
Please refer to Master Response AQF-2 and response to comment ORG42-16.

Comment ORG34-13
In sum, the No Hatchery Alternative is clearly environmentally superior to the proposed Project, meets every Project objective, and is feasible. The State Board should therefore consider this Alternative for adoption. If for any reason the Board should determine that the No Hatchery Alternative is infeasible, the agency must explain the reasons for this determination in detailed findings, which must be both legally accurate and supported by substantial evidence. Public Resources Code §§ 21081(a)(3), 21081.5; CEQA Guidelines §§ 15091(a)(3), (b).

Response to Comment ORG34-13
This comment summarizes conclusion of preceding comments and interprets CEQA. Comment noted. Please also refer to response to Master Response AQF-2 and responses to comment ORG34-11 and ORG42-16.

Comment ORG34-14
If the agency determines and makes adequate legal findings that the No Hatchery Alternative is infeasible, it must also then consider any and all feasible mitigation measures to lessen or avoid the significant impacts stemming from the Project's proposed hatchery operations. For every mitigation measure evaluated, the agency must demonstrate either that the mitigation measure: (1) will be effective in reducing a significant environmental impact; or (2) is ineffective or infeasible due to specific legal or "economic, environmental, social and technological factors." Friends of Oroville v. City of Oroville (2013) 219 Cal.App.4th 832, 842-44; Public Resources Code §§ 21002, 21061.1; CEQA Guidelines §§ 15021(b), 15364.

Response to Comment ORG34-14
Comment noted. This comment interprets CEQA.

Comment ORG34-15
If an agency ultimately determines that mitigation proposed in the EIR is infeasible, it may decline to adopt the measure. However, in that event, as with alternatives to the Project, CEQA requires that the agency explain the reasons for this determination in detailed findings, which must be both legally accurate and supported by substantial evidence. Public Resources Code §§ 21081(a)(3), 21081.5; CEQA Guidelines §§ 15091(a)(3), (b); Village Laguna of Laguna Beach, Inc. v. Bd. of Supervisors (1982) 134 Cal.App.3d 1022, 1032-35. And if the project's impacts will remain significant even after mitigation, the agency must issue an additional statement of overriding considerations, also supported by substantial evidence, demonstrating that the project's benefits outweigh its effects. Public Resources Code § 21081(b); see CEQA Guidelines §§ 15091(f), 15093.

In additional to these procedural requirements, CEQA also has substantive "teeth." The lead agency must actually adopt any feasible mitigation that can substantially lessen the Project's significant environmental impacts. Public Resources Code § 21002; CEQA Guidelines § 15002(a)(3); City of Marina v. Board of Trustees of California State University (2006) 39 Cal.4th 341, 368-69. In addition, the agency must "ensure that feasible mitigation measures will actually be implemented as a condition of development, and not merely adopted and then neglected or disregarded." Federation of Hillside and Canyon Assns. v. City of Los Angeles (2000) 83 Cal.App.4th 1252, 1261 (italics omitted); CEQA Guidelines § 15126.4(a)(2).

An EIR generally may not defer evaluation of mitigation until a later date. Guidelines § 15126.4(a)(1)(B). Rather, an EIR must evaluate each mitigation proposal that is not "facially infeasible," even if such measures would not completely eliminate an impact or render it less than significant. Los Angeles Unified School Dist. v. City of Los Angeles (1997) 58 Cal.App.4th 1019, 1029-31 ("LA Unified").

Response to Comment ORG34-15
Comment noted. This comment interprets CEQA.

Comment ORG34-16
Here, the DEIR identifies several significant and unavoidable impacts from hatchery operations, including on water temperature and dissolved oxygen in Fall Creek downstream of Fall Creek Hatchery. See, e.g., DEIR at 3-171 (Impact 3.2-17). The DEIR claims that no feasible mitigation could be employed to reduce these impacts. Id. However, as demonstrated by the analysis of the No Hatchery Alternative, these impacts could be reduced or eliminated by either reducing or eliminating the hatchery operations. All feasible mitigation options in

this regard must be explored, including but not limited to (1) reducing operations at Iron Gate hatchery and declining to reopen Fall Creek Hatchery; and (2) operating hatcheries with solely a conservation focus. The Native Fish Society does not by this letter endorse any particular mitigation approach, but only reminds the State Board of its obligation under CEQA to consider and adopt all feasible mitigation to reduce or avoid the Project's significant impacts from hatchery operations.

Response to Comment ORG34-16

Section 3.2.5.8 *Water Quality – Potential Impacts and Mitigation – General Water Quality* – Potential Impact 3.2-17 identifies one impact from hatchery operations at Fall Creek that would be avoided under the No Hatchery Alternative. This impact was found to be significant and unavoidable in the short term for water temperature and dissolved oxygen in Fall Creek downstream of Fall Creek Hatchery (FCH). Please refer to Section 3.2.5.8 *Water Quality – Potential Impacts and Mitigation – General Water Quality* – Potential Impact 3.2-17 for discussion of mitigation that was considered to reduce the impacts of Fall Creek Hatchery on water temperature in Fall Creek and the reasons that these options were determined to be infeasible. With respect to dissolved oxygen, the EIR analysis indicates that Fall Creek Hatchery discharges would have a low potential for causing dissolved oxygen percent saturation to become less than Basin Plan dissolved oxygen water quality objectives; however, as a conservative determination, the EIR notes that dissolved oxygen percent saturation in Fall Creek may infrequently decrease below Basin Plan dissolved oxygen water quality objectives and thus there would be significant impact without mitigation in the short term. Other unmitigable adverse impacts identified under the Proposed Project are also identified under the No Hatchery Alternative, and these would occur in the short term, during reservoir drawdown and construction activities associated with hydroelectric facilities removal. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

The comment asserts that a mitigation measure of reducing operations at Iron Gate Hatchery and declining to reopen Fall Creek Hatchery would reduce significant and unavoidable impacts of the Proposed Project. Operations at Iron Gate Hatchery are already being reduced relative to existing conditions under the Proposed Project (see Section 3.2.5.8 *Water Quality – Potential Impacts and Mitigation – General Water Quality* – Potential Impact 3.2-17), and further reducing its operations would not, therefore, reduce an identified potentially significant impact of the Proposed Project relative to the existing condition. In addition to reduced production at Iron Gate Hatchery not addressing an identified significant impact, declining to open Fall Creek Hatchery is not required to be included in the EIR as a mitigation measure, since it is included and assessed in the EIR as part of the analysis of the No Hatchery Alternative in Section 4.7.2 *Alternatives – No Hatchery Alternative – Water Quality* (page 4-304). In that section the EIR notes that not opening Fall Creek Hatchery would reduce short-term construction-related impacts and operational impacts on water quality in Fall

Creek for the eight years following dam removal. Continued hatchery production is stipulated in the Klamath Hydropower Settlement Agreement (KHSA), and it does not appear possible to achieve the hatchery production levels under the Proposed Project at Iron Gate Hatchery (see Master Response AQF-2). Suitable water temperatures for year-round rearing of coho is not available at Iron Gate Hatchery with infrastructure anticipated to be available following dam removal.

As discussed in Section 3.3.5.6 *Aquatic Resources – Potential Impacts and Mitigation – Fish Hatcheries*, all hatchery production of coho salmon is already operated for species conservation. Under existing conditions and the Proposed Project, all production of coho salmon is constrained by a Hatchery Genetic Management Plan (HGMP) for the Iron Gate Hatchery (CDFW and PacifiCorp 2014), which redefined the operation of this hatchery from a mitigation hatchery to one now operated to protect and conserve the genetic resources of the Upper Klamath population unit of the Southern Oregon/Northern California Coast (SONCC) coho salmon Evolutionarily Significant Unit (ESU). Included in the HGMP are defined monitoring and evaluation activities to evaluate effects of the hatchery activities on the abundance, productivity, spatial structure, and diversity of the SONCC coho salmon and the magnitude or relative impact of the hatchery program on other actions that influence SONCC coho salmon.

Chinook salmon production currently occurs at Iron Gate Hatchery without a conservation focus per se. Continuation of this baseline condition will not reduce a significant impact of the Proposed Project.

Comment ORG34-17

In sum, the Native Fish Society supports decommissioning and license surrender, but remains concerned about the environmental impacts of the proposed Project's hatchery operations at Iron Gate and Fall Creek. While the DEIR recognizes many of the detrimental effects of hatchery operations, it should be revised to incorporate the additional information identified in this letter. Further, CEQA requires that the State Board reduce or avoid the significant impacts of hatchery operations and construction to the extent feasible. Therefore, the Native Fish Society urges the State Board to adopt the No Hatchery Alternative or, at a minimum, to consider and adopt all feasible mitigation to reduce or avoid the significant impacts from hatchery operations and construction.

Response to Comment ORG34-17

Comment summary noted. Please refer to responses ORG34-4 to ORG34-16 for responses on substantive issues summarized by this comment.

Oregon Wild, Doug Heiken

Comment ORG32-1

Oregon Wild strongly supports the Proposed Project, involving removal of Iron Gate, Copco No. 1, Copco No. 2, and J.C. Boyle dams and associated facilities.

The Proposed Project will best meet project objectives and provide the greatest ecological gains in this important ecosystem. We do not want concerns about short-term impacts to get in the way of this great dam removal project that will be highly-beneficial in the short- and long-term. In the attached letter we offer a few suggestions to improve the Proposed Project.

Response to Comment ORG32-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment ORG32-2
Please accept the following comments from Oregon Wild concerning the Draft Environmental Impact Report for 401 Certification of the Lower Klamath Project License Surrender, FERC Project No. 14803, https://www.waterboards.ca.gov/waterrights/water_issues/programs/water_quality_cert/docs/low er_klamath_ferc14803_deir/noa.pdf. Oregon Wild represents 20,000 members and supporters who share our mission to protect and restore Oregon's wildlands, wildlife, and water as an enduring legacy. Our goal is to protect areas that remain intact while striving to restore areas that have been degraded. Oregon Wild has worked for more than three decades to protect and restore the ecological integrity of the Klamath River, the entire Klamath Watershed, and the fish and wildlife that call it home. Our members and supporters have a great affection and connection to this area.

Response to Comment ORG32-2
Comment noted.

Comment ORG32-3
Oregon Wild strongly supports the Proposed Project, involving removal of Iron Gate, Copco No. 1, Copco No. 2, and J.C. Boyle dams and associated facilities, with a Definite Plan described in EIR Appendix B. The Proposed Project will best meet project objectives and provide the greatest ecological gains in this important ecosystem. We do not want concerns about short-term impacts to get in the way of this great dam removal project that will be highly-beneficial in the short- and long-term. We offer a few suggestions to improve the Proposed Project below.

Response to Comment ORG32-3
Please refer to Master Response GEN-1.

Comment ORG32-4
Oregon Wild supports the Water Board's proposed 401 certification of the Klamath Project Dam Removal and License Surrender because it will lead to significant long-term improvements in the water quality of the Klamath River, especially temperature, dissolved oxygen, pH, and algal toxins. Of course, there are some short-term adverse water quality impacts associated with dam removal, such as the temporary pulse of stored sediments as they mobilize and move

through the system. The dam removal effort must be accomplished with great care to minimize and mitigate these water quality impacts, but because the existing situation is causing a variety of significant adverse water quality problems, the long-term net effect of dam removal on water quality is strongly positive.

Response to Comment ORG32-4
Comment noted.

Comment ORG32-5
The EIR (pp ES-9 to ES-11) provide a nice summary of the beneficial effects of dam removal, which clearly outweigh any adverse effects. This list could be expanded to include: vegetation succession within the reservoir footprint, and all the ecological complexity and self-organization that goes along with succession, such as primary production/consumption, biomass accumulation, large tree habitat, wildlife cover/nesting/feeding, stream shade, dead wood habitat recruitment, carbon storage, and various disturbances that interact with the features listed, etc.

Response to Comment ORG32-5
Comment noted. The list provided in the comment includes various ecological processes, ecosystem forms, and biotic responses that are generally aligned with the expected ecological changes that would occur in the newly exposed reservoir footprints following dam removal and would be promoted by restoration activities included in the Proposed Project to increase habitat complexity and function. For discussion of proposed activities that would improve habitat complexity under the Proposed Project, please refer to Volume I Section 2.7.4.2 *Proposed Project – Restoration Within the Project Footprint – Reservoir Restoration Features* (pages 2-71 to 2-76). For a discussion of carbon storage within the habitat types that would replace the reservoirs, please refer to Section 3.10 *Greenhouse Gas Emissions and Energy*, which was recirculated on December 21, 2019. Please note that benefits listed in the comment that are not discussed in the EIR do not change any of the EIR's impact determinations.

Comment ORG32-6
The listed "terrestrial" benefits of dam removal include "benthic macroinvertebrates." Is this a typo? Maybe the intention was to list benefit to terrestrial invertebrates, which include: mollusks, fungi, lichen, mosses, insects, arthropods, etc.

Response to Comment ORG32-6
Potential impacts on benthic macroinvertebrate populations were evaluated in Volume 1 Section 3.3 *Aquatic Resources* and in Section 3.5 *Terrestrial Resources* as these populations have the potential to be affected by changes in water elevation with the reservoir footprints and water flow, sedimentation, and total suspended sediments in the Klamath River downstream of the Lower

Klamath Project dams, and, in turn, to affect aquatic organisms that feed on them (e.g., fish) and terrestrial organisms that feed on them (e.g., western pond turtle). Many benthic macroinvertebrates also have an aerial life-stage. Please refer to Volume I Section 3.5.5.3 *Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities* Potential Impact 3.5-17 (pages 3-559 to 3-560) for an analysis of the potential impacts on benthic macroinvertebrates present in the reservoir footprint as a result of drawdown and drying of the habitat, and in the Klamath River downstream of Iron Gate Dam as a result of sediment transport and deposition. The analysis indicates that there would be no significant impact in the short term and there would be beneficial long-term effects.

Comment ORG32-7

The existing dams alter river flow and contribute to water quality problems, including toxic algal blooms, low dissolved oxygen, and higher water temperatures. The dams also contribute to fish disease in the lower reaches of the Klamath River. The license surrender and dam removal will revert the Klamath River to more natural seasonal flow conditions resulting in improved water quality, temperature regime, nutrient cycling, chemistry, and sediment storage/mobility. Free-flowing riverine conditions and improved water quality will benefit aquatic habitat and anadromous fish populations by increasing access to historical habitat, restoring mainstem and tributary habitat, and improving biological and physical factors that heavily influence fish populations (e.g., flow conditions, sediment and bedload transport, water quality, fish disease, toxic algal blooms, and water temperature).

We urge the Water Boards to adopt conditions that will minimize water quality impacts, reduce the spread of weeds, and conserve unique species like pond turtles, suckers, salmonids, amphibians, and lamprey, while allowing this important dam removal effort to proceed in an efficient and timely manner.

Response to Comment ORG32-7

Consistent with CEQA Guidelines section 15126.4, the EIR identifies several significant impacts for which mitigation is feasible to reduce environmental impacts. For a summary of the potential impacts and mitigation measures, please refer to Volume III Attachment 1 for the final *Executive Summary* Table ES-1.

Additionally, The State Water Board's draft water quality certification (available online at: https://www.waterboards.ca.gov/waterrights/water_issues/programs/water_quality_cert/docs/lower_klamath_ferc14803/lkp_dwqc.pdf [Accessed December 11, 2018]) incorporates conditions to minimize impacts on aquatic species. For example, the State Water Board includes conditions to monitor water quality and measures to control erosion and stream sedimentation, monitor anadromous fish (Pacific lamprey, fall-run Chinook salmon, coho salmon, and steelhead), rescue

and relocate juvenile salmonids and Pacific lamprey from tributary confluence areas, develop and implement aquatic vegetation management, and develop and implement amphibian and reptile management, which includes surveys and rescue and relocation. Klamath River Renewal Corporation (KRRC) has also included an aquatic resource measure as part of the Proposed Project for sucker species in Copco No. 1 and Iron Gate reservoirs (Aquatic Resource Measure 6 *Suckers*) and removal of invasive species and invasive weed control (Appendix B: Appendix H – *Reservoir Area Management Plan*).

Comment ORG32-8

It is reasonable to expect significant short-term erosion and movement of sediment stored behind the dams to be removed. This will likely cause some short-term impacts on Klamath River ecology. Most of these effects will occur during the first year after dam removal, followed by another pulse during the next 5-10 year high-flow event, which should substantially resolve sediment concerns by moving most of the fine sediments out of the system and naturally sorting and distributing the larger material.

Freshwater mussels are long-lived and an important part of the river ecosystem. We are concerned about sediments smothering downstream mussel beds after dam removal. Can this be mitigated by collecting some mussels from representative downstream areas that are expected to be buried in significant sediments, then replanting them in the same locations are things have sorted out? This might be a worthwhile project for tribal partners.

Response to Comment ORG32-8

As described in Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-19, the Proposed Project includes Aquatic Resource Measure AR-7 to salvage and relocate freshwater mussels prior to Lower Klamath Project dam removal. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment ORG32-9

The project controls significant acreage of uplands surrounding the project, as well as the footprint of the reservoirs themselves. We urge the agencies to require sound ecological stewardship of those lands so they are not subjected to grazing, logging, mining, or motorized recreation, to the detriment of Klamath River water quality. The EIR says that these lands would be transferred to the States of Oregon and California and/or third-parties, for "public interest purposes." This is too broad. There should be an explicit ecological conservation mandate permanently attached to these lands.

Response to Comment ORG32-9

Comment Noted. At this time, the outcome of the future Parcel B land transfer is speculative with regard to land use. While the lands would be managed for the public interest, this could include open space, active wetland and riverine

restoration, river-based recreation, grazing, and potentially other uses. The disposition and transfer of Parcel B lands is discussed in Volume I Section 2.7.10 *Proposed Project – Proposed Project – Land Disposition and Transfer* (page 2-108) and analyzed under several sections (e.g., Volume 1 Section 3.5.5 *Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities* Potential Impact 3.5-28 [page 3-574 to 3-575]). As noted, the disposition of Parcel B lands will be subject to a process described under the Klamath Hydroelectric Settlement Agreement to determine the disposition of lands. This process will include the ability to identify lands appropriate for conservation, and will include future environmental review under CEQA.

Comment ORG32-10

Weed-free native-only seed mixes should be used for seeding after the reservoir is drawn down. Using sterile wheat may not be a good idea because it may cause a boom in the local small animal population that consumes the wheat AND decimates the native seedbed.

Response to Comment ORG32-10

As defined in Klamath River Renewal Corporation's (KRRC) Reservoir Area Management Plan (Volume II Appendix B: *Definite Plan – Appendix H*), the Proposed Project native grasses, sedges, rushes, forbs and shrubs would be used for seeding in all revegetation zones. A very small amount of sterile wheat may be applied; this small amount should not have significant impacts on the native seedbed and would serve an important role stabilizing soils and providing erosion control.

Comment ORG32-11

We urge the agencies to require planting of native willows and other appropriate trees and shrubs in the reservoir footprint along the newly established river channels and tributaries. This will provide several benefits: (i) provide shade to mitigate temperature problems, (ii) suppress weeds, and (iii) stabilize the loose sediments along the river banks.

Response to Comment ORG32-11

As defined in Klamath River Renewal Corporation's (KRRC) Reservoir Area Management Plan (Volume II Appendix B: *Definite Plan – Appendix H*), the Proposed Project includes several actions to encourage rapid revegetation with native riparian species, including willows, in the reservoir footprints; these actions would ensure a no net loss of wetland or riparian habitat acreage and functions.

Comment ORG32-12

The plan is to salvage ESA-listed Lost River suckers and Short-Nose suckers that use the reservoirs, but this effort is expected to salvage only 10% of the population. We urge the agencies to require genetic testing, and if the fish are not unduly hybridized, then a more aggressive fish salvage effort should be

undertaken. The locations for releasing these salvaged fish must be carefully thought out in advance.

Response to Comment ORG32-12
As described in Volume I Section 2.7.8.1 *Proposed Project – Proposed Project – Other Project Components – Aquatic Resource Measures – Suckers (AR-6)* (page 2-88), the Aquatic Resource Measure AR-6 includes genetic testing of suckers in the Klamath River and in Hydroelectric Reach reservoirs, and capture as many suckers as feasible (not to exceed 3,000 fish) from within the Klamath River and in Hydroelectric Reach reservoirs and place them into the isolated waterbody of Tule Lake (to ensure hybridized suckers do not mix with sucker populations designated as recovery populations in Upper Klamath Lake). Additional detail is provided in Volume II Appendix B: *Definite Plan – Appendix I*.

Additional comments on the Definite Plan should be submitted to the Klamath River Renewal Corporation.

Comment ORG32-13
The EIR says that livestock grazing may be used as a veg control in the uplands. This is not a good idea, because livestock cause several undesired effects, including: spending disproportionate time in sensitive areas such as riparian areas, grazing non-randomly with greater adverse effects on some desired native species and little to no effect on many undesired species (e.g., thistle).

Response to Comment ORG32-13
As discussed in Klamath River Renewal Corporation's (KRRC's) Reservoir Area Management Plan (Volume II Appendix B: *Definite Plan – Appendix H*), the KRRC would evaluate all methods of invasive species control for both their benefits and their risks to the surrounding ecosystems. KRRC is not proposing to graze livestock in sensitive habitats such as riparian areas. Grazing is proposed in upland habitats that are not considered sensitive riparian areas. Furthermore, to protect planted native species and revegetation efforts and to replace the function of the reservoirs as natural barriers, cattle exclusion fencing would be placed around the reservoir areas after drawdown to prevent cattle from accessing areas of sensitive habitats and restoration areas.

Comment ORG32-14
Dead and down wood plays a critical role in maintaining aquatic and terrestrial ecological structure, function, and process. See Rose, C.L., Marcot, B.G., Mellen, T.K., Ohmann, J.L., Waddell, K.L., Lindely, D.L., and B. Schrieber. 2001. Decaying Wood in Pacific Northwest Forests: Concepts and Tools for Habitat Management, Chapter 24 in Wildlife-Habitat Relationships in Oregon and Washington (Johnson, D. H. and T. A. O'Neil. OSU Press. 2001) http://web.archive.org/web/20060708035905/http://www.nwhi.org/inc/data/GISdata/docs/chapte r24.pdf. It is reasonable to expect a significant shortage of dead wood within the former reservoir footprint. This wood deficit should be mitigated

by importing large wood to kick-start the process of natural wood functions and wood recruitment. Placing lots of large wood in the reservoir footprint will help meet water quality goals by capturing and storing sediment and nutrients. Wood should be placed both in and near the river and tributaries, as well as in uplands. Extra wood near tributary junctions is recommended. Wood for restoration should be obtained from appropriate sites, such as thinning of (young) plantations, (young) juniper removal projects, roadside hazard trees, or nearby reservoir salvage efforts.

Response to Comment ORG32-14
As described in the Volume 1 Section 2.7.4.2 *Proposed Project – Restoration Within the Reservoir Footprint – Reservoir Restoration Features* (pages 2-71 to 2-76), restoration activities for the reservoir footprints are supporting reservoir-deposited sediment evacuation; enhancing tributary connectivity to the Klamath River; incorporating floodplain features such as wetlands, swales, and side channels; enhancing floodplain roughness to stabilize vegetation; and stabilizing banks and enhancing channel complexity, including with the use of large woody debris.

Additional comments on the Definite Plan should be submitted to the Klamath River Renewal Corporation.

Comment ORG32-15
We also urge the agencies to adopt monitoring and adaptive management requirements specifically designed for learning and application to other similar projects. Dam removal is still a fairly new endeavor with uncertainty about environmental impacts and the spatial and temporal fate of stored sediment. Let's learn from this dam removal effort, so that future dam removal efforts can be even better.

Response to Comment ORG32-15
The Klamath River Renewal Corporation's (KRRC) Proposed Project includes several adaptive management elements for water quality, aquatic resources (i.e., fisheries, including actions to remove migration barriers to Klamath River tributaries and upper reaches of the river, should they occur), and terrestrial resources (i.e., revegetation of the reservoir footprints). Additionally, the State Water Board has issued a draft water quality certification which sets forth monitoring and adaptive management requirements for water quality monitoring. The State Water Board's draft water quality certification is available online at: https://www.waterboards.ca.gov/waterrights/water_issues/programs/water_quality_cert/docs/lower_klamath_ferc14803/lkp_dwqc.pdf (Accessed December 11, 2018).

Comment ORG32-16
Each substantive issue discussed in these comments should be (i) incorporated into the purpose and need for the project, (ii) incorporated into an EIR alternative,

(iii) carefully analyzed as part of the effects analysis, and (iv) considered for mitigation.

Response to Comment ORG32-16
Comment noted.

Pacific Coast Federation of Fishermans Association, Glen Spain

Comment ORG29-1
In general, both PCFFA and IFR endorse and incorporate herein by reference the written comments to be submitted by Feb. 26, 2019, by the Klamath River Renewal Corporation (KRRC), which we have reviewed and approve. The KRRC editing comments help clarify some areas in the Draft Environmental Impacts Report (DEIR) that are unclear, or which may be duplicative.

Please consider these as our Supplemental written comments on behalf of the Pacific Coast Federation of Fishermen's Associations (PCFFA) and its sister organization, Institute for Fisheries Resources (IFR) regarding the Draft Environmental Impacts Report (DEIR) released Dec. 2018, regarding the proposed State of California 401 Certification for removal of the Lower Klamath Dams within the State of California (i.e., CopCo 1 & 2 and Iron Gate Dam). Please make them part of the permanent public record for this decision-making process. Although our two organizations generally support the separate KRRC comments, PCFFA and IFR are separate legal entities presenting these Supplemental written comments solely on their own behalves, and do not in any capacity speak for the KRRC.

Response to Comment ORG29-1
Thank you for your comment.

Comment ORG29-2
PCFFA and IFR both strongly support the KRRC's ongoing efforts to remove the four Lower Klamath Hydropower Project FERC-licensed dams, including the three of the four dams (CopCo 1 & 2 and Iron Gate Dams) located in California, and which are the subject of the current dam removal project. Removal of these four Klamath Basin dams was agreed to in the Klamath Hydropower Settlement Agreement ("KHSA"), also signed by the dams' owner (PacifiCorp). Indeed, PCFFA and IFR are both signatory Parties to the original and amended KHSA documents as well. Both our organizations support the Proposed Project as the best choice among all the alternatives.

Response to Comment ORG29-2
Please refer to Master Response GEN-1.

Comment ORG29-3
On an initial note, looking at the prior Scoping Comments and other written comments from those (particularly Siskiyou County and the Siskiyou County

Water Users Association (SCWUA)) who have vehemently opposed dam removals in the Klamath, many of their past written comments raised concerns related to water quality and other issues that have already been systematically analyzed and long-since debunked or rebutted by hard science. Nevertheless, to make sure the Record in this action is clear, in our initial comments below we will again puncture the many myths about likely sediment releases from dam removal and other impacts of dam removals that opponents of the Proposed Project are repeating in the media and in their written comments on this DEIR.

In particular, we once again we are still reading or hearing public comments in this process with alarmist language about the "massive amounts of mud" behind the dams, and of "toxic mud" supposedly sitting as "sediment time bombs" behind the dams. But in fact, as the prior NEPA/CEQA (2013) rigorous and multiply peer-reviewed analysis of potential Klamath dam removal impacts indicated, multiple studies of the sediment trapped behind the dams have concluded that not only would most of these sediments released be naturally washed through the system to the sea within about 24 months, but that there are NO significant toxics in those sediments above and beyond natural background levels to be concerned about.

Also, a number of sediment containment and stabilization mitigation measures are contained in the recently released June 2018 KRRC "Definite Plan" that will assure that sediment and other short-term water quality impacts will be minimized or eliminated to the extent that is feasible, given that some short-term impacts are inevitable in order to achieve the many long-term water quality gains that would come from restoring the Klamath River's natural and free-flowing conditions. Additional sediment mitigation measures may also be adopted as part of the proposed 401 Certification process.

The debunked sediment and other specious concerns that continue to be raised by other parties in this process who oppose dam removals can be summarized as follows:

Response to Comment ORG29-3

With respect to sediment erosion, transport, and deposition associated with the Proposed Project, please refer to Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 (pages 3-765 to 3-775). Please also refer to Master Response GEO-1. With respect to nitrogen and other nutrients, please refer to Section 3.2.5.3 *Water Quality – Potential Impacts and Mitigation – Nutrients* Potential Impact 3.2-7 and Potential Impact 3.2-8. Both potential impact analyses conclude no significant impact, or beneficial effects, for nutrient conditions associated with the Proposed Project. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Comments on the Definite Plan should be submitted to the Klamath River Renewal Corporation (KRRC).

Comments on the California Draft Water Quality Certification for the Lower Klamath Project should be submitted to the State Water Board's Water Quality Certification Program following the instructions provided at: https://www.waterboards.ca.gov/waterrights/water_issues/programs/water_quality_cert/lower_klamath_ferc14803.html

The Oregon Water Quality Certification for the Lower Klamath Project is available at: https://www.oregon.gov/deq/FilterDocs/ferc14803final.pdf

Comment ORG29-4

MYTH: "Massive amounts of toxic chemicals are in the sediments behind the dams." – Multiple studies and on-site surveys analyzing the chemical make-up of reservoir sediments have concluded that these sediments pose no significant risk to human health.

Opponents to river restoration often cite the Camp, Dresser, and McKee Study, which first assumes a worst-case sediment scenario, and then speculates that the high cost of such toxic sediment removal would push dam removal into the billions of dollars. However, this report was prepared before, and thus fails to acknowledge the results of, the many later studies referenced in footnotes herein (and in the DEIR itself) which disprove that report's initial (and unwarranted) assumption that significant toxic contamination even exists.

This "fake fact" assertion that there are significant toxic chemical contaminant concerns in sediments behind the dams has also been officially debunked. For instance, the US EPA issued a letter dated 4 November, 2015, on just this issue, noting that multiple studies have shown that there were no significant concerns about any toxic sediment problems in any of the reservoirs raised by any of several comprehensive studies. See ATTACHMENT A for a copy of that EPA letter for the record. In general, detections of potential toxic chemicals in sediment core samples were within the range of natural background levels, and well below the range of significant concern for human health.

And while the Draft DEIR noted that levels of arsenic are naturally elevated in the region (due to its volcanic history), human exposure pathways for arsenic were very limited in this highly rural region:

"Thus, overall the Proposed Project would be unlikely to result in short-term or long-term substantive adverse impacts on human health under possible 'Exposure Pathway 2' [long-term exposure to reservoir terrace and/or river bed deposits] due to arsenic." [DEIR 3-143]

As to other contaminants, the DEIR correctly concluded:

"After consideration of dilution, chromium, lead, and total PCB concentrations would be less than the most stringent human health drinking water standards in the Hydroelectric Reach from J.C. Boyle Dam to the upstream end of Copco No. 1 Reservoir...." [DEIR 3-144-145]

"Thus, there would be little to no potential long-term potential for adverse impacts to human health from exposure to river water due [to] the release of reservoir sediments and associated inorganic or organic contaminants trapped behind the Lower Klamath Project dams, and there would be no significant impact in the long term for human exposure to inorganic and organic contaminants in the Hydroelectric Reach." [DEIR 3-149-150]

The Draft DEIR analysis also correctly noted that:

"Implementation of mitigation measures WQ-2 and WQ-3 would reduce the short-term significant impact of human exposure to inorganic and organic contaminants in the Middle and Lower Klamath River and the Klamath River Estuary to less than significant." [DEIR 3-150]

We believe that the KRRC has already committed to these mitigation measures.

And as to the impact of released sediments on aquatic, non-human species, the DEIR analysis is that these impacts would also be less than significant.

"Overall, one or more chemicals are currently present in the Lower Klamath Project reservoir sediments at levels with potential to cause minor or limited adverse impacts on freshwater aquatic species in the short term, based results from the Shannon & Wilson, Inc. (2006) study and the 2009–2010 Klamath Dam Removal Secretarial Determination study (CDM 2011), but chemicals present in the Lower Klamath Project reservoir sediments are expected to be mixed and diluted below water quality standards, reducing the likelihood of any substantial adverse impacts on freshwater aquatic species in the short term. In the long term, one or more chemicals are present, but at levels unlikely to cause substantial adverse impacts based on available evidence. Therefore, under the Proposed Project, the short-term and long-term impacts on freshwater aquatic species from exposure to sediment-associated inorganic and organic contaminants during sediment release and transit, and from potential downstream river-channel deposition, in the Middle and Lower Klamath River, would be a less-than-significant impact. [DEIR 3-158]

Response to Comment ORG29-4

Please refer to Master Response WQ-6 for further information about the inorganic and organic contaminants in the reservoir sediments.

Comment ORG29-5

MYTH: "20-30 million cubic yards of sediment behind the dams would wash out and devastate the lower river." – These numbers and their impacts are both greatly exaggerated by Siskiyou County and SCWUA. Only about an estimated 13.1 million cubic yards of sediments in total were actually trapped behind the dams by 2012, an amount that is expected to rise to about 15 million cubic yards by 2020. But of these sediments, only about one-third to two-thirds of the total volume (5 to 10 million cubic yards in 2020) would be expected to wash out to sea over 1 to 2 years, as the river becomes re-channelized, with the rest of these sediments to be replanted and stabilized as new river bank.

The majority of those sediments that would naturally erode and are likely to wash out to sea, however, are fine-grained and so would be easily mobilized by normal river flows and thus are not likely to be deposited in the river channel nor estuary for very long, if at all. In short, most of the mobilized sediment, as noted in the prior NEPA/CEQA (2013) analysis, would naturally wash out to sea within a couple of rainy seasons. The DEIR confirms this modeling prediction.

The less mobilized, larger gravel is also beneficial as it will likely help create gravel and cobble beds below the dams that are highly suitable for salmon spawning and rearing – indeed, the existing dams have systematically starved the lower river of natural recruitment of spawning and rearing gravel as much as 50 stream-miles downriver from Iron Gate Dam. (NEPA/CEQA (2013))

Alarmists warning of massive sediment erosion forget that rivers like the Klamath already, naturally, carry vast amounts of sediment out to sea as part of their natural baseline functioning, through natural erosion.

For instance, the Klamath River already normally carries an average water-year sediment load of about 5.834 million tons/year (which translates to 3.889 million cubic yards of sediment/year at a standard conversion rate of 1.5 tons/cubic yard density), which may be greater or lower depending on total rainfall. Sediment transport models (as noted in the DEIR) in fact indicate that, left completely to natural processes, high concentrations of suspended sediments would occur immediately downstream of Iron Gate Dam for only two-to-three months immediately following reservoir drawdown and removal.

But in fact, multiple reservoir silt stabilization and reseeding/revegetation measures are proposed by KRRC to help keep the downstream sediment flows, and later erosion flows, to a minimum. Data cited in the Definite Plan (June, 2018) estimate that with these mitigation measures in place:

"The Project could release up to 1.2 - 2.9 million metric tons of fine sediment (sand, silt, and finer) downstream from Iron Gate Dam (RM 193.1) over a two-year period (USBR 2011)."

In other words (except for a short-lived initial burst, which would be timed so as to avoid most impacts on migrating fish) additional sediment loads triggered by dam removals would remain within the range of what already naturally occurs in high-flow or wet water years.

The Draft Environmental Impact Report (DEIR) confirms that sediment loads would be manageable as well as short-term impacts. Specifically the DEIR notes:

- *"There would be an estimated 15.1 million cubic yards (14.6 million tons) of sediment stored in the J.C. Boyle, Copco No. 1, and Iron Gate reservoirs by 2020 (USBR 2012)." (DEIR ES-5)*
- *"Anticipated erosion volume due to dam removal into the context of annual basin-wide sediment discharge are estimated to average an annual total sediment supply from the Klamath River to the Pacific Ocean of approximately 5.8 million tons (4 million tons/yr. of fine sediment and 1.8 million tons/yr. of sand and larger sediment (Stillwater Sciences (2010). Farnsworth and Warrick (2007) estimate that the average annual silt and clay discharge is 1.2 million tons/yr.… In dry years the supply of sediment to the ocean could be less than 1 million tons/yr. (Figure 3.11-12). Given these estimates, it is expected that the amount of sediment released during the year of drawdown and dam removal would be similar to that transported by the Klamath River to the Pacific Ocean in a year with average flow, much less than that transported by the Klamath River in a wet year, and greater than that transported by the Klamath River in a dry year. See Section 3.11.5 [Soil, Geology, and Mineral Resources] Potential Impacts and Mitigation and Figure 3.11-12 for further details." (p. 3-769)" [DEIR 3-103]*
- *"A recent USGS overview report on the sources, dispersal, and fate of fine sediment delivered to California's coastal waters (Farnsworth and Warrick 2007) found the following:*
  - *Rivers dominate the supply of fine sediment to the California coastal waters, with an average annual flux of 34 million metric tons.*
  - *All California coastal rivers discharge episodically, with large proportions of their annual sediment loads delivered over the course of only a few winter days.*
  - *Farnsworth and Warrick (2007) conclude that fine sediment is a natural and dynamic element of the California coastal system because of large, natural sediment sources and dynamic transport processes." [DEIR 3-104]*
- *"The short-term (less than two years following dam removal) and long-term (2–50 years following dam removal) effects of the Proposed Project on sediment delivery to the Pacific Ocean would be less-than-significant, given the relatively small amount of total sediment input from reservoir sediment release in comparison to the total annual naturally occurring sediment inputs to the nearshore environment. Bedload sediment effects related to*

coarse sediment released by the Proposed Project or sediment re-supply likely would not extend downstream of the Cottonwood Creek confluence (RM 185.1). Therefore, there would be no bedload-related effects in the Klamath River Estuary or Pacific Ocean nearshore environment under the Proposed Project." [DEIR 3-755]

Response to Comment ORG29-5
Please refer to Master Response GEO-1 for further information regarding fine sediment erosion, transport, and deposition.

Comments on the Definite Plan should be submitted to the Klamath River Renewal Corporation.

Comment ORG29-6
MYTH: "Massive sediment plumes from dam removal will kill all the fish in the lower river for many years to come."—There will clearly be some adverse sediment impacts on fish within the mainstem of the river for a short period of time, but as noted above, these sediments are expected to reach lethal levels for fish only for a short period of time during one single, first-year winter flushing event. The Executive Summary of the DOI Final NEPA/CEQA (2013) EIS/EIR notes:

"While sediment release and other construction related activities during dam removal could cause short-term (1 to 2 years) adverse impacts on fisheries downstream from the Hydroelectric Reach, salmon and other aquatic resources would be expected to return to population levels observed prior to dam removal (in 2010 when the Notice of Preparation was issued) within 5 years……

And of course, these estimates are for the Klamath River and all its dams as a whole, including a contribution by J.C. Boyle. But since the sediments trapped behind J. C. Boyle Dam are relatively minor, that contribution would not be substantial.

The plan for reservoir drawdown to be completed in the high-flow winter season within a single year (2021) is also designed to minimize negative effects of sediment surges on sensitive fish species, particularly federally listed coho salmon. Drawdown will be timed to avoid the major runs of fish, many of which (such as coho) only use the mainstem river briefly each year as a migration corridor, and would thus be safe within their usual tributary habitat during the lethal peak of the mainstem sediment surge.

Response to Comment ORG29-6
The EIR analyzes the potential impacts of elevated suspended sediments on aquatic resources in Section 3.3.5 *Aquatic Resources – Potential Impacts and Mitigation* and Section 3.3.5.9 *Aquatic Resources – Potential Impacts and*

Mitigation – Aquatic Resource Impacts Potential Impact 3.3-1; Potential Impacts 3.3-3 through 3.3-16; and Potential Impacts 3.3-19 and 3.3-20.

Comment ORG29-7

MYTH: "Removing the Klamath dams would eliminate their flood control benefits."—First off, the dams in question were never designed for flood control and thus provide little emergency water storage in the event of flood-level flows. At very best, the reservoirs could physically provide less than 7% attenuation of any 100-year flood event, and then only for a few hours' time, i.e., until their reservoirs were full. At most, this might provide just a 10-hour delay in the peaking of any lower river flooding.

Response to Comment ORG29-7

Comment noted. For additional information regarding the flood hydrology analysis presented in the EIR, please refer to Master Response FLD-1.

Comment ORG29-8

As to any additional flood risk caused by the actual drawdown of the dams themselves during deconstruction, the DEIR correctly has this to say:

"While the release rates that would occur during reservoir drawdown would be greater than the flows at the same time under the existing conditions, and in some months above the historical monthly maximum flow (e.g., September), they would be lower than the overall peak flows for extremely wet years recorded during the period of record in each reach. Because the flows would stay below historical peak flows, they would not change the floodplain or flood risks in comparison to the existing conditions. Thus, the short-term increases in downstream flows and changes to flood risks resulting from reservoir drawdown would be less than significant." [DEIR 3-630, 631]

Reservoir drawdown plans were made with consideration for minimizing flood risks downstream. Controlled releases during reservoir drawdown would not be likely to increase flood risks because they would be kept well within the range of historic flows.

From the California-Oregon border, since these dams were not designed to provide any flood control, the total removal of the dams would pose no additional flood risks:

"Because J.C. Boyle Reservoir provides no storage and the dam typically operates in spill mode at flows above plant capacity (i.e., approximately 6,000 cfs; Table 2-1 in USBR 2012), existing conditions peak flows in the Hydroelectric Reach are not attenuated as a result of J.C. Boyle Dam..... Therefore, under the Proposed Project the 100-yr flood inundation extent on the Klamath River from the Oregon-California state line downstream to Copco No. 1 Reservoir would not change from existing conditions (see also Appendix K). [DEIR 3-634, 635]

Below Iron Gate Dam, however, the situation changes, albeit only slightly:

"Hydrologic and hydraulic modeling of floodplain inundation shows that removal of the Lower Klamath Project dams could alter the 100-year floodplain inundation area downstream of Iron Gate Dam between RM 193 and 174 (i.e., from Iron Gate Dam to Humbug Creek) (USBR 2012). The modeling indicates that the differences between existing conditions and the Proposed Project are minor..... This increased discharge would result in flood elevations that are 1.65 feet higher on average from Iron Gate Dam (RM 193) to Bogus Creek (RM 192.6) and 1.51 feet higher on average from Bogus Creek to Willow Creek (RM 188) (Appendix B: Definite Plan). The impact of dam removal on flood peak elevations would decrease with distance downstream of Iron Gate Dam, and USBR (2012) and the KRRC (Appendix B: Definite Plan) estimated that there would be no significant effect on flood elevations downstream of Humbug Creek (RM 174)....." [DEIR 3-630]

These impacts are significant, albeit they would impact only a small number of structures and then only to a minor degree, but there are a number of mitigation measures the KRRC is already assuming as part of its mitigation obligations under the KHSA, as noted below:

"The KRRC proposes to work with willing landowners to implement a plan to address the significant flood risk for the 36 habitable structures (including permanent and temporary residences) located in the altered 100-year floodplain between Iron Gate Dam and Humbug Creek following dam removal. The KRRC would work with the owners to move or elevate the habitable structures in place before dam removal, where feasible, to reduce the risks of exposing people and/or structures to damage, loss, injury, or death due to flooding. However, flood damage and/or loss of structures that are not feasible to move or elevate would be a significant impact. Final determination of the future 100-year floodplain after dam removal would be made by FEMA. The KRRC is coordinating with FEMA to initiate the map revision process (Appendix B: Definite Plan). The Project Component would also evaluate the river crossings that could be affected by a substantial risk of damage due to flooding. [DEIR 3-632]

The KRRC is actively working with Hornbrook area landowners to fully mitigate these risks wherever possible. Among the various previously proposed additional mitigation measures to minimize flood damage risk that should be adopted in the revised Definite Plan (if they have not already been) are: Mitigation Measure H-1 (install new river flow gages and improve predictive flooding models, thus increasing warning time to residents of any impending flood): new National Weather Service (NWS) warning systems can also be installed to give residents more accurate flood predictions as much as two days in advance.

Response to Comment ORG29-8
For additional information regarding the flood hydrology analysis presented in the EIR, please refer to Master Response FLD-1.

Comments on the Definite Plan or Emergency Response Plan should be submitted to the Klamath River Renewal Corporation (KRRC).

Comment ORG29-9
MYTH: "Keeping the dams would cost far less than tearing them down."— Actually, the financial facts show just the opposite: It would actually cost PacifiCorp ratepayers far more to retrofit and relicense these aging and now economically obsolete dams than to replace their small amount of power from other, newer and much more cost-efficient resources.

The 1956 Federal Energy Regulatory Agency (FERC) 50-year license to operate the Klamath Hydropower Project expired in 2006. PacifiCorp, the company that owns the Klamath dams (J.C. Boyles Dam in Oregon, and CopCo Dams 1 & 2 and Iron Gate Dam in California, in river-descending order), can limp along on temporary one-year FERC license extensions only while an active application for FERC relicensing is pending. That time is coming to a close and a decision on the fate of these dams must soon be made. No privately-owned dam can legally operate without a valid FERC license.

Whatever choice PacifiCorp (also called "Pacific Power" in California) could make, the company's costs of that decision will ultimately be charged to its customer/ratepayers. This is how electrical utilities work. Their only source of revenues is generally the creation of electrical power they then sell to their customers, collecting enough revenues from their customers to fund their operations. This is all tightly regulated by state Public Utilities Commissions (PUCs) in each state where they operate, as the watchdog agencies that assure that their state's customers get charged fair, reasonable – and generally the lowest-cost – power rates for the services they receive.

There are only two legal options for these Klamath Hydropower Project dams, both of which will cost PacifiCorp ratepayers money: (1) either fix them up and relicense them to modern standards, which turns out will cost at least $460 million, and quite likely more than $500 million once all (currently unknown) water quality mitigation costs are added in, with no upper cost cap, according to PacifiCorp testimony to the PUCs, or; (2) decommission and remove these aging dams entirely – which it can now do under the Klamath Hydropower Settlement Agreement (KHSA) for a "capped" cost to its customers of only $200 million, with the rest paid by the State of California.

And according to estimates by FERC, even after all the expensive retrofitting to meet modern standards for relicensing, these dams would then only generate about 61 MW of power on average—about 26% less than they do today.

Relicensing thus means spending a great deal of money for what is actually very little power. In fact, FERC estimated in its 2007 Final Environmental Impact Report (FEIS) on relicensing that even if fully relicensed, the required retrofitting would be so expensive that these dams would then operate at more than a $20 million/year net loss. In short, the Klamath dams are now economically obsolete. This above all reasons is why PacifiCorp is asking for permission to transfer them to the KRRC for removal.

The best current estimate for the total costs of decommissioning and full removal of the four dams, so that the Klamath River and its salmon can once again move freely through them, is about $397.7 million (in 2020 dollars), including various environmental mitigation measures. By implementing dam removal through the KHSA, PacifiCorp thus saves its customers at least another $197.7 million (and perhaps much more) as well as reduces its own company and ratepayer risk and uncertainty. This is another reason the KHSA is a good deal for PacifiCorp customers.

On May 5th, 2011, the California Public Utilities Commission (CPUC) formally confirmed that the KHSA is indeed the most cost effective, least risk and therefore best alternative for PacifiCorp's customers as compared to relicensing. A prior September 16, 2010, ruling by the Oregon PUC came to the same conclusion. A small Klamath dam removal surcharge has been assessed PacifiCorp's Northern California and Oregon customers since those PUC decision to make up the company's $200 million contribution, which will all be in the PUC Trust Funds to use by the KRRC for dam removal by 2020 – at which point PacifiCorp's customers will not have to pay a dam removal surcharge any more.

In short, keeping the Klamath dams would mean extremely expensive fixes for a lot less power, and a Project that would likely lose money for the rest of any new license – losses that customers would ultimately also have to make up for in even higher power rates. The "bottom line" is that it's just a lot cheaper for customers to remove these dams than to keep them. And this is completely ignoring likely economic and jobs benefits of a restored world-class salmon run, a more stable irrigation system and the many other benefits also highlighted in the DEIR.

Response to Comment ORG29-9
Please refer to Master Response ENR-1.

Comment ORG29-10
MYTH: "The region needs the power that the Klamath Dams provide. Without that power there will be brown-outs and other shortages of electrical supplies."— This is nonsense. When the first Klamath hydropower dams were built starting in 1918, and for a short while afterwards, they were the only source of electrical power for Klamath Falls.

But in today's much more modernized and interconnected world, the electrical power used in southern Oregon and northern California through PacifiCorp can come from anywhere within its massive, six-state power grid, and if purchased through the Bonneville Power Administration (BPA) as a power broker, from even further away.

The reality is that all four Klamath dams combined do not generate very much power. Although the whole Klamath Hydroelectric Project is technically rated for maximum power generation of about 171 megawatts (MW), these dams cannot run at maximum capacity 24/7, especially during summers when turbine flows are lowest.

The entire Klamath Hydropower Project combined actually generated only about 82 MW of power on average over the past 50 years of its license, according to FERC records. This amounts to less than 2% of PacifiCorp's overall power production capacity. By comparison, a single modern electrical power plant can continuously generate 1,000 MW or more, and a single off-the-shelf windpower turbine is rated for power production up to 6 MW.

Response to Comment ORG29-10
Comment noted. This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Greenhouse Gas Emissions and Energy*).

Comment ORG29-11
MYTH: "Replacing the power the dams create will increase carbon emissions from the resultant use of carbon generating electric production facilities."

PacifiCorp has no reason and no intention to replace the renewable power from the dams with anything other than more renewables. There is no reason whatsoever that any replacement power would have to be from coal or other CO2-generating sources. There are also strong public policies and economic incentives driving PacifiCorp to divest itself of coal-fired plants generally, which it is in the process of doing, and replacing that energy with carbon-free renewables.

As to replacement power, when Pacific Power was bought by Berkshire-Hathaway in 2005, the Company legally committed to bringing more than 1,400 MW of brand new, cost-effective non-carbon renewable power online by 2015. This is already 17 times more electrical power than the four Klamath dams generate all together. In fact, it has considerably exceeded that goal.

For a company of PacifiCorp's size and expertise, adding a mere additional 82 MW of cost-effective and clean replacement power to its grid after 2021, as it

intends to do under the KHSA, would be an almost trivial task by comparison. It is fair to say that the company has already done so many times over.

There are many options for the replacement of this power from comparable carbon-free or renewable sources by 2020. The DEIR correctly makes this very clear, as well as factors in the net reduction of the greenhouse gas methane (CH4) from elimination of the reservoirs that emit this other greenhouse gas, which is 28 times more effective as a greenhouse gas than CO2, although shorter-lived in the atmosphere:

"In 2017, PacifiCorp issued an Integrated Resource Plan (IRP) identifying the preferred power generation portfolio over the next 20 years. The IRP indicates that PacifiCorp plans to meet new energy resource needs primarily through new renewable resources and demand management (e.g., energy efficiency measures) over the 20-year (2017–2036) planning horizon. The IRP includes the anticipated loss of Lower Klamath Project hydroelectric generation beginning in 2020. The preferred portfolio also identified a reduction in coal capacity of 3,650 MW through the end of 2036. PacifiCorp projects that between 2017 and 2036 its average annual CO2 emissions would be reduced by 24.5 percent falling from 43.8 million tons in 2017 to 33.1 million tons in 2036 representing an annual average reduction in CO2 emissions of 10.7 million tons (PacifiCorp 2017b).

"Removal of the reservoirs associated with the Lower Klamath Project dam complexes would also result in a reduction in methane (CH4) production. As previously described, CH4 emissions from the reservoirs range from 4,000 to 14,000 MTCO2e per year. Under the Proposed Project, these CH4 emissions would cease to be a factor and would further reduce GHG emissions beyond the projections in the PacifiCorp 2017 IRP.

"Since it is planned in the 2017 IRP for PacifiCorp to add new sources of renewable power or purchase RECs to comply with the California RPS, and removal of the reservoirs would result in a reduction in methane production, it is not anticipated that the replacement of the hydroelectric energy from the Lower Klamath Project dam complexes would result in an increase in GHG emissions from non-renewable power sources. As such, GHG impacts from replacement of the hydroelectric energy from the Lower Klamath Project dam complexes is determined to be less than significant." [DEIR 3-728, 729]

Response to Comment ORG29-11
Comment noted. This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Greenhouse Gas Emissions and Energy*).

Comment ORG29-12
MYTH: "Water will be taken away from farmers because taking down the dams will destroy irrigation systems."—The reality is that removing the dams will have

no effect whatsoever on the irrigation system of the federal Klamath Irrigation Project in Klamath and parts of Modoc and Siskiyou Counties. That extensive irrigation system is fed directly from Upper Klamath Lake by diversions at Link River Dam or (in small portion) by numerous small systems allowing direct pumping from the reservoir above Keno Dam, or from Gerber Reservoir, which has no hydrological connection to the Klamath River. That entire federal irrigation systems is hydrologically well above the four PacifiCorp Klamath hydropower dams, and so removal of those dams will not affect the federal Klamath Project water delivery system hydrologically above it in any way.

There are only a handful of riparian water users along the river below the dams, some of whose existing pumps might be affected by sediments coming down from dam removal on a very short-term basis, but this is only a very few people and those impacts can be readily mitigated through appropriate filtering systems, if they occur at all.

As to the impacts of removing the dams on lower river irrigation flows, the DEIR correctly points out that these impacts would be minimal to zero, as explained as follows:

"Using historical flow data to create a set of flows under future operational prescriptions, USBR (2012) compared modeled surface water flow rates at Iron Gate Dam under the Proposed Project to a dams-in scenario. Modeling results indicate that under the Proposed Project, average monthly flows in the Klamath River just downstream of Iron Gate Dam would only slightly increase or decrease (typically less than approximately 15 percent) depending on month and water year type, compared to existing conditions. The anticipated small relative changes in Klamath Rivers flows are due to the fact that the Lower Klamath Project reservoirs were not designed, nor are they operated, as seasonal storage reservoirs for maintaining downstream flows for irrigation or drinking water diversions. As a whole, the Lower Klamath Project is primarily operated as a run-of-the-river operation, with inflows essentially matching outflows below Iron Gate Dam. Thus, the Lower Klamath Project has only a small effect on daily, monthly, seasonal, or annual flow conditions downstream of Iron Gate Dam. USBR (2012) modeling results indicate that at Seiad Valley, approximately 62 river miles downstream of Iron Gate Dam, surface water flow rates under the Proposed Project would be nearly identical to those under existing conditions." [DEIR 3-677]

Response to Comment ORG29-12

For additional information regarding water supply for agricultural irrigation as analyzed in the EIR, please refer to Master Responses WSWR-1, as well as Volume I Potential Impact 3.8-1 for a discussion of the effect of dam removal on availability of water for diversion and Volume II Appendix M for a discussion of water rights.

Comment ORG29-13

MYTH: "There has been no analysis of the economic damages to Siskiyou County, Modoc County, or other adjacent and directly impacted counties."—This is another obvious factual error. Not only does this DEIR analyze in depth the public service, population and housing, social services and other socioeconomic impacts of the Proposed Project on these counties and their regions, but there are numerous studies of these impacts that were part of the original NEPA/CEQA (2013) analysis done to inform the Secretarial Decision.

Potential impacts on the property values of landowners around Copco Lake and Iron Gate Reservior, potential county property tax revenue changes and other similar economic impacts have all been thoroughly studied and those impacts are well-known. This includes studies of real estate values around the lakes, as well as potential property tax impacts and estimates.

Dozens of these studies are available on the official Klamath Dams web site at: www.klamathrestoration.gov, and specifically from the following link: https://klamathrestoration.gov/keep-me-informed/secretarial-determination/role-of-science/secretarial-determination-studies.

Many of these socioeconomic impacts, however, as noted in DEIR Sec. 5-4, are simply outside the jurisdiction of the State Water Board in that they have nothing to do with water quality impacts per se, as well as are outside what are considered "impacts to the environment" to be considered under CEQA. Those that were deemed within the scope of CEQA were considered in detail in DEIR Sec. 5-4 and elsewhere throughout the document.

Response to Comment ORG29-13

Volume I Section 5.4.1 *Other Required CEQA Discussion and Consideration of Social and Economic Factors – Social and Economic Factors Under CEQA – Consideration of Economic Information for Resources Potentially Affected by Dam Removal* (pages 5-4 to 5-11) summarizes the results of prior economic studies conducted by the U.S. Department of the Interior (DOI) to characterize potential economic costs and benefits, including for commercial fishing and local real estate, of dam removal.

Comment ORG29-14

MYTH: "The data from the former EIS/EIR process for the Secretarial Determination is either too old, or too unreliable, to use in the current DEIR analysis."—Dozens of detailed studies were done in preparation for the NEPA/CEQA (2013) analysis and the then-planned Secretarial Determination. Those studies are all still highly relevant to this 2018 DEIR, and were also subjected to reconsideration by the authors of the 2018 DEIR as to whether any significant changes had occurred, including new information if any. Most of those studies are still quite accurate, and still represent the best available science.

Then too, the original studies for the NEPA/CEQ (2013) process were not only peer-reviewed once, but peer-reviewed a second time by Independent Panels of experts, and then the Secretarial Determination those studies were summarized into was itself later independently peer-reviewed once again. The end result was a robust three distinct levels of independent peer-review to check, double-check and cross-check the conclusions of those studies.

SCWUA frequently cites the concerns about information bias in the Secretarial Determination process raised in allegations in February, 2012, by Dr. Paul Hauser, which became a cause célèbre among dam removal opponents, but SCWUA deliberately neglects to note that those same claims were thoroughly investigated by the Inspector General of the Department of Interior, which commissioned a highly credible, independent scientific review committee that reviewed Dr. Hauser's allegations and unanimously found in its findings report of August, 2012, that there was no substantial merit to Dr. Hauser's accusations of scientific bias in the Secretarial Determination NEPA/CEQA (2013) review or press release process.

Response to Comment ORG29-14

Regarding the use of data compiled for the 2012 Klamath Hydropower Settlement Agreement (KHSA) Environmental Impact Statement (EIS)/ Environmental Impact Report (EIR) analyses in the Lower Klamath Project EIR analyses, please refer to Master Responses WQ-4 and AQF-12. Please note that during the Lower Klamath Project Notice of Preparation public comment period, the State Water Board heard concerns regarding the whistleblowing accusations of Dr. Paul Houser as related to the 2012 KHSA EIS/EIR. After hearing these concerns, the State Water Board staff reviewed the independent investigative panel report regarding Dr. Houser's whistleblower complaint, which indicates that the concerns were related to disagreements on how to present uncertainty in scientific data, rather than about the data or scientific analysis itself. (RESOLVE, 2012 - *Independent Investigation of the Scientific Record Pertaining to the Allegations of Dr. Paul Houser.*) Ultimately, the panel determined that Mr. Houser's complaint did not have merit.

Comment ORG29-15

The DEIS Executive Summary at E-7 discusses the current plan for dealing with Iron Gate Hatchery production under the Proposed Project as follows:

"Fish Hatcheries—During demolition, some Iron Gate Hatchery facilities located at the base of Iron Gate Dam would be removed, along with the cold-water supply and aerator for the hatchery. However, operational components of Iron Gate Hatchery would be retained and modified to continue operations at a reduced rate for just Chinook salmon and to eliminate coho salmon production. The nearby Fall Creek Hatchery, located at Fall Creek just upstream of Iron Gate Reservoir, would be reopened to maintain the current Iron Gate coho salmon production and some Chinook salmon production. The Iron Gate and Fall Creek

hatcheries would remain in operation for eight years following removal of the dams, at which point the hatcheries would cease operations."

It is also the case that Iron Gate/Fall Creek hatchery production need not necessarily cease at the end of 8 years after dam removal has been fully accomplished, only that the promised PacifiCorp funding for that production would cease. At the end of that 8-year PacifiCorp funding term, the reconstructed Iron Gate and Fall Creek Hatcheries should be left in a condition to continue production if that is decided upon by CDFW, based on conditions in the river and the rates of recolonization and associated natural production recovery progress.

We do NOT SUPPORT the "No Hatchery Alternative" in any form. The DEIS notes that under the "No Hatchery Alternative":

"While natural-origin returns typically outnumber hatchery returns, the proportion of the Chinook salmon escapement comprised of Iron Gate Hatchery returns has historically been substantial (~35 percent of age 3 adults; KRTT 2011, 2012, 2015). Eliminating the hatchery goal of releasing around 6 million Chinook salmon smolts and yearlings annually would likely result in a reduction in adult hatchery returns to the Klamath River.....

"Based on historical data (CDFW 2016b), the reduction in returns could average around 16,000 fish beginning in post-dam removal year 3, as the population responds to the benefits of dam removal. Based on the current proportion of hatchery adults in the run, this could represent a short-term reduction in abundance of around 35 percent of age 3 adults on average until production from newly accessible habitat increases adult escapement (anticipated to begin in dam removal year 3, Table 4.6-1). However, depending on the year, the reduction could be as high as 50 percent (the proportion of hatchery return adult spawners in 1993 for example), or as low as 19 percent (the proportion in 1995) (KRTT 2015). [DEIR 4-306, 307]

This alternative would amount to a huge spawner deficit for several years running until natural production could infill into restored habitat, which could take several fish generational cycles to accomplish, especially in the absence of human intervention such as egg out-planting efforts.

There is already a serious, long-term fall-run Chinook spawner deficit affecting the river (see ATTACHMENT B – Klamath Fall-Chinook Escapements (1998-2012)) and an unacceptably high risk of future fall-run Chinook stock extinctions as a result, particularly of the weakest sub-stocks.

It should be noted that historically (i.e., before European colonization and development) the Klamath River is estimated to have produced an average annual 500,000 fall-run Chinook. Today (as seen from ATTACHMENT B)

fisheries managers are hard pressed to assure that the Pacific Fishery Management Council's (PFMC) fall-run Chinook escapement "minimum spawner floor" of 40,700 natural spawners can be met. Suddenly subtracting all hatchery production from the system would simply increase the pressure on the already extremely weakened natural stocks, at least in the short term, from natural predation and other natural mortality factors as well as fishing pressures.

It is argued in the DEIR that:

"The impact of a reduction in the number of hatchery returning fish is not equivalent to a reduction in the natural-origin population, from a population perspective..... As discussed in detail in Section 3.3.2.3 Habitat Attributed Expected to be Affected by the Proposed Project [Fish Hatcheries], hatchery returning adults can have substantial detrimental effects on native populations. As such, a reduction in hatchery returns under this alternative would be a benefit for fall-run Chinook salmon over the long term. [DEIR 4-307]

However, since our industry is highly dependent on the health of Klamath River fish production generally (both naturally and hatchery generated), and is also highly dependent on hatchery stocks generally, it is our strong preference that the Iron Gate/Fall Creek hatchery complex phase down its production only as natural spawner production increases in areas now blocked by dams. In other words, some proportionality should be maintained between recolonization success with recovery of natural production and reduced hatchery production. This recolonization process may take more than 8 years to complete, and it should be acknowledged that the original 8-year estimate was at most merely an educated guess.

In short, river conditions and real-time salmon recolonization success rates should dictate the hatchery production phase-out time frame, not arbitrary deadlines. And since these factors are by their nature unknown in advance (only estimated), the Hatchery Management Plan (HMP) and CDFW should maintain some flexibility as to the termination dates and phase-out plans for the Iron Gate/Fall Creek hatchery program. Otherwise both our industry and the entire Klamath River salmon-based ecosystem could face abrupt fall-offs in Klamath spawner numbers that would require major adjustments in fisheries management by the Pacific Fisheries Management Council (PFMC) and could cause severe and unexpected disruptions in harvestable salmon availability, including potential coast-wide, at-sea salmon fishery closures that could devastate coastal fishing-dependent communities. The sudden and major loss of between 35% and 50% of all fall-run Chinook spawners from the river would also doubtless have cascading negative impacts on the river's natural salmon-based ecosystems as well.

One simple principle for decreasing the problem of negative hatchery-natural stock interactions, particularly with respect to the problems of hatchery fish

interbreeding with and thus truncating or diluting the natural genetic diversity that fish evolved for survival, is noted in the DEIS as follows:

"Although eight years of additional hatchery production under the Proposed Project is anticipated to achieve the production levels predicted by the EDRRA model sooner than without continued hatchery production, immediate closure of Iron Gate Hatchery and no production at Fall Creek Hatchery would eliminate most interbreeding of hatchery and natural-origin salmon by post-dam removal year 3, and would likely increase the rate at which Chinook salmon develop traits adapted to their new habitats upstream of Iron Gate Dam (Goodman et al. 2011). This could increase survival of natural-origin Chinook salmon at a faster rate than with continued hatchery operations under the Proposed Project. Goodman et al. (2011) note that this effect would depend, in part, on the degree to which local Chinook salmon stocks have been integrated into the hatchery brood stock and the degree to which the current mixed hatchery and natural-origin spawning population has maintained genetic potential for life history diversity to adapt to conditions upstream of Iron Gate Dam." [DEIR 4-307 – underline added for emphasis]

In short, the Hatchery Management Plan (HMP) for the Klamath mainstem post-dam hatchery system should continue the CDFW's mandate for utilizing only the native wild (natural) fish gene pool as the broodstock for its hatchery program, thus maximizing the gene pool and life history diversity of these salmonids (both natural and hatchery in origin) from all sources that evolved to face Klamath river conditions. Any incidental interbreeding would then simply spread the same genes more widely into the population, increasing – rather than decreasing – overall population resiliency and survival rates.

On no account should non-native stocks be used for hatchery broodstocks. Assuming this policy remains in place, there is no particular advantage to a "no hatchery alternative" so far as avoiding natural-hatchery interbreeding is concerned, and the Proposed Action is clearly better insofar as it will hasten the achievement of full recolonization of those released habitat areas above the dams in line with the EDRRA model. Additional salmon habitat restoration efforts also linked to dam removal mitigation mandates would also be expected to increase river carrying capacity for salmonids generally, thus to reduce inter-fish competition as well as to encourage faster recolonization of currently blocked areas.

As to the potential for the reduction of fish diseases (particularly C. shasta) within the river system, the Proposed Alternative and the No Hatchery Alternative are likely to be equally effective, as both will be accompanied by dam removals which will then not only restore spawning gravel to gravel-deprived areas, but would restore natural annual "flushing flows" considered necessary to mobilize and scour out and thus greatly reduce in-river habitat for the C. shasta polychete worm that is its primary disease vector.

Response to Comment ORG29-15
Section 15126.6 of the CEQA Guidelines requires that an EIR describe and evaluate a reasonable range of alternatives to the project, or to the location of the project, which could feasibly attain most of the basic project objectives but would avoid or substantially lessen any of the significant environmental effects of the project. As stated in Volume I Section 4.1.1.1 *Alternatives – Alternatives Selection/Overview – Alternatives Selection – Alternatives Carried Forward for More Detailed Analysis* (specifically page 4-6), the No Hatchery Alternative emerged from scoping concerns regarding the water source for the Iron Gate Hatchery, and in light of uncertainty regarding whether the Fall Creek Hatchery (FCH) could be timely reopened. The effects of the No Hatchery Alternative on adult returns of fall-run Chinook salmon (the target of commercial fishing efforts) are described in Volume I Section 4.7.3 *Alternatives – No Hatchery Alternative – Aquatic Resources* Potential Impact 3.3-7 (pages 4-306 to 308). Please also note that Potential Impact 3.12-9 and Section 4.7.12 *Historical Resources and Tribal Cultural Resources* discuss the potential effects on fish availability for tribal harvest under the Proposed Project and under the No Hatchery Alternative, respectively. Please also refer to Master Response AQF-2 regarding the fate of hatchery operations under the Proposed Project and alternatives.

Comment ORG29-16
We concur with the DEIR finding (Sec. 5.4.1.1) of both severe economic impacts on the coastal ocean salmon fisheries and the communities those fisheries support as a result of the Klamath dams' impacts on river salmon productivity, and the conclusion of the DEIR that the Proposed Project (i.e., 4-dam removal) will greatly benefit these salmon fishing-dependent communities, as for instance these summaries:

- *Coastal ocean fishing-dependent communities have suffered severe economic impacts due to decreases in fish numbers and related harvest limitations. USBR (2012) identified that the removal of four dams and facilities would result in notable positive regional economic benefits to commercial troll fishing of SONCC coho and Klamath River fall- and spring-run Chinook salmon." [DEIR 5-5,6]*
- *"… dam removal would advance the long-term restoration of natural fish populations in the Klamath Basin, including having a significant beneficial effect on commercial fisheries and an associated significant beneficial economic impact on the coastal commercial fishing industry." [DEIR 5-7]*

As an indication about just how dire decades of Klamath-driven declines and closures have become for the economies of once-prosperous Klamath Management Zone (KMZ) fishing ports, refer to ATTACHMENT C—Declines in KMZ Port Salmon Landings Between 1976-2017. As compared to historic landings for the average of the years 1976-1980 vs. The average of the years 2010-2017, the Port of Eureka has suffered a 96% long-term decline and the Port

of Crescent City has suffered a staggering 98% long-term decline in salmon landings.

The primary driver of these declines has been the persistent trend of decreasing salmon productivity in the Klamath Basin (see ATTACHMENT B), which in turn has been strongly driven by the enormously negative impacts of the Klamath Dams on salmonid production generally.

Response to Comment ORG29-16
Comment noted.

Comment ORG29-17
We believe that there is overwhelming evidence in the record that the Proposed Project four-dam removal and the restoration of salmonids in the Klamath River back into their historic habitat will result in far more benefits and improvements in overall water quality of the river, as well as restoring the beneficial uses of restored fisheries and wildlife, than any other option. Furthermore, the short-term (mostly 2-years) of disturbance in the system will be well worth the much greater and long-term benefits, particularly since the adverse effects of those short-term impacts can and will be considerably mitigated. We are in agreement with the DEIR support the issuance of the 401 Certification with the current reasonable conditions proposed, and as proposed to be amended by the KRRC comments and our comments herein.

This concludes our supplemental written comments at this time. Thanks for the opportunity for public input, and please make this letter part of the record.

Response to Comment ORG29-17
Please refer to Master Response GEN-1.

PacifiCorp Energy, Tim Hemstreet, Mark Sturtevant

Comment ORG46-1
PacifiCorp fully supports the KHSA as a balanced outcome for its customers, so long as all of the customer protections embodied in the agreement are achieved. Successful settlement implementation will facilitate the policy preferences of the federal government, the states of California and Oregon, Klamath Basin Tribes, and other stakeholders. From the outset, PacifiCorp has consistently held that its customers must be protected against the unknown costs and risks of implementing these policy preferences, and the liability and indemnification provisions of the KHSA were expressly negotiated to accomplish these protections. PacifiCorp remains committed to securing these protections for its customers and continues to work with the KRRC to ensure that adequate protections are in place to satisfy this foundational requirement.

Because the Draft EIR is a critical waypoint for public input and engagement about the full range of potential environmental effects that may result from

removal of four of the dams on the Klamath River, it is important to provide a deeper perspective and context for these comments to the Board. As noted by the Klamath River Expert Panel in its 2011 report on the effects of dam removal on Chinook salmon, Klamath dam removal " is an experiment in that many of the outcomes are difficult to predict, particularly those of greatest interest to stakeholders (e.g., increasing abundance of Chinook salmon)."2 This experiment has been long-advanced by certain stakeholders who believe that dam removal is the only option for improving salmonid fisheries and water quality in the Klamath River. Unprecedented in size, scope, and potential impact, the project involves drawing down three expansive reservoirs, discharging millions of cubic yards of sediment, impacting 225 miles of river within and downstream of the project, and ending hatchery programs that currently conserve listed Coho salmon and support harvest opportunities for Chinook salmon. The project will have significant near-term impacts to these important species, and the hope of the KHSA is that any significant impacts will be outweighed by long-term benefits.

Dam removal is inherently risky, but the depth of uncertainty around the potential outcome of Klamath dam removal makes this action extraordinary. Some stakeholders have embraced the idea that dam removal will result in overall benefits to the river, while other stakeholders have expressed deep concern about the costs and risks of such an endeavor. Without doubt, this proceeding will highlight this divide and bring the underlying perspectives and analysis of each stakeholder group to the forefront. For PacifiCorp, comprehensive liability protection and indemnification is essential to support prudent utility decision-making. The KHSA 's cost cap and liability protections are also central to our utility regulator's authorization for PacifiCorp to participate in the settlement process and collect $200 million in customer funds for dam removal. Without the negotiated protections of the KHSA, ultimate liability and risks from dam removal could likely fall upon PacifiCorp's customers.

Background on KHSA and PacifiCorp Customer Protections

Dam removal on the Klamath River is natural-resource-management decision that PacifiCorp, as a regulated utility, is unwilling to undertake because of the substantial risks and uncertain benefits. PacifiCorp' s perspectives are informed by our past experience addressing fish passage requirements and water quality improvements through new project licenses. This does not mean that PacifiCorp disputes that dam removal may have positive effects on the river. It simply means that the outcome is unknown, the risks are high, and that it would be imprudent to expose PacifiCorp's customers to such far-reaching risks for an uncertain outcome.

Minimizing customer risk was PacifiCorp' s primary goal in joining the original KHSA in 2009 and the amended KHSA in 2016. Faced with the unknown costs and risks associated with obtaining a new Federal Energy Regulatory

Commission (FERC) license for the project, PacifiCorp agreed to support the dam removal project embraced by California, Oregon the federal government, Klamath Basin Tribes, and other stakeholders, as long as four key principles were met: (1) PacifiCorp would transfer the dams to another entity responsible for their removal; (2) our customers' financial contribution to dam removal would be capped; (3) our customers would be protected from the potentially significant liabilities associated with dam removal and its potential known and unknown consequences; and (4) PacifiCorp would continue to operate the dams for the benefit of its customers until the facilities were decommissioned. These principles are bedrock anchors for PacifiCorp' s support of this endeavor and well-known to all KHSA signatories.

Over the past three years, PacifiCorp has worked closely with the KRRC and our other settlement partners to advance the KHSA. The KRRC' s efforts have produced noteworthy progress, but significant uncertainties remain—particularly for PacifiCorp's customers. FERC has yet to approve PacifiCorp and the KRRC's joint license application to transfer the license for the four facilities that are planned to be removed to the KRRC. That approval is a critical component of the KHSA and constitutes a key customer protection for PacifiCorp. FERC must determine that the KRRC has the financial, technical, and legal capacity to become the licensee, and FERC has stated that it will apply a heightened public-interest standard to that determination due to the unique nature of this endeavor. The KRRC is scheduled, on April 29, 2019, to provide FERC with revised cost estimates, a detailed insurance and risk-mitigation package, and the plan to address costs and liabilities that exceed the $450 million in funding available under the KHSA. After receiving this information, FERC may be in a position to rule on the request to transfer the license.

The KRRC also has yet to satisfy certain contractual preconditions to license transfer that protect PacifiCorp and the states of California and Oregon. Most importantly, KRRC must demonstrate that it has adequate funding to complete the project and that it has the capacity to fulfill its obligation to indemnify PacifiCorp and its customers. Central to both the cost and indemnification determinations is KRRC's ability to contract with a liability transfer company (LTC) consistent with KHSA Appendix L. The LTC is a cornerstone of obtaining FERC approval of the application to transfer the license for the Klamath dams to KRRC, so that KRRC can proceed to surrender the license and remove the dams. The LTC will provide a critical financial buffer if dam-removal costs or liability claims exceed the fixed funding available under the KHSA by providing assurances to all stakeholders in this process that a capitalized entity will support the KRRC to respond to potential unforeseen consequences or costs. PacifiCorp expects that our determinations under KHSA Section 7.1.4 will be reviewed by our state utility regulators in Oregon and California to determine whether PacifiCorp's decisions are prudent and in our customers ' best interest.

Compliance with California Environmental Quality Act

The Draft EIR is critical in furthering the work the settlement partners are performing. The Draft EIR is intended to provide the Board and the public, including the KHSA signatories, FERC, and other regulators with a transparent and accurate accounting of potential project impacts. From that accounting, the Board can determine whether to issue or deny a Clean Water Act section 401 Water Quality Certification for the dam-removal project, and what conditions should be imposed on the project to avoid or mitigate significant environmental impacts associated with that decision. The DEIR will also inform the settlement parties about how best to manage risk, and it will help our utility regulators evaluate whether the continued collection of funds from our customers is prudent in light of how customer risks are proposed to be mitigated. And the DEIR will aid FERC to evaluate whether license transfer and dam removal are in the public interest. Ultimately, flaws in the Draft EIR's analysis that confuse, minimize or inaccurately portray existing conditions and potential significant impacts will compromise successful KHSA implementation and dam removal.

While PacifiCorp cannot justify bearing the risk of dam removal, resource agencies—like the Board—can certainly elect to approve a project despite uncertain outcomes or significant risks. But before determining that the risks and significant environmental impacts of dam removal are worth the potential benefits, a factually and legally accurate environmental impact report must be developed, and the Board may be required to adopt a statement documenting why the project should be approved despite significant unmitigated environmental impacts. And the environmental impact report should be based on the most current and best available scientific information. Indeed, the fundamental purpose of CEQA is not to guarantee that significant impacts will not occur from a project, but rather to require an accurate and thorough assessment of potential impacts and uncertainties associated with a project so that agency decision-makers and the public can be properly informed.

In that context, PacifiCorp has taken a hard look at the Draft EIR in an effort to ensure that it is factually accurate and legally sufficient because, as noted above, any technical or legal shortcomings put KHSA implementation and ultimate dam removal at risk. PacifiCorp' s concerns are informed by its long- standing involvement in the Klamath basin as the operator of the Klamath Hydroelectric Project, and reflect our long-standing understanding of the risks and uncertainties associated with dam removal. While our comments are informed by new information, they are consistent with our previous comments on the 2011 U.S. Department of the Interior and California Department of Fish and Game Klamath Facilities Removal Public Draft Environmental Statement/Environmental Impact Report. Once again, our comments have consistently focused on ensuring that the impacts of our facilities are accurately assessed, and the benefits and risks of dam removal and alternatives are accurately portrayed so that agencies can make informed decisions the public is aware of the risks and benefits associated

with a major natural resource action, and PacifiCorp can ensure that its customers are protected from risks that are transparently acknowledged.

The issues we identify in our attached comments must be addressed to ensure the final EIR and water quality certification are legally justified and defensible. As detailed in our technical and legal comments, the Draft EIR does not meet the requirements of CEQA. Critically, it relies on outdated data, inaccurately evaluates the impacts of sediment discharges and minimizes impacts to listed species while also overstating adverse impacts related to continued operation of the Klamath Hydroelectric Project. Our comments are intended to inform and improve the environmental analysis contained in a revised and recirculated Draft EIR, and further the KHSA signatories' efforts to successfully fulfill all of the conditions of the KHSA.

Response to Comment ORG46-1
Thank you for your comment. As PacifiCorp states in this comment, this cover letter is introductory to more specific comments attached. To the extent this cover letter includes topics that warrant further response, these are addressed in responses to the more detailed following comments, ORG46-2 through ORG46-516.

Comment ORG46-2
Recent field monitoring data (MKWC2016, 2017, 2018; Chesney and Knechtle 2017; Knechtle and Chesney 2017), indicates that the Coho population upstream of Portuguese Creek (including the Scott and the Shasta rivers) is extremely small; perhaps less than 1,000 adults in most years, which is well below the risk thresholds associated with abundance set by NMFS (2014) in the Recovery Plan. While adults mainly spawn in the tributaries, some do spawn in the mainstem Klamath River, and any deposited eggs in the mainstem will die as a result of sedimentation within the spawning areas (see Waters 1995; Quinn 2005) the year dams are removed (See Major Issue 2.4). Juvenile Coho use the mainstem throughout the year (Soto et al. 2016b; Man hard et al. 2018), both for rearing in cool-water and low velocity refuge habitat, and as a movement corridor from natal to non-natal habitat.

The few adult Coho that spawn in the tributaries in turn produce relatively few juveniles. In some streams and in some years, approximately 25 percent of the rearing juveniles will leave the tributary for the mainstem in the winter (Soto et al. 2016b; Manhard et al. 2018). Juvenile Coho moving into the mainstem Klamath River will be subject to increased direct mortality rates, decreased fitness and condition, and likely will be more susceptible to disease. These fish would suffer increased mortality (20–40 percent according to Appendix Table E-10 (DEIR pg. E-36) from high suspended sediment concentrations generated by reservoir drawdown. The DEIR assumes these fish will not leave the tributaries or, if they do, will find refuge in cleaner-water inflows along the mainstem; however, the DEIR does not acknowledge that these cleaner-water areas will be crowded with

fish from the entire river also seeking refuge, nor does the DEIR discuss the corresponding impacts to juvenile Coho from competition or direct predation. If Coho survive to rear in these conditions, these factors could reasonably be expected combine to create juvenile Coho in relatively poor body condition (Ebersole et al. 2006; Weybright and Giannico 2018), which will in turn reduce their survival rate in the ocean (Gorman 2016).

Iron Gate Hatchery currently operates under a Hatchery and Genetics Management Plan (CDFW and PacifiCorp 2014) that supports an integrated conservation program for Coho Salmon listed as threatened under the Endangered Species Act. Dam removal and associated impacts to Iron Gate Hatchery will likely end this support of the Coho populations. While there is funding for 8 years of continued hatchery operations included in the Klamath Hydroelectric Settlement Agreement (KHSA) under Interim Measure 19, the relocation of the program from Iron Gate Hatchery to Fall Creek and lack of an identified funding source 9 years after dam removal creates uncertainty regarding the ability of hatchery releases to continue to support this population. Currently, an average of 50 percent of the Coho spawning naturally in Bogus Creek and the Shasta River are Iron Gate Hatchery fish (Chesney and Knechtle 2017; Knechtle and Giudice 2018a). When these population are no longer supported by hatchery releases they are likely to dramatically decrease in size. There is no analysis in the DEIR that evaluates the impact of the loss of this hatchery program on Coho populations.

The Proposed Project would add additional stress to outmigrating juveniles; however, the DEIR fails to indicate what this means in terms of the population. The population of Coho is small enough that even a modest increase in mortality rate (either through reduced fitness, predation, or increased susceptibility to disease) could reduce the number of returning adults. Naman and Perkins (2015) noted that on the Trinity River "...because of low population size of unmarked coho [sic] salmon, managers should take measures to limit the mortality of any new fisheries on the natural component of the run." Although this comment is focused on mortality from harvest, the rationale applies equally to the upper Klamath Coho population and mortality that will occur as a result of the Proposed Project. Because the overall Coho population in the Upper Klamath River is already very small, there is a significant and unanalyzed risk that Coho populations would not survive such a mortality event.

Response to Comment ORG46-2

PacifiCorp discusses additionally available analysis and field monitoring data on coho salmon in the Klamath River. Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species – Fish – Anadromous Salmonids* has been modified to include the new data. Please refer to Volume III Attachment 1 Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species – Fish – Anadromous Salmonids* for the revisions.

PacifiCorp cites Soto et al. (2016b) and Manhard et al. (2018) to assert that the Draft EIR underestimated the potential impacts of the Proposed Project to juvenile coho salmon produced in tributaries that migrate from tributaries into the mainstem "during winter," and thus would be susceptible to impacts from suspended sediment.

Impacts to coho salmon resulting from suspended sediment are detailed in Volume II Appendix E Section E.3.2.3 *Results – Coho Salmon* and are summarized in Volume III Attachment 1 Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts – Potential Impact 3.3-9*. The central notion of the PacifiCorp assertion is that juvenile coho salmon use the mainstem throughout the year both for rearing in cool-water and low velocity refuge habitat, and as a movement corridor from natal to non-natal habitat, based on the observations of Soto et al. (2016b). Manhard et al. (2018) does not include new observations or data, but rather draws on the results of Soto et al. (2016b) and others to describe productivity, survival, and migration patterns of coho salmon in the Klamath River Basin.

Soto et al. (2016b) describe migration of coho salmon into the "mainstem Klamath River corridor," which refers not only to the mainstem Klamath River, but also to side channels, off-channel habitats (alcoves, ponds, and groundwater channels associated with the floodplain), and the lower reaches of small tributaries. These more protected areas of the river corridor all would provide refuge from the anticipated increases in suspended sediment under the Proposed Project. It is these refuge habitat locations that Soto et al. (2016b) documented coho salmon migrating to, whereas juvenile coho salmon rearing in the mainstem is a rare occurrence. Soto et al. (2016b) refer to the observed coho salmon in the mainstem as a "re-distribution migration," and not mainstem rearing

The EIR assesses the impacts of suspended sediment on coho salmon juveniles that use the mainstem during winter (November 15th through February 14th), and thus this impact is accounted for in the analysis. In addition, Soto et al. (2016b) report that most of the observed re-distribution of juvenile coho salmon from natal streams to these habitats occurs during "spring, early summer, fall, and early winter," and would avoid the predicted peak in suspended sediment in January of dam removal year 2. The most substantial numbers of migration into the mainstem are observed during spring and early summer (after the peak in suspended sediment), and an extensive re-distribution with the advent of the first fall rain events (prior to the peak in suspended sediment). It is unsurprising that coho salmon would have adapted to avoid periods of naturally high suspended sediment in the Klamath River. In addition to general migration timing, juvenile salmonids also actively avoid exposure to high Suspended Sediment Concentrations (SSCs).

Many of the migrations observed by Soto et al. (2016b) were to locations far downriver from the confluence with the Salmon River, and well within areas predicted to experience similar levels of suspended sediment to existing conditions.

PacifiCorp further asserts that juvenile coho salmon using higher water quality refugia in the mainstem Klamath River corridor would be vulnerable to the effects of increased rearing density, such as competition, predation and poor body condition. However, there is no reason to predict a substantial increase in density in refuge habitats; juvenile coho salmon and other fish are currently using these locations as refuge from seasonally poor water quality in the mainstem Klamath River, and increased migration from tributary natal streams is not anticipated. In addition, although no substantial impact on coho salmon populations is anticipated, the Klamath River Renewal Corporation (KRRC) is implementing Proposed Aquatic Resource Measure AR-2, which is designed to protect coho salmon juveniles using mainstem Klamath River corridor refuge habitat during dam removal years 1 and 2. As further described in the Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts – Potential Impact 3.3-9*, Proposed Aquatic Resource Measure AR-2 includes salvage of juvenile mainstem coho prior to reservoir drawdown, monitoring and salvage during and after dam removal, and ensuring tributary-mainstem connectivity. These actions would effectively reduce the number (and density) of coho salmon juveniles and smolts potentially exposed to periods of high SSCs in the mainstem habitat following dam removal, and therefore reduce the proportion of the population experiencing sub-lethal effects or mortality beyond what is estimated in Appendix E.3.2.3.

PacifiCorp asserts that when coho salmon are no longer supported by hatchery releases they are likely to dramatically decrease in abundance, and that there is no analysis in the Draft EIR that evaluates the impact of the loss of this hatchery program on the coho salmon population.

As described in Volume I Section 2.7.6 *Proposed Project – Proposed Project – Hatchery Operations* (page 2-77), under the Proposed Project, the Fall Creek Hatchery (FCH) would be reopened, and both the Iron Gate Hatchery and Fall Creek Hatchery would continue to operate for a period of eight years following dam removal, with the same level of coho salmon production as under existing conditions. It is uncertain whether Fall Creek hatchery will close at that point, or whether it will continue operation in some capacity. For purposes of analysis, the EIR makes the conservative assumption that the hatchery operations will cease, as there is no concrete plan or identified funding source for continued operation.

Volume III Attachment 1 Section 3.3.5.6 *Aquatic Resources – Potential Impacts and Mitigation – Fish Hatcheries* and Potential Impact 3.3-9 in Volume III Attachment 1 Section 3.3.5.6 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* provide a detailed analysis of the effect

of ending hatchery production for coho salmon after eight years under the Proposed Project. As described, available information indicates that the benefits from dam removal and cessation of hatchery operations would increase adult returns by more than the loss of hatchery progeny.

Please also refer to Master Response AQF-2 for a discussion of the assumption of hatchery closure after eight years.

PacifiCorp asserts that the Draft EIR does not analyze the population level effect of additional stress to outmigrating coho salmon smolts resulting from the Proposed Project, citing Naman and Perkins (2015) to suggest that modest increases in mortality can result in reduction in returning adults.

Potential Impact 3.3-9 in Volume III Attachment 1 Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* and Volume II Appendix E Section E.3.2.3 *Results – Coho Salmon* (pages E-35 to E-38) provide a detailed analysis of the effects on the coho salmon population of short-term impacts to coho salmon rearing in the mainstem, and to outmigrating smolts. The population-level effects of the Proposed Project in the short-term are summarized in Potential Impact 3.3-9 in Volume III Attachment 1 Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts*. The Naman and Perkins (2015) study on Trinity River fishing assessed mortality to *adult* coho salmon, and its findings are not transferrable to population level effects of stress to outmigrants.

Regarding the Portuguese Creek population and the comment's assertion regarding its risk threshold, please see response to comment ORG46-4. For additional discussion about significance thresholds, please refer to response to comment ORG46-199 and Master Response AQF-9.

Comment ORG46-3

2.1.2 Proposed Project Impacts to Coho Salmon Upstream of Portuguese Creek

The DEIR characterizes the short-term impacts from the Proposed Project on Coho as not significant with application of mitigation. There are several issues with this conclusion. The following discussion focuses solely on the DEIR impact analysis as it relates to sediment transport and does not discuss the DEIR's chosen threshold for significance (loss of 50 percent or more of the total Klamath River Coho population) or other technical issues. The purpose of the following discussion is to provide a more comprehensive overview than is provided in the DEIR regarding the existing upper Klamath River Coho populations, address impacts to these fish from suspended sediment, and clarify the uncertainty associated with the Proposed Project's impacts to Coho Salmon.

Adult Populations. The Coho population in the upper Klamath River and its tributaries is very small (Figure 1). The CDFW has maintained counting stations

on Bogus Creek, Scott River, and Shasta River consistently since 2007 (Knecht le 2019). The population trend over this period has been downward for Bogus Creek and the Shasta River. The Scott River population appears to be larger and more variable in total returns than any of the other tributaries in the upper Klamath River.

Since 2015, the Mid-Klamath Watershed Council has conducted spawning Coho surveys of tributaries from Bogus Creek downstream to Portuguese Creek (not including the Shasta and Scott rivers). Of the 15 streams surveyed annually, Coho are reliably found only in Horse Creek and Seiad Creek with the occasional fish or two in other streams. Over the 4 years these surveys have been conducted, on average there appear to be about 191 natural-origin Coho per year using these tributaries (MKWC 2016, 2017, 2018, preliminary 2019 data).

Coho return data for Iron Gate Hatchery is available since the hatchery started operating in 1962 (Figure 2). While the long-term average Coho return is 985 fish, this data also illustrates the variable nature of Coho returns over the years. Since 1962, there are only 4 years with more than 2,500 Coho returning to the hatchery, but 13 years with fewer than 250 Coho (Figure 2). Although the last 4 years have seen a gradual increase in adults (Figure 2), it is too soon to tell if this will continue, especially because a similar trend is not apparent in the downstream tributaries.

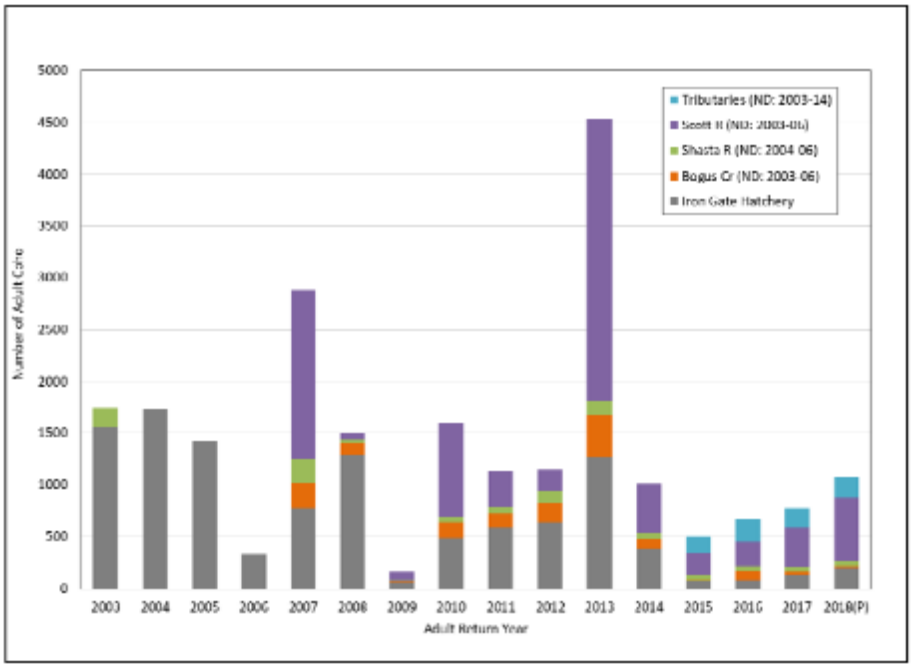


Figure 1. Adult Coho returns to the Klamath River and tributaries upstream of Portuguese Creek. (2018 data is preliminary, Data from COFW 2018b, Knechtle 2019).

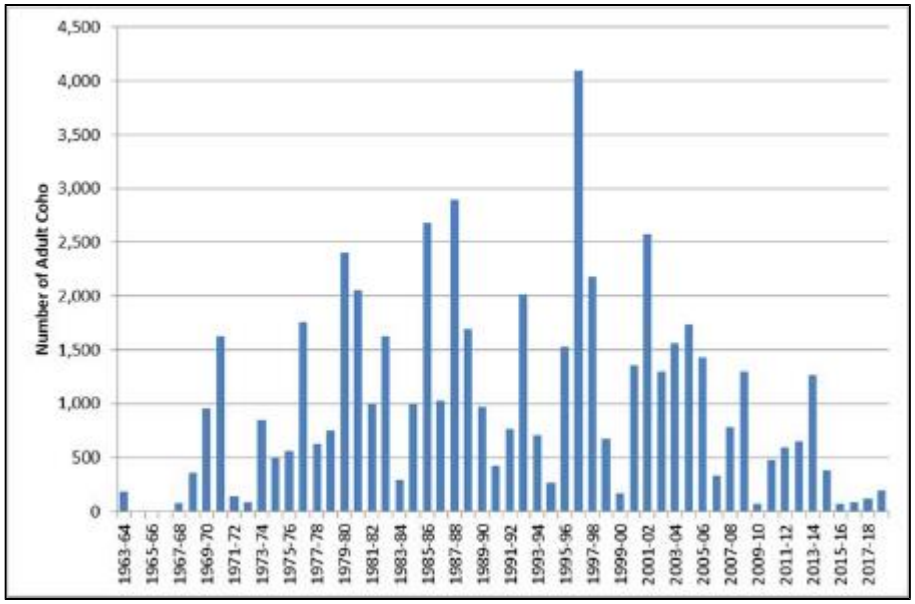


Figure 2. Adult Coho Returns to Iron Gate Hatchery on the Klamath River, 1962 through 2019 (CDFW 2018b).

Juvenile Populations. Juvenile Coho are found in the mainstem Klamath River and its tributaries throughout the year (Soto et al. 2016). Coho spend about a total of up to 18 months in freshwater (from emergence to outmigration) before they migrate to the ocean. During this period, they can exhibit any of several life history patterns. Some spend that entire time in one stream, others move from a creek into the mainstem Klamath River for a while sometimes moving back into the same creek or another stream as river conditions dictate. Still others move into the Klamath River, distribute downstream, and then move into non-natal rearing habitats (creeks, off-channel ponds, groundwater springs, etc.). Soto et al. (2016) indicate that the Klamath River provides important habitat for juvenile Coho throughout the year; during the summer periods this use is likely limited to refugia habitats in or adjacent to the mainstem river. Of particular note for the Proposed Project are the spring and early winter redistributions of juvenile Coho from natal streams to non-natal rearing habitat. Soto et al. (2016) hypothesized that juvenile Coho that leave rearing habitat in mid-winter are in search of higher-quality habitat, but are not prone to make long-distance movements.

Response to Comment ORG46-3

PacifiCorp provides a summary of data on coho salmon in the Klamath River upstream of Portuguese Creek. PacifiCorp discusses adult coho salmon return data for Iron Gate Hatchery (CDFW 2018d) that is not included in Section 3.3 *Aquatic Resources*; however, this data is very similar to what was included in Section 3.3 *Aquatic Resources* (CDFW 2016b). Additionally, the natural-origin coho salmon return data to tributaries from Bogus Creek downstream to Portuguese Creek does not change the EIR's analysis of potential impacts to

coho salmon due to increased suspended sediments due to the fact that very few coho salmon are expected to spawn in the Klamath River (0-13 redds). This additional information is included in the record, but not added EIR analysis because it does not differ substantively from the data that are already included and discussed, and therefore would not change the analysis, or conclusions of the EIR.

Comment ORG46-4

2.1.3 Coho Mortality from Suspended Sediments

Mainstem Spawning Adults. Even though most Coho spawn in the tributaries, those fish that do spawn in the mainstem would suffer 60-80 percent mortality from sediments mobilized by the Proposed Project (DEIR pg. 3-318). This is up from 20–40 percent present under existing conditions–a 40 percent increase in the mortality rate that is solely attributable to the Proposed Project. Granted this is a small number of individual Coho, perhaps a couple of dozen fish, but the mainstem population could make up about 14 percent of the total population between Portuguese Creek and Iron Gate Dam assuming the average population is about 191 Coho as has been recently documented (not including Bogus Creek) (Table 1). While suspended sediment may kill an added 40 percent of the adults, it is reasonable to expect suspended sediment concentrations would kill 100 percent of the eggs and alevins (newly hatched fish) from mainstem spawning Coho. The DEIR discounts these adult Coho as hatchery fish that did not migrate all the way to the hatchery. That may be the case, but the Iron Gate Hatchery is managed as an integrated hatchery under a Hatchery Genetics Management Plan (HGMP; CDFW and PacifiCorp 2014) with the entire upper Klamath Coho population, making each of these fish of critical importance to the overall population. Currently, Coho returning to Iron Gate Hatchery make up about 65 percent of all returning spawners upstream of Portuguese Creek (including the Scott and Shasta rivers).

Tributary Spawning Adults. When populations are comprised of very few individuals, they can experience difficulties finding mates, which in turn reduces fertilization rates and limits production of young. This in turn results in increased per capita predation rates, and decreased overall survival (Williams et al. 2008). The threshold at which these effects are apparent is the depensation threshold for the population. As noted in Williams et al. (2008) failure to achieve depensation thresholds can exacerbate the rate of decline towards extirpation and extinction. This context is important for the discussion of impacts of the Proposed Project on Coho in the upper Klamath River because populations are generally smaller than these depensation thresholds and therefore, even a small change in abundance can have a substantial effect on the population.

Table 1. Annual counts of adult Coho at Iron Gate Hatchery, video weirs in Bogus Creek, Shasta River, and Scott River, and spawning survey estimates from other tributaries between Bogus Creek and Portuguese Creek from 2003–2018.

Adult Return Year	Iron Gate	Bogus Creek	Shasta River	Scott River	Other Tributaries
2003	1558	No Data	187	No Data	No Data
2004	1734	No Data	No Data	No Data	No Data
2005	1425	No Data	No Data	No Data	No Data
2006	332	No Data	No Data	No Data	No Data
2007	779	233	249	1622	No Data
2008	1296	111	30	62	No Data
2009	70	6	9	81	No Data
2010	485	154	44	911	No Data
2011	586	142	62	344	No Data
2012	644	182	115	201	No Data
2013	1268	405	134	2731	No Data
2014	384	94	46	485	No Data
2015	72	14	45	212	156
2016	86	85	52	226	222
2017	122	44	41	382	186
2018 (Preliminary)	198	24	40	614	200
Average	**690**	**125**	**81**	**656**	**191**

Sources: Knechtle 2019; MKWC 2016, 2017, 2018, and preliminary 2019 data)

The Upper Klamath River Coho population as defined in the NMFS (2014) recovery plan, does not include the Scott and Shasta rivers populations or the Iron Gate Hatchery fish. The depensation thresholds for the Upper Klamath Coho population is 425 adult Coho, for the Shasta River it is 531 adult Coho, and for the Scott River it is 441 adult Coho (Williams et al. 2008). The Upper Klamath adult returns have been below this threshold since at least 2013 (spawning estimates for Coho in tributaries between Bogus Creek and Portuguese Creek are not available until 2015; Figure 3). The population in the Shasta River has not been above the depensation threshold for the entire period for which data is available (Figure 4). The Scott River population seems to be slightly more robust than the other two populations with 2 out of the last 5 years above the depensation threshold (Figure 5).

Coho on the Klamath River show a distinct 3-year life cycle, and adult returns are driven by the relative strength of an individual brood year with almost no overlap between years. Review of return data indicates that 2007 is the strongest of the three brood years and led to more adult s returning in 2010, 2013, and so on (Table 1). This is important to consider because if an entire year-class is eliminated, that year class may not re-establish itself.

Most of the tributary spawning adults are likely to have reached their spawning grounds before suspended sediment concentrations in the mainstem become lethal. The DEIR analysis indicates that the median conditions under existing conditions could be expected to have some "moderate habitat degradation and impaired homing" (DEIR Table E-4). Under the Proposed Project, the effects of suspended sediment concentrations under the same median flow conditions are expected to result in

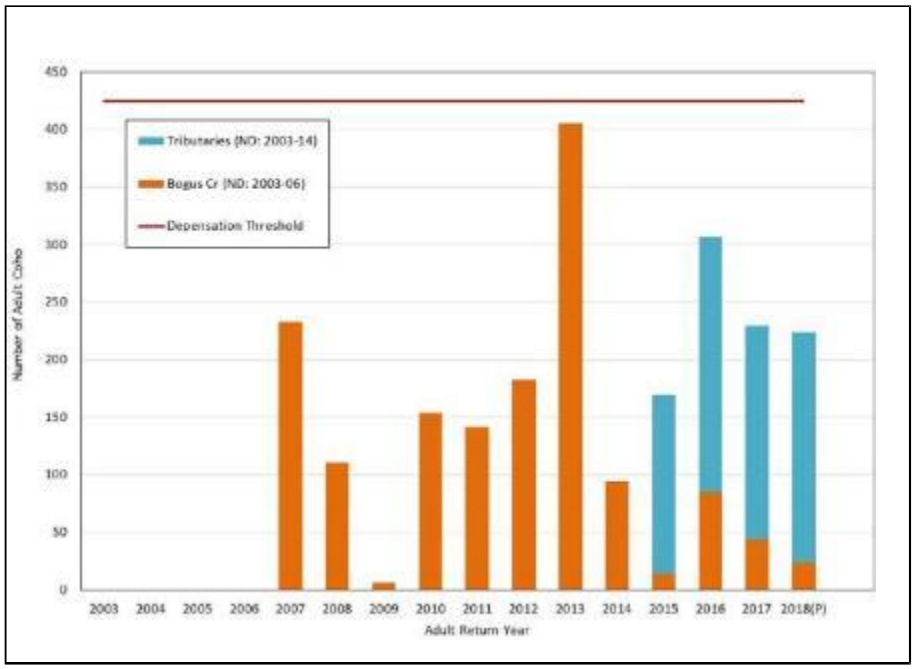


Figure 3. Adult Coho Returns to the Upper Klamath River Population - Portuguese Creek to Iron Gate Hatchery {2018 data is preliminary, Data from CDFW 2018b, Knechtle 2018, Depensation threshold from Williams et al. 2008).

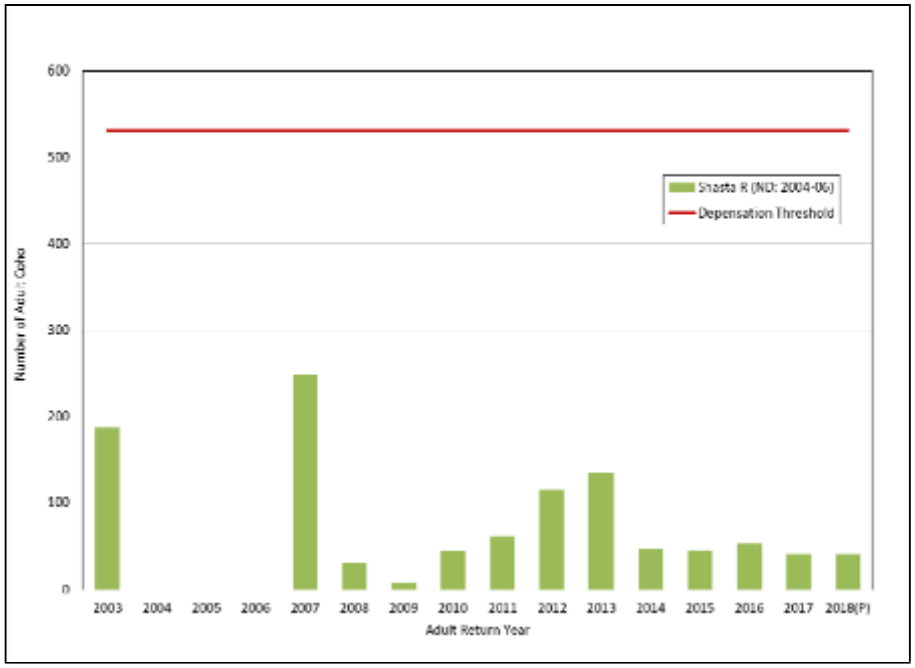


Figure 4. Adult Coho Returns to the Shasta River Population (2018 data is preliminary, Data from Knechtle 2018, Dispensation threshold from Williams et al. 2008).

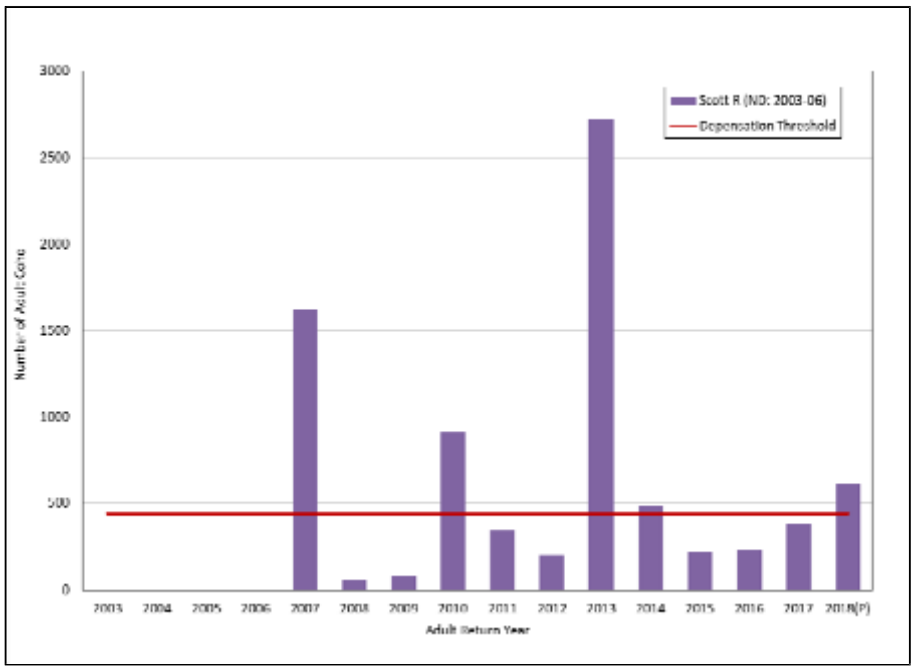


Figure 5. Adult Coho Returns to the Scott River Population {2018 data is preliminary, Data from Knechtle 2018, Depensation threshold from Williams et al. 2008).

"major physiological stress; long-term reduction in feeding; and poor condition " (DEIR Table E-10). This is an increase in adverse conditions associated with the Proposed Project for adult Coho, but still sub-lethal. The reduction in feeding rates are not important for the adults, but changes in condition as a result of physiological stress could reduce fecundity and affect the spawning success even if the adults survive their transit of the mainstem to reach tributaries.

Juvenile Coho in the Mainstem. Juvenile Coho use the mainstem Klamath River throughout the year (Soto et al. 2016), although summer-time use is probably limited to cool-water refugias. About 30 percent of the tagged juvenile Coho in Seiad Creek emigrated from the creek to the Klamath River between the beginning of November, 2010 and the end of February, 2011 (Soto et al. 2016). While Manhard et al. (2018) caution that juvenile Coho migrate in different patterns when coming from different streams, their modeling of migration patterns indicates that between 19 and 24 percent of the juvenile Coho present in a tributary population may leave that tributary during the winter months.

The DEIR assumes that those juvenile Coho that migrate early in the year (January through March) are few in number and would find refuge from elevated suspended sediment concentrations in the mainstem in off-channel habitats, tributary inflows, or tributaries themselves. While fish do actively avoid areas of high suspended sediment concentrations, naturally-generated events do not last for 6-8 weeks like under the Proposed Project. Because of the duration of the Proposed Project-generated suspended sediment concentrations, there would be little escape for Coho leaving tributaries during the winter. It is also reasonable to expect that <u>all</u> the fish (e.g., resident trout, Chinook, Steelhead, etc.) in the river may be trying to access those very same refuge habitats. There is some indication that there may already be density dependent interactions occurring in refuge habitats (Soto et al. 2016). Forcing more fish to use these areas would increase the risk to Coho from predation, competition for space and food, and disease exposure; this potential impact on Coho is not addressed in the DEIR. The DEIR' s assumption that Coho will simply avoid periods of high turbidity does not reflect complexities of actual fish behavior or the likelihood that the Proposed Project could result in high rates of mort alit y of juvenile fish that originated from the tributaries. Because the overall Coho population in the Upper Klamath River is already very small, it is not clear if the populations could survive such a mortality event.

During the January-t o-March drawdown period, suspended sediment concentrations are expected to result in 20-40 percent mortality for all age classes of juvenile Coho in the mainstem (DEIR Table E-10). This is higher than the sub-lethal "moderate to major stress" levels predicted for existing conditions (DEIR Table E-4). Deposition of sediment in mainstem refugia could eliminate these habitat s. Similarly, deposition of sediment at the confluences of tributaries with the Klamath River could eliminate mainstem refugia and limit juvenile access to areas of higher water quality in the tributaries.

The DEIR posits that existing Coho outmigrants face high mortality under existing conditions for a variety of reasons and that the Proposed Project could result in even higher mortality in the spring of 2021 (DEIR pg. 3-319). While the DEIR does not indicate what the incremental change in juvenile mortality may be, it would appear that the upper Klamath River Coho populations are small enough that even a minor change in mortality could have dramatic results on adult escapement and the viability of these populations. Because there are so few juvenile Coho in the river, juvenile Chinook are used as a surrogate for assessing disease levels. The rate of Ceratonova shasta (C. shasta) infection in fish has ranged from about 12 to 96 percent from 2005 through 2015 (Som et al. 2016). As fish become more stressed by environmental condit ions (lack of food, space, increased competition, etc.) they become more susceptible to disease. This would make them more likely to contract common fish diseases including Ich (Ichthyophthirius multifilis), Columnaris, or Parvicapsula minibicornis, all of which can be lethal.

Response to Comment ORG46-4

Potential Impact 3.3-9 in Volume III Attachment 1 Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* and Volume II Appendix E Section E.3.2.3 *Results – Coho Salmon* (pages E-35 to E-36) are consistent with PacifiCorp's summary of the importance of tributary spawning for Klamath River coho salmon, and the predicted impacts to adult migrating coho salmon from suspended sediment under the Proposed Project. This analysis addresses the concerns raised by PacifiCorp regarding potential sublethal effects to adult migrating coho salmon adults returning to tributaries, including an assessment that few coho salmon adults are predicted to be in the mainstem in January when the highest levels of reservoir sediment would be released.

In Section 2.1.3 of their comment letter, PacifiCorp suggests that the population level impact of the loss of redds from mainstem spawning coho salmon could be 14 percent of the total population between Portuguese Creek and Iron Gate Dam (designated by National Marine Fisheries Service [NMFS] as the Upper Klamath River population following Williams et al. 2006). This estimate appears to be based on the observation of 13 redds in 2001 (equating to 26 adults presumably assuming two adults per redd), and a total adult population of coho salmon in that reach of 191 based on the average of four years of returns from 2015 through 2018 to tributaries in the reach, while excluding returns to the mainstem, Bogus Creek and Iron Gate Hatchery (summarized in Table 1). Presumably Iron Gate Hatchery returns are excluded as it is less likely that those fish would spawn naturally (although, as noted in the EIR, many of the mainstem spawning coho are likely straying hatchery fish). However, there is no logical or scientific basis for excluding Bogus Creek returns, or the mainstem spawning counts from the estimate.

The “14 percent of the total population between Portuguese Creek and Iron Gate Dam” described by PacifiCorp is misleading. The more logical and scientifically defensible estimate of the likely mainstem contribution is presented in Volume II Section E.3.1.3 of Appendix E. In sum, based on the range of escapement estimates of Ackerman et al. (2006), 13 redds (the highest number observed) would be much less than one percent of the natural and hatchery returns combined. Coho salmon are distributed throughout the Klamath River downstream from Iron Gate Dam, and spawn primarily in tributaries (Trihey and Associates 1996, NRC 2004). During their upstream migration, adult coho salmon from the Upper Klamath River Population Unit may travel upstream as far as Iron Gate Dam (river mile [RM] 193.1) and were formerly known to occupy mainstem Klamath River and tributary habitat at least as far upstream as Spencer Creek at RM 232.6 (NRC 2004, as cited in NMFS 2007a). Thus, the mainstem Klamath River functions primarily as a migration corridor for coho salmon. Coho salmon are typically tributary spawners (NMFS 2010a) and based on Magneson and Gough (2006) spawning surveys from 2001 to 2005, only from 0 to 13 redds are typically observed in the mainstem. In 2015, no redds were observed in the mainstem Klamath River between Portuguese Creek (RM 128) and Bogus Creek (RM 192.6) (Hentz and Wickman 2016), and seven were observed in 2017 in the same reach (Dennis et al. 2017).

In addition, PacifiCorp assesses impacts on coho salmon based on the nine historical populations within the Klamath River Basin, which segregates returns from coho salmon upstream of Portuguese Creek into the Upper Klamath River Population. PacifiCorp uses this segregation approach to raise concern regarding the depensation threshold for coho salmon described by Williams et al. (2008), noting that when populations are at lower abundances than depensation thresholds, small reductions in abundance can have a detrimental impact. Assessing the significance of impacts assigned to this historical population unit is misleading. The historical unit is not sufficiently analogous to the present-day population because of the significant curtailment of its historic range, which extended far upstream of Iron Gate Dam. Notably, Williams et al. (2008) describe the highest intrinsic potential for spawning coho salmon in the historical population unit that extended upstream of Iron Gate Dam to Spencer Creek. The comment does not extend the logic of its historic population focus to the benefits of the proposed project – the extension of habitat for this historic population back into its former range. Citing depensation thresholds as a concern without addressing the range is misleading, since the NMFS 2014 Southern Oregon/Northern California Coast (SONCC) Recovery Plan (NMFS 2014) specifically identifies restoring habitat access upstream of Iron Gate Dam as a high priority to recover the coho population and address the current low spawner densities. In addition, the Iron Gate Hatchery operates for the purpose of coho salmon conservation, and, as described in the EIR, would continue to produce coho salmon smolts during and following dam removal, which directly addresses the current low spawning densities of the population and concerns regarding the depensation threshold.

The “small population of Coho in the mainstem Klamath River…” referenced in this comment is not a separate population of coho salmon by the designation of any fisheries regulator and is not a meaningful unit of analysis for the EIR. In the coho recovery plan, NMFS (2014) groups populations with similar geologic and genetic features into seven diversity strata, following the work of Williams et al. (2006). In assessing risk and recovery of the Evolutionarily Significant Unit (ESU), NMFS considers the Interior Klamath River Diversity Stratum, which includes the Middle Klamath River, Upper Klamath River, Salmon River, Scott River, and Shasta River populations designated by Williams et al. (2006). The EIR considers the nine historical populations within the Klamath River Basin in analysis but conducts the analysis of significance consistent with the NMFS 2014 SONCC Recovery Plan, which assesses all of the coho salmon in the Klamath River Basin as part of the same ESU. The EIR acknowledges the low abundance of the coho salmon population consistent with the alarm and concern raised by PacifiCorp. As noted in Volume I Section 2.1 *Project Description – Project Objectives* (page 2-1) the Proposed Project is a restoration project intended to improve fishery conditions.

In Volume II Section E.3.2.3, the maximum of 13 redds observed in 2001 was selected to present the highest potential impact, since this is the highest count observed in over 15 years, while in many years no coho salmon redds were observed in the mainstem. Assuming one female and one male per redd, this could represent at most 26 returning adult coho salmon. Based on average adult returns presented by PacifiCorp in Table 1 of their comments on the EIR (and the maximum of 13 redds assumed to occur in the mainstem), this would be at most less than 1 percent of the coho salmon adult returns upstream of Portuguese Creek. Even if the Williams et al. (2006) Upper Klamath River Unit were adopted (contrary to the NMFS approach for assessing risk and recovery), this would be 8 percent of adult coho salmon returns if Iron Gate Hatchery, Shasta River, and Scott River returns are ignored. PacifiCorp comments do not support an assertation that this level of loss of redd production from infrequent mainstem production of coho salmon would present a substantial short-term decrease in coho salmon abundance of a year class.

PacifiCorp cites Soto et al. (2016b) and Manhard et al. (2018) to assert that the Draft EIR underestimated the potential impacts of the Proposed Project to juvenile coho salmon produced in tributaries that migrate from tributaries into the mainstem “during winter,” and thus would be susceptible to impacts from suspended sediment. Potential Impact 3.3-9 in Volume III Attachment 1 Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* and Volume II Appendix E Section E.3.2.3 *Results – Coho Salmon* (pages E-35 to E-38) provide a detailed analysis of the effects on the coho salmon population of short-term impacts to coho salmon rearing in the mainstem, and outmigrating smolts. The comment suggests that sediment deposition under the Proposed Project may further reduce opportunities to avoid

suspended sediment impacts by “filling in” refuge habitat. Such deposition is not predicted under the Proposed Project (see Master Response GEO-1). Additionally, the analysis of impacts to mainstem rearing coho salmon concludes high potential rates of mortality in large part because the assessment conservatively assumes that coho salmon do not locate refuge habitat. Please also refer to response to comment ORG46-2 regarding coho use of the mainstem Klamath River.

Potential Impact 3.3-9 in Volume III Attachment 1 Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* and Volume II Appendix E Section E.3.2.3 *Results – Coho Salmon* (pages E-37 and E-38) includes a discussion of the cumulative impacts of exposure to suspended sediment, water quality, and disease on coho salmon fry, juveniles, and smolts.

Comment ORG46-5

2.1.4 Population Level Impact of the Proposed Project

The DEIR says that "...Coho salmon smolts outmigrating from the Upper Klamath River, Scott River, and Shasta River populations currently have high mortality rates (35 to 70 percent) presumably as a result of poor water quality and disease (Beeman et al. 2007, 2008)"[1] (Appendix E pg. E-38). The Proposed Project would add additional stress to outmigrating juveniles; however, the DEIR fails to indicate what this means in terms of the population. The population of Coho is small enough that even a modest increase in mortality rate (either through direct mortality, or indirect through reduced fitness, predation, or increased susceptibility to disease) could reduce the number of returning adults. With most of the Coho populations below depensation thresholds, it is unclear how these populations would respond to this event.

Uncertainty. The DEIR acknowledges that there is uncertainty associated with the effects of the Proposed Project on Coho. While the DEIR extensively references the Expert Panel report on Coho and Steelhead (Dunne et al. 2011), there is not an adequate discussion of the implications of this uncertainty. Dunne et al. (2011) repeatedly reinforce that what could ultimately happen to the Coho population from the Proposed Project is not clear and note that while there may be a small increase in production from newly accessible habitat, disease and low ocean survival could easily offset this gain. It is also important to recall that the determinations by the Expert Panel included the implementation of the Klamath Basin Restoration Agreement (KBRA), an element that is no longer available to, in part, provide funding and structure for restoration in the basin. If the Expert Panel thought that the outcome was uncertain in 2011, that level of uncertainty has increased in 2019 without the elements of the KBRA that were intended to improve habitat function and result in water quality improvements in the Upper Klamath Basin that might address acknowledged fish passage impediments.

The suspended sediment modeling and the effects analysis relating to Coho attempts to address some of the uncertainty associated with the effects of the

Proposed Project by using the 10th, 50th, and 90th, exceedance probabilities. While helpful if properly done, the analysis in the DEIR uses the sediment transport modeling incorrectly (see Major Issue 2.4 and Brookes 2019), is incomplete, and does not help the reader understand the potential effects of the Proposed Project. The analysis fails to make the connection between the effects of increased suspended sediment concentrations on Coho and the population of Coho present that will be impacted by these changes.

Recolonization at low abundance levels. There are few Coho left in the upper Klamath Rive r populations (Figure 1). Few Coho return to Bogus Creek and even fewer to the Shasta River, and it appears that less than 200 Coho annually spawn in the tributaries of the Upper Klamath from Iron Gate Dam to Portuguese Creek. These populations are below the abundance risk thresholds and mostly below depensation thresholds established in the recovery plan (NMFS 2014, Williams et al. 2008). Although adult straying is a natural event in salmon, it is a relatively infrequent occurrence. The main population from which recolonization could occur is adult Coho returning to Iron Gate or Fall Creek hatcheries. Although straying rates vary greatly amongst species and populations and specific rates are difficult to establish without an abundance of tagging data (see Quinn 2005), if there are only a couple hundred natural Coho in this population to start with there may not be many adults available to stray into the newly accessible habitat. Because all the Coho released from Iron Gate Hatchery are clipped, the number of Coho available to recolonize the areas upstream of Iron Gate Dam can be estimated by the number of natural-origin fish that return to Iron Gate Hatchery annually because the se natural-origin fish are straying into the hatchery. The average number of natural-origin fish entering the hatchery from 1997 through 2017 was 30 adult Coho (Giudice and Knechtle 2018); there is no sex information readily available on these strays so it is impossible to evaluate the true recolonization potential. Even if females make up half of this straying population, 15 pairs of Coho on average does not seem like enough fish to effectively recolonize the area upstream of Iron Gate Dam and any straying that does occur reduces the population size in the source streams.

Hatchery Operations. The ability of Iron Gate Hatchery and the redeveloped Fall Creek Hatchery to capture fish after Iron Gate Dam is removed remains is uncertain. Coho may or may not successfully home to these facilities. The importance of hatchery production in maintaining the Upper Klamath population cannot be overemphasized. Adult Coho escapement data indicate that on average, approximately 50 percent of the Coho spawning naturally in the Shasta River and Bogus Creek were of hatchery origin (Chesney and Knechtle 2017; Knechtle and Giudice 2018). This percentage indicates that all of the natural production in these two streams may only be one generation or less removed from the hatchery. Failure of the hatchery or cessation of the hatchery program could permanently reduce these populations of Coho by 50 percent.

Response to Comment ORG46-5
The comment asserts that the Draft EIR fails to consider population level impacts on coho salmon as a result of predicted mortality to juveniles and smolts under the Proposed Project. Please refer to Potential Impact 3.3-9 in Volume III Attachment 1 Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* for an analysis of the population level impacts on coho salmon under the Proposed Project, including consideration of stress to outmigrating juveniles. Please also refer to response to comment ORG46-4 for further discussion of the population-level impacts of the Proposed Project on coho salmon.

The comment also asserts that within the Draft EIR there is not adequate discussion of the implications of uncertainty in the coho salmon population response to dam removal as described by the coho salmon expert panel (Dunne et al. 2011), especially since the Klamath Basin Restoration Agreement (KBRA) is no longer proposed. Please refer to Potential Impact 3.3-9 in Volume III Attachment 1 Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts*, which addresses uncertainty in predicting the effects of the Proposed Project and specifically describes the concerns related to predicting a population-level response as described by Dunne et al. (2011). Please also refer to Master Response AQF-12 for a discussion of the incorporation of expert panel reports in the analysis of effects in the EIR.

Please note that the central benefits predicted for the coho salmon population under the Proposed Project include increased access to suitable coho salmon habitat upstream of Iron Gate Dam and decreased disease risk, as summarized in Potential Impact 3.3-9 in Volume III Attachment 1 Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts*. These benefits are not predicated on the actions that were formally included in the KBRA.

The comment also asserts that the Draft EIR uses the sediment modeling results incorrectly and fails to make the connection between the effects of increased suspended sediment concentrations (SSCs) on coho salmon and the population of coho salmon present that would be impacted by these changes. Please refer to the response to comment ORG46-8 for a discussion of the use of sediment transport modeling in the EIR and addressing PacifiCorp's referenced comments. In addition, Potential Impact 3.3-9 in Volume III Attachment 1 Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* and Volume II Appendix E Section E.3.2.3 Coho Salmon (pages E-35 to E-38) include a detailed analysis of the connection between predicted suspended sediment release and the population of coho salmon that may be present and affected by increased suspended sediment as a result of the Proposed Project.

The comment asserts that 200 coho salmon on average spawn annually within tributaries to the Klamath River, and it estimates that 15 females on average will

stray to newly accessible habitat, suggesting that this is not enough fish to recolonize newly accessible habitat. The average of 200 adult coho salmon that the comment cites as being the potential source population of adult coho salmon available for straying into newly accessible habitat is based on observed returns to tributaries to the Klamath River between Portuguese Creek and Iron Gate Dam. However, adult coho salmon returning to Iron Gate Hatchery, Fall Creek Hatchery (FCH), Bogus Creek, Shasta River, and Scott River would also be potential strays into newly accessible habitat. The returns to these additional locations (excluding Fall Creek Hatchery) averages over 1,500 annually, in addition to the 200 returns cited in the comment, based on the data compiled and cited by PacifiCorp (i.e. Knechtle 2019, MKWC 2016, 2017, 2018). As discussed in Potential Impact 3.3-9 in Volume III Attachment 1 Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts*, recolonization success and rate would be a function of fish straying into newly available habitats (Pess 2009). The comment appears to underestimate the potential for straying of coho salmon adults into newly accessible habitat by only considering straying of natural returns to Iron Gate Hatchery and not considering straying of adults from other areas, or from hatchery origin returning adults to newly accessible habitat. Different salmon species and populations (and even the same populations from year to year) have highly variable straying rates, with hatchery origin spawners straying at a higher rate (Lasko et al. 2014). As discussed in Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Fish Hatcheries,* data from Ackerman et al. (2006) indicate that substantial straying of Iron Gate Hatchery fish may be occurring into important tributaries of the Middle Klamath River under existing conditions. As discussed in Potential Impact 3.3-9 in Volume III Attachment 1 Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts*, under existing conditions CDFW and PacifiCorp (2014) estimates that greater than 30 percent of the total adult returns to the upper Klamath River are of hatchery origin, including greater than 70 percent of returns to the hatchery, around 34 percent of returns to Bogus Creek, and around 16 percent of returns to tributaries such as the Shasta and Scott rivers. PacifiCorp cites recent data from Chesney and Knechtle (2017) and Knechtle and Giudice (2018a) to note an even higher proportion of hatchery returns, which would not change the conclusions of the EIR. Between 2004 and 2011 an average of 46 coho salmon hatchery adults per year strayed into Bogus Creek (CDFW and PacifiCorp 2014). Between post-dam removal years 4 and 10, both hatchery returns and returns from newly accessible habitat would occur, providing a likelihood of increased abundance and recolonization of the newly accessible habitat.

As further discussed in Potential Impact 3.3-9 in Volume III Attachment 1 Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts*, coho salmon recolonization of newly accessible habitat was observed following fish ladder installation at Landsburg Dam on the Cedar River, Washington (Kiffney et al. 2009) and following removal of Condit Dam on the

White Salmon River, Washington (Allen et al. 2016). The Landsburg Dam was laddered in 2003, and coho salmon were observed within areas upstream of the dam within the first year. By 2011, salmon (with coho salmon being most abundant) occurred within nearly all of the accessible habitat upstream of Ladsburg Dam. Pess et al. (2011) predicted that within the habitat upstream of Landsburg Dam juvenile coho salmon would establish a population that outnumbered resident salmonid species (e.g., rainbow trout, cutthroat trout) by 40 percent within five years of colonization, suggesting a strong ability of coho salmon to successfully occupy newly accessible habitat.

Without citing specific evidence, the comment expresses the concern that coho salmon may or may not successfully home to the Iron Gate or Fall Creek Hatchery under the Proposed Project, challenging the ability of these hatcheries to operate successfully. As described in Section 2.7.6 *Proposed Project – Proposed Project – Hatchery Operations* (page 2-80), hatchery operations would be managed by California Department of Fish and Wildlife (CDFW) in consultation with the National Marine Fisheries Service (NMFS), as occurs under existing conditions. NMFS and CDFW (2018) submitted a memorandum entitled the "*NMFS and CDFW Technical Staff Recommendation for Klamath River Hatchery Operations in California Post-Dam Removal*" in which facility upgrades to increase attraction to the Iron Gate Fish Hatchery collection facility (including increased attraction flow) are described, as are new collection facilities in Fall Creek, which could include construction of an adult ladder and trap, and/or a new picket and weir with trap at the mouth of Fall Creek. In their memorandum, NMFS and CDFW expressed no concerns for the ability of hatchery collection facilities to capture adult coho salmon for the purpose of maintaining successful operations, and under existing conditions sufficient adults are captured each year to maintain production goals.

Comment ORG46-6

2.2 Klamath River Flow Modeling

In the introduction to the effects analysis in the DEIR, Section 3.1 includes a discussion regarding hydrology information, analyses, and provides a rationale to defend the use of the hydrology analysis found in the Klamath Facilities Removal Environmental Impact Statement (EIS)/EIR (2012 KHSA EIS/EIR; DOI and CDFW 2012). Section 3.1 is cross-referenced over 40 times throughout the DEIR. The hydrology and flow analysis from the 2012 KHSA EIS/ EIR is outdated and inconsistent with the best representation available of existing hydrologic conditions, which is the 2013 Biological Opinion (2013 BiOp) Klamath Basin Planning Model (KBPM) hydrologic results (USBR 2012a). Throughout the DEIR, statements like the following are used to justify use of the 2012 KHSA EIS/EIR hydrology analysis (DEIR pg. 3-96):

...model predictions made using hydrology assumptions adopted for the Klamath Dam Removal Secretarial Determination are still appropriate for assessing

Proposed Project impacts since the NMFS 2013 Biological Opinion mandatory flows are encompassed within the modeled range of flows.

In Section 3.1.6 of the DEIR, the 2012 KHSA EIS/EIR Supplemental Information Report (SIR) (USBR 2016) is cited as supporting information for these statements. Specifically, the DEIR states (DEIR pg. 3-4):

USBR (2016) concluded that the relatively small flow differences between 2013 BiOp and KBRA Flows would not substantively alter the conclusions in the 2012 KHSA EIS/ EIR for those environmental resources that would be affected by flows (i.e., water quality, aquatic resources, flood risk, recreation).

Review of U.S. Bureau of Reclamation (USBR 2016) found that it does not provide additional explanation or information to adequately support the conclusion in the DEIR that the difference from the 2013 BiOp and KBRA flows would not alter the previous conclusions. Additionally, information regarding differences in water supply diversion volumes and storage conditions throughout the basin, such as in Upper Klamath Lake, are not provided in Section 3.1.6 of the DEIR or USBR (2016). Review of the differences in KBRA versus 2013 BiOp flows (see DEIR Figure 3.1.1 and Figure 3.1. 2) clearly indicates that in many months the differences are significant, not small. The use of the 2012 KHSA EIS/ EIR (DOI and CDFW 2012) analyses, when more recent flow information is readily available, indicates that the DEIR does not use the best available science to inform its hydrologic analysis, which then impairs all subsequent analysis that relies upon these hydrologic inputs.

The hydrology data forms the foundation upon which analysis in the DEIR is based. Because the more representative 2013 BiOp KBPM analysis was not used to characterize existing hydrologic conditions, the representativeness and accuracy of the DEIR analyses of the Proposed Project as it relates to hydrology, water quality, and aquatic resources impacts are questionable. This includes the DEIR's conclusions regarding significance of impacts on these resources. The KBRA flows and resultant 2012 KHSA EIS/EIR analysis represents a baseline in which river flows are greater under the KBRA flow assumptions as compared to flows from the 2013 BiOp KBPM analysis, which reduces impacts on water quality and aquatic resources. Not using the updated information available from the 2013 BiOp KBPM results in an overstatement of beneficial water quality and aquatic resources effects from the Proposed Project, and an understatement of adverse impacts associated with the Proposed Project. The DEIR incorrectly and inappropriately states that it is sufficient to "bracket the range of 2013 BiOp flows" (DEIR pg. 3-9) rather than maintain more comparable and updated probability distributions of flow duration and magnitude, but the DEIR fails to provide a discussion of why this bracketing is adequate. The DEIR should include a specific analysis and examples (preferably based on formal statistical analysis) to demonstrate the appropriateness of the DEiR's use of the KBRA flows and 2012 KHSA analysis rather than the 2013 BiOp model.

The Klamath Hydroelectric Project has limited flood control capacity as it is currently operated, and storage in Upper Klamath Lake, which is managed by USBR, is relied upon to provide flood control in the Upper Klamath Basin. Flood storage in Upper Klamath Lake is important in order to reduce the potential for Upper Klamath Lake to overtop levies since hydraulic restrictions at the outlet of the lake and at Link River Dam limit the amount of water that can be released from Upper Klamath Lake. Storage in Upper Klamath Lake is also used to limiting downstream releases that can exacerbate flooding in the Keno Plain, as occurred during the 1964 flood. Thus, Upper Klamath Lake elevations impact the amount of storage available for flood control and ultimately drive the need for pre-emptive flood control releases from Link River Dam. Due to concerns over water surface levels in Upper Klamath Lake to protect endangered suckers and the desire to manage to higher lake levels to protect sucker habitat, Upper Klamath Lake levels are being managed to higher elevations under the 2013 BiOp (see Exhibit A, comment 3.3-46). The USBR changed its flood control management with the 2013 BiOp as compared to earlier flood control operations evaluated in the 2010 BiOp (and as used in the 2012 KHSA EIS/ EIR analysis), resulting in less pre-release of water downstream for flood control purposes. There is no discussion in Section 3.1.6 of the DEIR comparing Upper Klamath Lake storage levels between the previous 2012 KHSA EIS/EIR analysis and the 2013 BiOp KBPM analysis, which drives changed river flows. Thus, the DEIR flood risk analysis does not recognize the changed operating conditions in Upper Klamath Lake that affect routing of the 100-year flood, which may underestimate flood risk impacts associated with the Proposed Project.

Response to Comment ORG46-6

Comment noted. Volume I Section 3.1.6 *Introduction – Summary of Available Hydrology Information for the Proposed Project* has been revised to provide additional background information regarding the 2013 Biological Opinion (BiOp), including clarifying statistical analyses and flow exceedance analyses indicating that the hydrologic model outputs previously developed using the Klamath Basin Restoration Agreement (KBRA) Flows for the 2012 KHSA EIS/EIR are sufficient to estimate conditions under 2013 BiOp Flows for the Lower Klamath Project EIR. As explained in the clarifying revisions to Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*, the range of 2013 BiOp Flows is within the range of modeled KBRA Flows approximately 99.9 percent of the time at Keno and Iron Gate dams, and the primary differences between the 2013 BiOp Flows and the KBRA Flows are temporal shifts in the flow distribution within some months and changes in expected flows in different water year types. While the specific timing of flows and the likelihood of exceeding a specific flow during individual months changes between the 2013 BiOp and KBRA flows, modeled 2013 BiOp Flows less than or greater than modeled KBRA Flows would occur too infrequently (i.e., 0.01 percent of the time or less) to substantially alter the range of flow conditions in the Klamath River or previous model results using KBRA Flows. The data source for the 2013 BiOp

Flows was also updated from USBR (2016) to USBR (2010b) and USBR (2019a) to include the longest period of record available for the flow comparison (1980−2011), and new monthly flow exceedance plots have been added to the EIR that also indicate in which months there would be a statistically significant difference in the flow distributions ($p<0.01$ or $p<0.05$). Further, the clarifying revisions to the EIR include a comparison plot of the maximum and minimum monthly exceedance curves for the 2013 BiOp Flows and the KBRA Flows for the 1 to 99 percent exceedance flows at Keno Dam and Iron Gate Dam, which further clearly indicates that the distribution of flow duration and magnitude under the 2013 BiOp Flows is sufficiently similar to that of the KBRA Flows that the hydrologic model outputs previously developed using the KBRA Flows for the 2012 KHSA EIS/EIR are sufficient to estimate conditions under 2013 BiOp Flows. Please refer to Volume III Attachment 1 Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project* for the revisions.

Please refer to Master Response HYD-1 for a discussion of how the 2019 BiOp Flows were considered for the Lower Klamath Project EIR analyses.

Please refer to Master Response FLD-1 for a discussion of the limited flood control capacity of the Lower Klamath Project. With respect to the comment's concern regarding the flood risk analysis and Upper Klamath Lake levels, variations in the Upper Klamath Lake levels between the KBRA, the 2010 BiOp, the 2013 BiOp, and the 2019 BiOp are not explicitly discussed in Section 3.1.6 *Environmental Setting, Impacts, and Mitigation Measures – Introduction – Summary of Available Hydrology Information for the Proposed Project* because the analysis of modeled Klamath River flows at Keno and Iron Gate dams inherently includes the net influence of Upper Klamath Lake variations on flows, and potential impacts within the Area of Analysis under the Proposed Project would be the result of Klamath River flows rather than the Upper Klamath Lake levels. United States Bureau of Reclamation (USBR) uses the Upper Klamath Lake levels in the calculations of Klamath River flows at Keno and Iron Gate dams under the KBRA, 2010 BiOp, 2013 BiOp, and 2019 BiOp, so any variations in the water supply diversion volumes, storage conditions in the basin, and the flood control capacity/storage in Upper Klamath Lake would be incorporated into the flows at Keno and Iron Gate dams. Additionally, the Proposed Project does not make changes to the Klamath Irrigation Project operations criteria or applicable biological opinion(s), so there would be no change in the Upper Klamath Lake levels or the amount of flow released by the Klamath Irrigation Project and the applicable biological opinion(s) under the Proposed Project. Since there would be no change to the applicable biological opinion(s) that specify the Upper Klamath Lake flood release threshold elevations, there would be no impact on the flood storage in Upper Klamath Lake or the potential for Upper Klamath Lake to overtop levees under the Proposed Project. Thus, Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project* only discusses the flow variations between the KBRA, the 2010 BiOp, the 2013 BiOp, and the 2019 BiOp to the extent those flow variations would

contribute to potential impacts within the Area of Analysis, including those associated with flooding. Please refer to Volume III Attachment 1 for the final Section 3.1.6 *Environmental Setting, Impacts, and Mitigation Measures – Introduction – Summary of Available Hydrology Information for the Proposed Project*.

While there was a flood event during the December 1964 flood in the Klamath Basin, the operational criteria for the Klamath Irrigation Project in 1964 were different from those under the KBRA, 2010 BiOp, 2013 BiOp, or 2019 BiOp. The modeled peak flow releases from Keno Dam under the KBRA, 2010 BiOp, 2013 BiOp, and 2019 BiOp operation criteria do not occur in December 1964. As shown in Figure ORG46-6-1 below, modeled peak flows at Keno Dam under the KBRA and 2013 BiOp operations criteria both occur in January 1997 and they have a similar magnitude (12,854 cfs under the KBRA; 13,136 cfs under the 2013 BiOp), indicating that previous modeling of peak KBRA Flows would characterize peak 2013 BiOp Flows. Modeled peak 2019 BiOp Flows (9,932 cfs) also occur during January 1997, but it is less than the modeled peak KBRA Flows. Analysis of the flood risk impacts using KBRA Flows are expected to overestimate the flood risk impacts under the 2019 BiOp Flows since the modeled peak flow under the 2019 BiOp operations criteria is less than the modeled peak flow under the KBRA operations criteria.

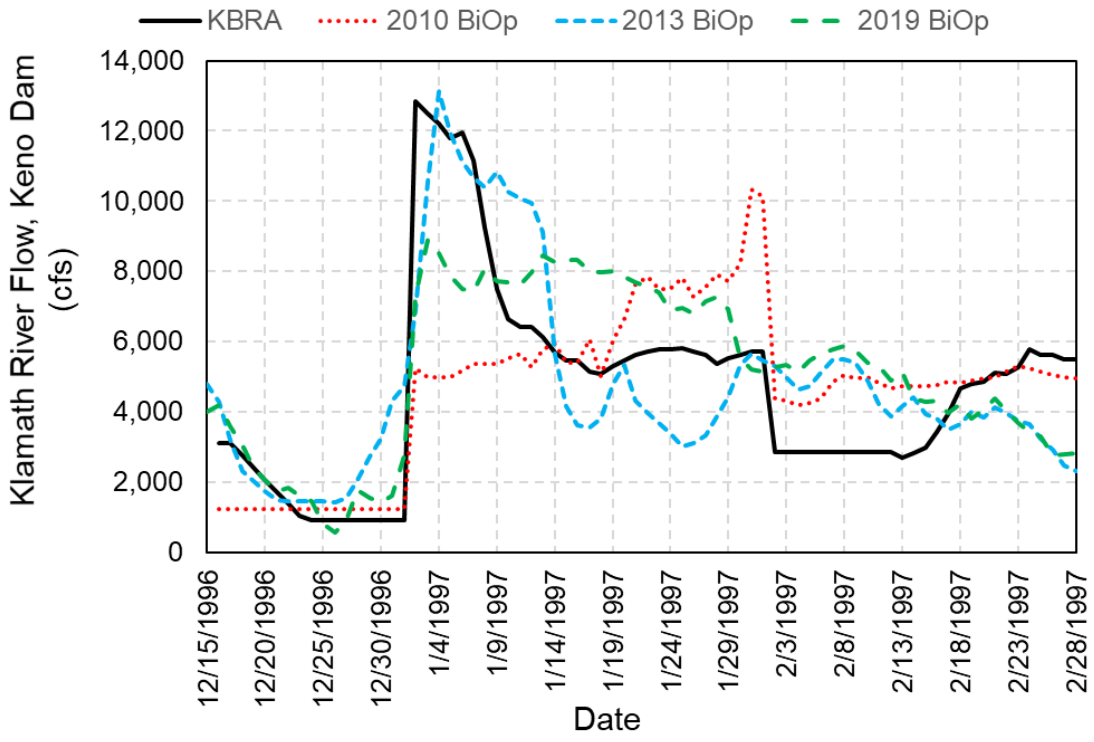


Figure ORG46-6-1. Peak USBR Modeled Klamath River Flow at Keno Dam During January 1997. Source: USBR 2010b, 2019a, 2019b.

Comment ORG46-7
2.3 Water Quality

Upper Klamath Lake is hypereutrophic and is the source of the nutrient loading to the Klamath River. The river itself exceeds phosphorus and nitrogen loading levels typically associated with eutrophic rivers (Dodds 2006; Smith et al. 2003). The DEIR does not consistently acknowledge this or the decades-long timeframe necessary for implementation actions, which remain uncertain, to result in nutrient loading reductions necessary to achieve the Oregon TMDL' s water quality goals in Upper Klamath Lake (ODEQ 2002). Because the flow regime discussed in the DEIR does not accurately represent existing conditions, the water quality modeling and effects analysis that is based on those flows also do not reflect existing conditions nor are they adequate to evaluate the impacts of the Proposed Project. The DEIR acknowledges that "multiple numeric models" (DEIR pg. 3-64) were used in the effects analysis for water quality. The DEIR however, does not use the most recent version of the Klamath Hydroelectric Project water quality model developed by PacifiCorp (2014), which includes numerous model updates and improvements from the version of the model used by ODEQ and others to develop the Klamath River TMDLs. Highlights of the more recent modeling outputs from the PacifiCorp (2014) model are presented here and included in the files that accompany PacifiCorp' s comments.

Water temperatures in the 190-mile lower Klamath River downstream of Iron Gate Dam are generally at or near equilibrium water temperature conditions with the exception of immediately downstream of the dam and in the vicinity of certain tributaries (PacifiCorp 2014). Releases from Iron Gate Reservoir are generally moderated owing to the relatively large reservoir volume and a penstock intake elevation that is about 30 feet below the reservoir water surf ace. These attributes lead to water temperatures that may be at or slightly cooler than equilibrium water temperature during the spring period. The river is considerably smaller in terms of volume per unit length, and thus cools and heats more quickly than the reservoir in response the ambient meteorological conditions.

During the fall period, temperature of water releases from Iron Gate Dam are warmer than equilibrium water temperature due to the thermal lag caused by the reservoir's mass (PacifiCorp 2014). The effect of this seasonal lag is largest in the river just downstream of Iron Gate Dam and diminishes relatively quickly in the downstream direction as the river comes into equilibrium with the local meteorological conditions. PacifiCorp's (2014) water temperature modeling indicates that by the time flows reach the Shasta River (RM 177), the impact of the lag is diminished by approximately 50 percent and continues to diminish in the downstream direction (Figure 6).

Water temperatures are generally at or near equilibrium water temperature conditions over the rest of the lower Klamath River below the Shasta River (RM

177) (PacifiCorp 2014). The major tributaries generally enter the Klamath River at similar temperatures to the river. The overall state of temperature equilibrium may not hold during periods when cold tributary runoff during spring snowmelt runoff or rain on snow events enter the mainstem Klamath River. During warmer periods of the year there are isolated regions at the confluence of many tributaries where inflow water temperatures are markedly colder than the mainstem. These thermal refugia areas may range from a few square yards to several hundred square yards in size depending on the flow and temperature in the tributary, flow conditions in the mainstem Klamath River, and local geomorphology (Sutton et al. 2002). By the time waters reach the Scott River (RM 143), water temperatures indicate minimal seasonal thermal lag and variability in mean daily water temperatures are largely absent, but results may vary among months (Perry et al. 2011). Such results are consistent with PacifiCorp (2014) water quality modeling results (Figure 6). The DEIR repeatedly incorrectly asserts that the temperature effects of releases from Iron Gate Dam are apparent downstream of or to the confluence of the Salmon River (RM 66) (e.g., DEIR pg. 3-78), and that dam removal will provide benefits to outmigrating fish. Such an example is found on pg. 3-277 of the DEIR, where it states (emphasis added), "FERC (2007) concluded that dam removal would enhance water quality and reduce the cumulative effects on water quality and habitat that contribute to disease- induced salmon die-offs in the Klamath River downstream from Iron Gate Dam. In turn, this would benefit salmon outmigrants from tributaries downstream from Iron Gate Dam, such as the Shasta and Scott rivers." This statement is contrary to the best available water quality modeling results, which indicate temperature differences hardly discernible at the Scott River confluence and mean daily temperatures at Iron Gate Dam that are cooler during the juvenile outmigration period as compared to locations further downriver (Figure 7).

PacifiCorp (2014) modeling simulations indicate that the consistently warmest reach of the Klamath River under existing conditions is the reach between approximately Seiad Valley (RM 129) and Clear Creek (RM 98.8). Maximum daily temperatures can reach 30°C and daily minimum temperatures in the 20 to 25°C range are common in this reach during summer (Figure 8). Downstream of this reach, the river experiences considerable accretion and the aspect ratio of the channel changes from a broad shallow stream to a deeper river. As the river approaches the coast, marine influences can moderate river temperatures, but when clear warm conditions prevail, water temperatures respond accordingly. For example, water temperatures at Turwar (RM 6) are cooler overall during spring and summer periods than upriver at Orleans (RM 57) or Seiad Valley (RM 129), with the diurnal range in temperature also more moderated at Turwar (Figure 8). During winter, water temperatures at Turwar are generally warmer overall than at upriver locations (Figure 8) due to milder meteorological conditions at lower elevations.

Because of specific shortcomings created by inappropriate flow data, the complicated interrelated nature of water quality, and the matrix of outdated or flawed water quality models that the DEIR analysis is based upon, it is difficult to discern the actual shortcomings in the water quality discussion in the DEIR. At the most basic level flow rates affect water temperatures which in turn affect dissolved oxygen concentrations, hydraulic retention times, growth of cyanobacteria, nutrient cycling, pH, and so on. Because short-duration adverse water quality events (on the scale of hours to days) can have significant effects on aquatic species, correctly representing the flow regime is critical when assessing potential impacts of a proposed action on water quality. Many of those water quality analysis influence the evaluation of Proposed Project's effects on aquatic species.

Response to Comment ORG46-7

With respect to the comment's assertion regarding Upper Klamath Lake as a continuing source of nutrients to the Lower Klamath Project, please refer to Section 3.2.2.1 *Water Quality – Environmental Setting – Overview of Water Quality Processes in the Klamath Basin*, which states "The Upper Klamath Basin has naturally elevated levels of phosphorus that combine with human activities (e.g., wetland draining, agriculture, ranching, logging, water diversions), to increase concentrations of nutrients (nitrogen and phosphorus) and suspended sediment, to degrade water quality parameters (e.g., water temperature, pH, dissolved oxygen). This, in turn, affects the water quality entering California." There are also other instances in Section 3.2.2 *Water Quality – Environmental Setting* (e.g., Section 3.2.2.4 *Water Quality – Environmental Setting – Nutrients*) and Appendix C *Water Quality Supporting Technical Information* (e.g., Appendix C, Section C.2.1.1 *Suspended Sediments – Upper Klamath Basin – Hydroelectric Reach* and Appendix C, Section C.3.1.1 *Nutrients – Upper Klamath Basin – Hydroelectric Reach*) where the EIR indicates that water quality in Upper Klamath Lake impacts water quality in the Hydroelectric Reach. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality* and the final Appendix C *Water Quality Supporting Technical Information*.

This comment also asserts that the Draft EIR does not reference results from the most recent version of the Klamath Hydroelectric Project (KHP) water quality model. In reviewing the referenced information, it appears that PacifiCorp may have rerun the Klamath River Water Quality Model (KRWQM) in 2014 to produce figures included in its 2014 draft water quality certification application to the State Water Board (reference years 2000 to 2004; Figures 5.2-19 to 5.2-26 in Section 5 and Figures 1-24 in Appendix A of PacifiCorp [2014a]) but did not provide supporting information to substantiate the figures or PacifiCorp's statements in this comment. To thoroughly investigate PacifiCorp's assertions, the State Water Board requested on April 25, 2019, that PacifiCorp provide: 1) all input and output data files (by model reach) for the Klamath River Water Quality Model updated since December 12, 2005, in a Microsoft Excel or tab-delineated .txt file format (.txt format preferred); 2) specific flow assumptions used in PacifiCorp's

KRWQM runs for results presented in the draft 2014 water quality certification application; 4) assumptions used in creating and definitions for existing conditions (EC) and without project (WOP) scenarios included in the habitat suitability analyses reported in Section 5.2.3.3 of the draft 2014 water quality certification application; 5) list of all assumptions and parameters that changed in the 2014 model runs presented in the draft 2014 water quality certification application versus model runs conducted in 2004 and/or 2005; 6) calibration and validation data sets for the 2014 model runs presented in the draft 2014 water quality certification application; and 7) sensitivity analyses conducted for the 2014 model runs presented in the draft 2014 water quality certification application. The 2019 report that PacifiCorp provided in response to the above request from State Water Board included a description of model updates, which were primarily focused on Keno Reservoir, and calibration summary information. The information provided by PacifiCorp in the 2019 report has been incorporated into responses to comments ORG46-17, ORG46-21, ORG46-88, ORG46-90, ORG46-98, ORG46-101, ORG46-122, and ORG46-127, and as described in those responses, this information has resulted in revisions to clarify the EIR. The additional information has not changed any significance determinations and does not otherwise represent significant new information for the EIR.

With respect to the comment's assertion that the water temperature analysis in the Draft EIR does not reflect PacifiCorp (2014), please refer to response to comment ORG46-127.

Daily variations in water quality with the potential to adversely impact aquatic resources under existing conditions are discussed in multiple places in Section 3.2.2 *Water Quality – Environmental Setting* (e.g., Section 3.2.2.2 *Water Quality – Environmental Setting – Water Temperature* and Section 3.2.2.5 *Water Quality – Environmental Setting – Dissolved Oxygen*). Additionally, changes in these daily variations under the Proposed Project are analyzed for multiple water quality parameters in Section 3.2.5 *Water Quality – Potential Impacts and Mitigation* (e.g., Potential Impact 3.2-1 [water temperature], Potential Impact 3.2-10 [dissolved oxygen], and Potential Impact 3.2-11 [pH]) using the available Klamath River Total Maximum Daily Load (TMDL) model and PacifiCorp KRWQM results at an hourly to daily time scale that would characterize these variations. PacifiCorp 2008 and 2014 model results are not presented at an hourly to daily time scale. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Comment ORG46-8

2.4 Sediment Transport Modeling

The fate and transport of the fine sediment predicted to be released under the Proposed Project is critically important to understanding a wide-range of both short- and long-term environmental impacts. Therefore, the DEIR must include a detailed discussion and supporting numerical or quantitative analysis to

document the expected impacts of the Proposed Project. Because this is a critical area for the effects analysis, PacifiCorp had an independent expert review the sediment transport models and the DEIR's use of the modeling information (see Brookes 2019 which is included in Exhibit C materials).

In numerous locations throughout the DEIR, there is a repeated conclusion that the fine sediment will be transported the length of the Klamath River and enter the Pacific Ocean. For example, the DEIR states that:

- *"Most of the fine sediment is expected to be transport ed in suspension to the ocean shortly after being eroded. Fine sediment erosion would result in elevated suspended sediment concentrations downstream of Iron Gate Dam in the short term (Stillwater Sciences 2010, USBR 2012)." (DEIR pg. ES-6)*
- *"Over 80 percent of the reservoir sediments are fine sediment (organics, silts, and clays), which are expected to remain suspended in the Klamath River flow as it moves downstream and out into the Pacific Ocean." (DEIR pg. 2-60)*
- *"Because the trapped sediments consist primarily of organic material (e.g., dead algae), silts, and clays, they would be easily eroded and flushed out of the reservoirs into the Klamath River, and would continue to be suspended in the river downstream to the Pacific Ocean." (DEIR pg. 2-68)*
- *"The amount of sediment deposition in the estuary as a result of dam removal is anticipated to be small..." (DEIR pg. 3-83).*

These conclusions represent highly simplified opinions that are not supported by the cited numerical analysis (i.e., Stillwater Sciences 2010; USBR 2012c). The Stillwater Sciences (2010) and USBR (2012c) models both <u>assume</u> that fine sediment behaves as wash load, which by definition does not deposit. The DEIR makes a fundamental error by presenting this assumption as a conclusion of the modeling.

It is reasonable to assume that some proportion of the fine sediment load would behave as wash load (sediment that remains in suspension throughout the river system). However, in the absence of a specific numerical analysis, such an assumption is a broad generalization that only holds true under specific circumstances, presenting significant risk that the wash load flushing would not persist for the duration of the drawdown or the 190 miles of river downstream of Iron Gate Dam. Fine sediment can, and does, settle-out in riverine systems. This is likely to happen in the Klamath River in areas such as backwaters, pools, eddies, slack water, side channels, the estuary, and any floodplains accessed by high flows. Deposition will also occur at the heads of riffles where downwelling will move sediment-laden water into the gravels resulting in deposition of those fine silt s and clays into the interstitial spaces of the riffles; these areas are important spawning habitat for salmon. Deposition of fine sediments into these areas would adversely affect aquatic and riparian biota and important habitat.

Despite the potential significance of the issue to aquatic and fishery resources, analysis of fine sediment transport downstream of Iron Gate was included in a very simple manner in the DEIR's cited references. While the modeling in these cited source materials appears generally technically sound, the models are limited and the DEIR fails to present these model limitations or the uncertainties that remain. Specifically, these areas of uncertainty could substantively affect the analysis in the DEIR include:

- *Errors in estimating the amount and type of stored sediment.*
- *Lack of high flow suspended sediment data.*
- *Definition of the mobilization flow without direct field measurements of sediment movement.*
- *Unknown bed material and channel dimensions that will prevail after dam removal.*
- *Incision and erosion of deposits accumulated behind the dams (e.g. Copco and Iron Gate reservoirs).*
- *Effect of climate change on geomorphology.*
- *Angle of repose of material upstream of dam, which impacts sediment volumes that may be eroded from the reservoirs due to bank failures during drawdown.*
- *The impact of proposed sediment jetting, which is included in the Proposed Action as part of the Definite Plan, but was not included in prior modeling related to sediment volume and transport relied upon in the DEIR.*
- *Cohesive materials (fine silts and clays) that are not addressed in the modeling and this material would behave differently than how it is modeled because of cohesion (the USBR 2012 model is capable of modeling cohesive and non-cohesive sediment transport).*

Because the DEIR does not discuss the uncertainties associated with the numeric modeling, the reader is erroneously led to believe that these models accurately represent conditions likely to occur under dam removal. However, other large-scale dam removal projects, such as on the Elwha River, have had sediment impacts that were not consistent with expectations. The limitations and uncertainties associated with the modeling present significant residual and unaddressed risks that need to be described in the DEIR. Specific areas that need to be addressed include:

1. The DEIR states that a faster drawdown would reduce the time of interaction between flow and reservoir sediment deposits. While this may be true, there are processes involved other than the duration of exposure to erosive forces. The DEIR needs to discuss the rate of erosion because of exposure to higher water velocities generated by a faster drawdown could also produce more slumping and bank failures along reservoir margins because of the pore pressure of water remaining in the sediments and over-steepened banks.

2. The DEIR should analyze the effects of erosion processes operating both upstream and downstream of the dams and within the reservoir footprints (such as lateral channel adjustment following reservoir drawdown), which could extend the duration of downstream sediment effects.

3. The DEIR should identify key sensitive habit at locations downstream of Iron Gate Dam, discuss how susceptible these areas are to deposition, evaluate rates at which deposition could occur, and provide an analysis of effects of deposition on the habitat and resources in those sensitive locations. Some of the key habitats that should be addressed include known Chinook spawning areas and refugia that are important to Coho rearing throughout the year.

4. Spawning sites at the head of riffles where downwelling currents carry oxygenated water into the interstices of salmon spawning sites may be especially vulnerable to deposition (Tompkins and Kondolf 2009). As water is pulled into the gravels, the fine sediment that is suspended moves into the interstices where it is deposited thereby clogging gravel, interrupting important intergravel flow, and reducing survival of deposited eggs or newly hatched fish.

5. The impacts of proposed sediment jetting to remove additional sediments during reservoir drawdown. Sediment jetting as proposed in the Definite Plan was not considered in the modeling work conducted by Stillwater Sciences (2010) and USBR (2012a), and would be expected to increase the amount of sediment discharged from the reservoirs, impacting modeling results.

In summary, while the modeling that was conducted by Stillwater Sciences (2010) and USBR (2012c) may be technically sound, the models are inherently limited. Moreover, the DEIR fails to use these models properly, interprets a basic modeling assumption as a result, does not discuss impacts resulting from deposition of fine sediment downstream of Iron Gate dam that would result from implementation of the Proposed Project, and does not consider changes in the approach to reservoir drawdown (sediment jetting) that may impact model results.

Response to Comment ORG46-8

Comment noted. The first paragraph of the comment cites an independent review of the sediment transport models used in the Draft EIR (Brookes 2019), where the review was commissioned by PacifiCorp and was provided as an attachment to PacifiCorp's comments on the Draft EIR. Paragraph two of the comment includes a bullet list with quotations from the Draft EIR, which provide context for later paragraphs of the comment that are responded to below.

Regarding the third and fourth paragraphs of the comment, which include statements on wash load and settling of fine sediment, please refer to Master Response GEO-1. Master Response GEO-1 explains the fine sediment

modeling and analysis approach and the potential for short-term spatially discrete sedimentation impacts.

With respect to the specific points the commenter lists in the second set of bullet points regarding an alleged weakness in disclosing limitations and uncertainty associated with the sediment modeling, it is noted that these points appear to primarily reflect discussions of model uncertainty and sensitivity in USBR (2012a). USBR (2012a), when reviewed in full, provides context and explanation for elements of uncertainty and sensitivity in the SRH sediment models. Responses to the points raised in the second set of bullet points are provided below.

Second Set of Bullet Points, Point 1: The uncertainty in the sediment volume estimates is presented in Volume I Section 2.7.3 *Proposed Project – Proposed Project – Reservoir Sediment Deposits and Erosion During Drawdown* Table 2.7-10 (page 2-67), and it is related to the spatial interpolation of sampled sediment flux. Because it is impractical to sample the entire reservoir bed, sediment cores were drilled and sampled, then sediment flux results were spatially interpolated to find the total sediment volume (yd^3) and associated sediment mass (tons) deposited within each reservoir. The spatially distributed core sites are shown in Volume I Section 2.7.3 *Proposed Project – Proposed Project – Reservoir Sediment Deposits and Erosion During Drawdown* Figures 2.7-7, 2.7-8, and 2.7-9 (pages 2-62 to 2-64). The uncertainty of the sediment volume estimates is reasonable for sediment yield analyses, which generally use modeling to estimate the order of magnitude of sediment yield. For additional information, please refer to Section 5.6.1.2 *Reservoir Sediment – Current Estimates* of USBR (2012a). Regarding sediment type, this was sampled directly from the spatially distributed sediment cores (USBR 2010a); therefore, there is not considered to be significant uncertainty associated with the type of sediment in the reservoirs.

Second Set of Bullet Points, Point 2: Due to lack of high flow suspended sediment concentration (SSC) data between the dams and Orleans, USBR (2012a) synthesized a relationship between flow and sediment concentrations based on the mass of sediment deposited behind the dams (see USBR [2012a] Section 5.3 *Sediment Loads* page 5-5 for further details). While the lack of high flow SSC data between the dams and the Klamath River at Orleans still introduces uncertainty into the modeled SSCs at high flows, the approach in USBR (2012a) provided a reasonable method to quantitatively resolve a data limitation and estimate the increase in SSCs with increases in Klamath River flow. Overall, USBR (2012a) provides the best available information and quantitative SSC modeling results under reservoir drawdown to analyze the potential impacts from SSCs under the Proposed Project. There are no data or other evidence provided by the comment or publicly available to indicate that additional quantitative analysis, improvements in the precision of the modeling, or changes in the model uncertainty, would alter the result of the analysis in Section 3.2.5.2 *Water Quality – Potential Impacts and Mitigation – Suspended Sediments*

Potential Impact 3.2-3 that there would be a significant and unavoidable impact for SSCs under the Proposed Project. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*, including Potential Impact 3.2-3.

Second Set of Bullet Points, Point 3: USBR (2012a, pages 5-4 to 5-8) used reach-averaged hydraulic properties to estimate the flows required for slight and significant bed mobilization under existing conditions. USBR (2012a) recognized that there is uncertainty in defining the bed mobilizing flow without direct field measurements of sediment movement. United States Bureau of Reclamation (USBR), therefore, used a range of shear stress values for probable mobilization, rather than a single value. USBR (2012a) also compared their results with previous studies and found that they returned comparable flow estimates for bed mobilization. Results are summarized in Volume I Section 3.11.2.4 *Geology, Soils, and Mineral Resources – Environmental Setting – Sediment Load* (pages 3-748 to 3-753), which is partially modified in Volume III Attachment 1. As USBR (2012a) used a combined data reporting approach for the two-year sediment model simulations, the report does not forecast potential transient sediment storage and bed mobilization following dam removal. This has been considered in Master Response GEO-1.

Second Set of Bullet Points, Point 4: Regarding the alleged unknown post-dam removal bed material, potential changes to bed material associated with dam removal have been interpreted based on sediment transport model simulations (USBR 2012a) in Volume I Section 3.11.2.4 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation – Sediment Load* (pages 3-748 to 3-753). Regarding the alleged uncertainty due to unknown post- dam removal channel dimensions, exact future channel dimensions cannot be determined by sediment transport modeling or other means. However, sediment transport modeling is used to inform analysis of channel response to dam removal in Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 (pages 3-765 to 3-775) and this impact is modified in Volume III Attachment 1. Please also refer to Master Response GEO-1.

Second Set of Bullet Points, Point 5: The Sedimentation and River Hydraulics sediment transport model (SRH-1D) model (USBR 2012a) uses an above water angle of repose to enable simulations of reservoir sediments moving into the fluvial system; therefore, this process is captured in the sediment model outputs discussed in the EIR. The SRH-1D model (USBR 2012a) does not capture more complex processes of slumping and movement of fine sediment into the fluvial system, which is a limitation recognized in USBR (2012a) and discussed below in this comment response. SRH-1D model simulations found that 36 to 57 percent of the sediment stored behind the reservoirs would not erode during drawdown (i.e., would remain in the reservoir footprints) and the physical properties of the sediments mean that they would consolidate with some cracking (i.e., gullying or incision and erosion) (USBR 2012a). The EIR uses information from the model

outputs and hydrology theory to assess potential gullying of the reservoir sediment deposits that would remain following drawdown. Please refer to Potential Impact 3.11-5 in Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* (pages 3-768 to 3-769) and modifications in Volume III Attachment 1. After the initial drawdown, the greatest potential for gullying of reservoir sediments and associated secondary erosion would occur in the short-term period (within two years of dam removal) following sub-aerial exposure of the reservoir sediments, as a surface runoff network establishes. Although the rate of sediment erosion and transport is dependent on the water year types during and following dam removal, rapid consolidation of the remaining sediment deposits following sub-aerial exposure (USBR 2012a), along with hydroseeding and other restoration work (see Section 6.1.1 *Measures to Manage Remaining Sediment* of Volume II Appendix B: *Definite Plan*), mean that elevated concentrations of suspended sediments, with potential to impact water quality and aquatic species, are not expected to occur in the longer term. Some surface erosion of the remaining reservoir sediment deposits may occur during storm events over the long term. Overall, gullying of the reservoir sediment deposits is accounted for in the sediment model outputs (USBR 2012a) and in the EIR analysis.

Second Set of Bullet Points, Point 6: Consistent with CEQA Guidelines section 15125(a), future climate changes are not part of the existing condition against which this EIR compares potential impacts. While climate change predictions are occasionally used in the Lower Klamath Project EIR to provide additional context for potential impact analyses related to the Proposed Project or the alternatives (e.g., Volume III Attachment 1 Section 3.2.5.1 *Water Quality – Potential Impacts and Mitigation – Water Temperature* Potential Impact 3.2-1, Volume III Attachment 1 Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-8, Volume 1 Section 4.2.2 *No Project Alternative – Water Quality* Potential Impact 4.2.2-1 [pages 4-103 to 4-108]), the predictions are not relied upon for significance determinations associated with the Proposed Project or the alternatives. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality* and Section 3.3 *Aquatic Resources*. Long-term changes to the existing (and historical) physical environment resulting from dam removal were analyzed for reference periods of up to 50 years (see Volume I Section 3.11 *Geology, Soils, and Mineral Resources* (pages 3-733 to 3-780), using hydrologic and geomorphic theory and quantitative modeling. The sediment models are described in Master Response GEO-1 and include long-term (50-year) simulations focusing on evolution of the riverbed post dam removal and short-term (2-year) simulations focusing on suspended sediment erosion, transport, and deposition during and following drawdown (USBR 2012a). The water flow conditions input to the sediment models (USBR 2012a) are described in ORG46-203 and include allowance for a wide range of flow conditions that could reasonably occur in the future, accounting for Klamath River flows continuing to be controlled by the Keno Dam under the Klamath Irrigation Project post dam removal. Therefore, anticipated

future flow conditions reasonably inform the sediment modeling applied in the EIR sediment and geomorphology analysis (see Volume III Attachment 1 Section 3.11-5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5). It is noted that the sediment models (USBR 2012a) were applied to assess sediment erosion, transport, and deposition at the reach scale as intended by the model framework. Finer scale transitory sediment deposition and remobilization is assessed theoretically (see Master Response GEO-1). It is also noted that as gravel supply would be restored following dam removal under the Proposed Project, deposition of gravel and sand is expected within the active channel bed at specific locations between Iron Gate Dam and Cottonwood Creek under the range of modeled flow conditions, regardless of increases or decreases of peak flows. Higher peak flows could transport transitory sediment deposits downstream within shorter timeframes than expected (see Master Response GEO-1). In addition to the model- and theoretical-based analyses of sediment and geomorphology, and as noted in Brookes (2019, page 7), meteorological effects on hydrographs under a range of climate scenarios predicted by Global Circulation Models (GCMs) are considered in Section 11 *Climate Change Effects* of USBR (2012, page 11-1 to 11-9). Temperatures in the Upper Klamath Basin are expected to increase under climate change, and precipitation may increase or decrease. Although there are variations with 'wet' and 'dry' climate simulations, water flows entering the Upper Klamath Lake in late winter and early spring (February to April) are generally excepted to be similar to, or higher than, existing flows, but from late spring through early fall (May to October) flows are generally expected to be similar to, or lower than, existing flows. Winter flows (November to January) could be higher or lower, depending on the climate change scenario (USBR 2012a). Forecasting of sediment erosion, transport, and deposition under climate change scenarios is not undertaken in USBR (2012a). Such modeling is inherently difficult and a limited outcome of advanced research. However, based on the hydrograph modeling results, theoretical knowledge of how sediment and geomorphology may respond has been applied, which is a standard approach in considering climate change effects on sediment movement. If peak flows increase under a 'wet' climate change scenario, this may create a wider channel and floodplain (USBR 2012a); however, flows will continue to be controlled by Keno Dam, thus unintentional geomorphological effects associated with increased flows are not expected to be significant. In addition to changes of water flow, climate change could influence a change of riparian vegetation, affecting bank properties, with or without the Proposed Project; however, potential bank stability changes are speculative. Climate change effects on water flow and sediment movement impacting flood hydrology are considered in response to comment ORG46-288 and no changes to the Volume I Section 3.6 *Flood Hydrology* analysis are required.

Second Set of Bullet Points, Point 7: The angle of repose, which is related to the stability of above-water reservoir sediments, was included in sediment transport modeling by USBR (2012a), and the outputs of the sediment modeling inform

Volume I Section 3.11 *Geology, Soils, and Mineral Resources* (pages 3-733 to 3-780), which is partially modified in Volume III Attachment 1. The assumed angle of repose was conservatively set at 15°. One limitation of the SRH-1D model is that it cannot input a separate angle of repose for fine sediment (silt and clay) than for sand. Although the angle of repose for drained sand may be closer to 30°, the 15° angle was deliberately selected as most representative when modeling fine sediment and sand together with the same angle of repose (USBR 2012a). The sensitivity of the angle was tested in USBR (2012a) by running simulations of the same sediment model with the angle set at 5° and 10°, separately. Decreasing the angle of repose decreased the maximum SSC and increased the duration of elevated SSC impacts (over 100 milligrams per liter (mg/L) for fine sediment, and over 1000 mg/L for sand). This sensitivity output is related to the unlikely scenario of sand re-depositing in Iron Gate Reservoir and subsequently remobilizing when Iron Gate Reservoir is completely drawn down (with almost all the sand remobilizing and entering the fluvial system when the angle of repose is set at 5°) (USBR 2012a). Given that the angle of repose was cautiously considered most representative at 15°, applying the sediment model simulation that used this angle (i.e., the primary SRH-1D sediment model) to the EIR analyses is considered to capture the best available information (see Potential Impact 3.11-5 in Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* [pages 3-765 to 3-775], which is modified in Volume III Attachment 1). While the angle of repose is applied in the SRH-1D sediment model to simulative reservoir sediments moving into the fluvial system, the model assumes instantaneous bank failure and movement of sediment into the fluvial system. The angle of repose does not apply to, or account for, ongoing bank failures (slumping), nor do any of the other sediment model parameters. This is a recognized limitation of the model (see USBR 2012a, pages 9-33 to 9-37 and 23-39 to 23-40). The anticipated small, shallow slumping along upstream embankment slopes during drawdown, when the force of the sediment weight and draining water exceeds the shear strength of the sediment, would not erode enough sediment to substantially change the range of estimates of fine sediment erosion and transport presented in Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 – Table 3.11-*7* (page 3-768) (see the same table in Volume III Attachment 1). The shear strength of the sediment would increase as the water drains and cohesion would increase as the sediment consolidates, resulting in stabilization of remaining reservoir sediments and reduced potential for slumping. Some localized, small areas of sediment on steeper slopes (greater than 0.2°) surrounding Copco No. 1 Reservoir would remain unstable with potential for slumping post-drawdown (USBR 2012a). As for the discussion of gullying (see above in this comment response), rapid consolidation of reservoir sediments and hydroseeding would reduce potential for bank slumping in the long term (see Volume II Appendix B: *Definite Plan* Section 6.1.1 *Measures to Manage Remaining Sediment*). Therefore, elevated concentrations of suspended sediments, with potential to impact water quality and aquatic species, are not expected to occur in the longer term.

Second Set of Bullet Points, Point 8: For an explanation of sediment erosion associated with sediment jetting, please refer to comment response ORG46-132.

Second Set of Bullet Points, Point 9: Cohesive properties can be input differently in different sediment models. Stillwater Sciences (2008) originally used the peer-reviewed Dam Removal Express Assessment Model (DREAM-1) (Cui et al. 2006a,b) to identify preferred reservoir drawdown options for minimizing suspended sediment impacts to the Klamath River, especially biological resources, downstream of Iron Gate Dam. The DREAM-1 model was designed for simulations where reservoir sediment upstream of dams being removed is composed primarily of non-cohesive fine sediment (sand and silt). The model was considered suitable for assessing reservoir drawdown options, because of the high silt content of the Klamath River reservoirs. USBR (2012a) subsequently applied the SRH-1D model, developed by Huang and Greimann (2010), to examine surface hydrology, groundwater hydrology, hydraulics, geomorphology, and sediment transport within the Klamath River Basin under the No Project Alternative (dams remain in place) and the Proposed Project (dam removal). USBR (2012a) considers cohesive and non-cohesive sediment transport processes within the limits of industry standard numerical sediment transport modeling. Cohesion of the reservoir sediment deposits was considered in the SRH sediment models and reporting that produced the sediment model outputs analyzed in Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 (pages 3-765 to 3-775) and modified in Volume III Attachment 1. The erosion rate of cohesive sediment is governed by the simple linear excess shear stress model. The data to support the cohesive parameters was taken from jet tests described in Appendix D of USBR (2012a). Fine sediment (clay and silt) particles would interact with each other, thus were modeled as a single cohesive unit for the purposes of estimating SSCs, longitudinal sediment erosion and transport, and reach-scale sediment deposition (USBR 2012a). The sensitivity of the cohesive erodibility parameter was tested and increasing or decreasing the cohesive sediment critical shear stress from 0.2 Pa to 1.2 Pa, or to 0.03 Pa, respectively, did not have any significant effect on output sediment concentrations, which were essentially the same for each critical shear stress applied (USBR 2012a, pages 9-18 to 9-19). Therefore, the sediment transport results applied in the EIR analyses are not considered to have significant uncertainty with regard to cohesive erodibility.

The comment recommends additional analysis in light of the alleged non-disclosure of model uncertainty in a third set of bullet points. The third set of bullet points are addressed as follows:

Third Set of Bullet Points, Point 1: Please refer to Volume I Section 2.7.2 *Proposed Project – Proposed Project – Reservoir Drawdown* (pages 2-54 to 2-60), as well as to Volume II Appendix B: *Definite Plan*, for explanations of

drawdown periods and rates. Please also refer to Section 3.2.4.2 *Water Quality – Impact Analysis and Approach – Suspended Sediments* for a discussion of the reservoir drawdown rate with respect to sediment discharge. Please see Volume III Attachment 1 for the final Section 3.2 *Water Quality*. As discussed above in this comment response, the angle of repose accounts for instantaneous movement (erosion) of reservoir sediment into the fluvial system in the SRH-1D model, but the model does not account for ongoing channel bank slumping nor for reservoir rim instability. The angle of repose applied for SRH-1D modeling (USBR 2012a) was set at 15 degrees and sensitivity tested at 5 degrees and 10 degrees, with 15 degrees considered most representative of sediment mobilization upon drawdown. Results associated with sediment mobilization at this angle (and associated velocity) are included in Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5, which is modified in Volume III Attachment 1. The angle of repose applied in the DREAM-1 model (Stillwater Sciences 2008), which was used for identifying preferred reservoir drawdown options for minimizing suspended sediment, was conservatively set at 10 degrees, and results are generally consistent with USBR (2012a). Regarding channel bank slumping, consideration of ongoing channel bank slumping at different drawdown rates is based on hydrology theory, rather than on quantitative modeling. Pore-water pressure, bank steepness, and the shear strength of the bank sediment relative to the forces of sediment weight and velocity are all factors in the occurrence, or lack of, bank slumping. The sediment pore-water pressure and bank steepness would remain similar over the range of drawdown rates (2 to 5 feet per day) considered. Further, the upper limit of the drawdown rate (5 feet per day) proposed would only increase the maximum average water discharge by 3 to 14 percent of the 2-year peak flow and 1 to 7 percent of the 10-year peak flow (see Volume I Section 2.7.2 *Proposed Project – Proposed Project – Reservoir Drawdown* [pages 2-54 to 2-60] and modifications in Volume III Attachment 1), which means that the associated relative increase of velocity in fluvial channels downstream of the reservoir footprints would also be slight. To provide context, please refer to Figures 4-7 and 4-9 in USBR (2012a), which show that reach averaged channel velocities in the Klamath River between Iron Gate Dam and Indian Creek are within the range of approximately 3.5 to 4.5 ft/s under median flow conditions and that this range increases to approximately 5.5 to 8.5 ft/s during the 2-year peak flow. As previously noted, the maximum average flow increase during drawdown would be 3 to 14 percent of the 2-year peak flow and 1 to 7 percent of the 10-year peak flow with the upper limit of the proposed drawdown rate (5 feet per day), so the average increase in the Klamath River velocities during drawdown would typically be less than those experienced under the 2-year peak flow. Thus, there would not be a substantial increase in bank erosion, including slumping, with the upper limit of the proposed drawdown rate (5 feet per day) compared with a slightly slower drawdown rate, and the EIR analysis accurately describes the range of potential erosion. Regarding the latter point of reservoir rim stability from above, this is considered separately from channel bank slumping—see Section 3.11.5 *Geology, Soils, and Mineral*

Resources – Potential Impacts and Mitigation Potential Impact 3.11-3 and Master Response GEO-2. Although the significance determination remains unchanged, Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* – Potential Impact 3.11-3 and associated Mitigation Measure GEO-1 has been revised to clarify the potentially unstable slope segments associated with potential slope instability during drawdown and the actions required in relation to this. The proposed drawdown rate (2 to 5 feet per day) is expected to have minimal effect on the stability of the slopes, and as such Potential Impact 3.11-3 does not differentiate the analysis or significance determinations based on drawdown rate. Please refer to Volume III Attachment 1 Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* for these revisions.

Third Set of Bullet Points, Point 2: Sediment transport modeling was divided into two model segments: an upstream model extending from upstream of J.C. Boyle Dam to downstream of Iron Gate Dam, and a downstream model extending from Iron Gate Dam to the Pacific Ocean (USBR 2012a). Figures 9-28 and 9-29 of USBR (2012a, page 9-35) show modeled reach averaged erosion and deposition depths from J.C. Boyle to Iron Gate dams. The reaches between J.C. Boyle and Iron Gate dams are modeled to have minimal morphological change following dam removal (USBR 2012a), including the reach upstream of Copco No. 1 Dam in California, which shows the least change. The EIR focuses on the potential geomorphological impacts to reaches downstream of Iron Gate Dam, because this is where modeling indicated that there could be potential impacts in California. Please refer to Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 (pages 3-765 to 3-775) and modifications to this impact in Volume III Attachment 1. Please also refer to Master Response GEO-1.

Third Set of Bullet Points, Point 3: Regarding sensitive habitat locations downstream of Iron Gate Dam and the effects on these resources, including sediment deposition effects, please refer to Volume III Section 3.3 *Aquatic Resources* and to Master Responses AQF-7 and AQF-10. Regarding sediment deposition specifically, please refer to Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 (pages 3-765 to 3-775) and modifications to this impact in Volume III Attachment 1, as well as to Master Response GEO-1. Given that the significance of short-term sediment deposition during and following dam removal is split, with a significant and unavoidable impact between Iron Gate Dam and Cottonwood Creek, and no significant impact downstream of Cottonwood Creek, the associated aquatic impacts are also considered at this spatial scale. As discussed in Master Response GEO-1, the existing sediment models were sufficient to assess potential sediment-related impacts of the Proposed Project against criteria relevant to CEQA, and additional analysis of fine sediment erosion, transport, and deposition, is not necessary for the purposes of the EIR.

Third Set of Bullet Points, Point 4: Regarding fine sediment erosion, transport, and deposition, including behavior in riffles, please refer to Master Response GEO-1, and to Master Responses AQF-7 and AQF-10 for the associated impacts to fish. A more spatially discrete sediment analysis would not change the key findings or impact determinations for aquatic resources. Potential short-term and long-term impacts to critical habitats and Essential Fish Habitats (EFHs), as well to specified salmonid populations, are assessed in Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts*. Geomorphological changes, including channel bed deposition, are considered. For coho salmon critical habitat and Chinook and coho EFH, as well as for salmonid populations generally, increased bedload transport and deposition from the removed dams to Cottonwood Creek would improve spawning substrate following dam removal in the short- and long-term (i.e., once elevated SSCs rescind, habitat would be improved). Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Third Set of Bullet Points, Point 5: Prefer to response to comment ORG46-132 for a discussion of sediment jetting.

Lastly, although not specifically discussed in the comment, Brookes (2019) makes the incorrect statement that the sediment volumes trapped behind the Lower Klamath Project dams are unknown. The second row below the header of the table in Section 2 (pages 4-5) of Brookes (2019) misinterprets information from USBR (2012a). The fraction of fine (silt- and clay-sized) material trapped behind the dams is known within a reasonable level of uncertainty based upon data from more than 75 sediment cores collected across J.C. Boyle, Copco No. 1, and Iron Gate reservoirs using standard sampling methods (see Table 5-15 [page 5-25] in USBR 2012a, and Table 2.7-10 [page 2-67] and Table 2.7-11 [page 2-68] in EIR Volume I Section 2.7.2 *Proposed Project – Reservoir Drawdown*, as well as Table 3.11-6 [page 3-766] in Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-6). While the proportion of the total fine fraction that is silt- versus clay-sized particles was not distinguished during the sediment core sampling, the analysis of sediment erosion potential for the reservoirs is not sensitive to this uncertainty. The known fine sediment fraction is used for estimating SSCs at high flows (USBR 2012a, page 5-5).

Comment ORG46-9

2.5 Greenhouse Gas

The impacts to greenhouse gas emissions resulting from removal of a non-emitting power source and its relation to California climate change policies are inadequately addressed in the DEIR. The qualitative analysis identifies the replacement of hydroelectric power with possible non-renewable energy sources as an indirect impact. This is not an indirect impact but rather a direct consequence of removing a stable and reliable non-emitting generation source

from PacifiCorp' s resource portfolio that can meet the energy needs of approximately 69,000 homes.

The analysis repeatedly refers to PacifiCorp's 2017 integrated resource plan (IRP; PacifiCorp 2017) and associated plans to increase renewable energy resources on its system over time. While it is the case that PacifiCorp is in the process of decarbonizing its generating resource portfolio, the analysis in the DEIR is inadequate in that what is required is an assessment of PacifiCorp' s system emissions if the Klamath Hydroelectric Project is not removed, or if specific elements of the project are not removed as considered in the Two Dam Removal and Three Dam Removal alternatives. Since PacifiCorp's (2017) IRP assumes the Klamath Hydroelectric Project is removed, it already represents the scenario where the energy and capacity from the Klamath Hydroelectric Project are replaced with existing or incremental resources. Though future capacity resources may be non-emitting, from an operational perspective low-cost energy from a hydroelectric resource displaces a combination of energy resources and wholesale market purchases on PacifiCorp's system that provide similar capacity and dispatch flexibility as the hydroelectric facilities and that do have an emissions profile that is not accounted for in the DEIR. To continue to balance fluctuating loads and resources in real-time, while providing local voltage and frequency support to the transmission system, PacifiCorp will need to call upon non-renewable resources if the Klamath Hydroelectric Project is removed. While PacifiCorp's continued expansion of renewable resources in its generation portfolio can replace zero-emission energy lost as a result of dam removal, the expansion of non-carbon resources that can provide capacity (e.g. storage) will be needed to reduce these impacts over time. For these reasons, these emissions impacts should be acknowledged in the DEIR.

As calculated pursuant to the California Air Resources Board Mandatory Greenhouse Gas Reporting Rule, PacifiCorp's 2017 system emission factor was 0.6844 metric tons of carbon dioxide equivalent ($MTCO_2e$) per megawatt-hour (MWh). Using this factor, the Klamath Hydroelectric Project developments proposed to be removed, which produce 686,000 MWh of generation per year, displace approximately 469,500 $MTCO_2e$ per year. As a point of reference, PacifiCorp's total obligation for emissions reductions under California' s cap-and-trade program in 2017 was 756,736 $MTCO_2e$. Thus, removal of the Klamath project dams will set back PacifiCorp's compliance with mandated emissions reductions and increase its required emissions reductions to achieve California's climate change policy mandates.

The threshold for a potentially significant impact related to greenhouse gas emissions in the DEIR is set at 10,000 $MTCO_2e$ (DEIR pg. 3-719). Though avoided emissions will go down over time as PacifiCorp decarbonizes its system, the DEIR entirely fails to consider the emissions impacts related to removal of hydroelectric facilities that are qualified generation resources under California' s renewable portfolio standard. In a single year, the increased emissions resulting

from removal of the Klamat h Hydroelectric Project will exceed the DEIR' s significance criteria by a factor of nearly 47. Over the expected life of a new potential FERC license—40 years—the increased system emissions would be on the order of 18 million MTCO2e at PacifiCorp's current system emission factor. Granted, revised instream flow requirements under a new license would reduce the generation output of the Klamath Hydroelectric Project, but the failure of the DEIR to consider the potential impact on greenhouse gas emissions due to dam removal reflects a lack of balance in the document that results in adverse environmental impacts of potential dam removal being downplayed. Millions of tons of avoided greenhouse emissions is not an insignificant environmental impact, particularly in the near-term when reducing emissions to avoid the worst impacts of climate change is critical.

Indeed, prior environmental analysis of Klamath relicensing and dam removal alternatives (FERC 2007; DOI and CDFW 2012) have considered greenhouse gas emissions impacts to be a direct consequence of Klamath dam removal. In its Final EIS, FERC (2007) estimated the greenhouse gas emissions impacts of removing the four Klamath dams proposed for removal to range between 68,600 to 106,330 metric tons of carbon per year, or 251,500 to 389,900 $MTCO_2e$ per year (see Table 4-8 in FERC 2007). Similarly, the 2012 KHSA EIS/EIR (DOI and CDFW 2012) documented emissions impacts from potential dam removal ranging between 341,539 to 396,575 $MTCO_2e$ per year (see Tables 3.10-6 and 3.10-7 in DOI and CDFW 2012). The DEIR considers the emissions impacts of removing non-emitting generating resources as an indirect impact of the Proposed Project, and then only qualitatively discusses those impacts as being not significant given PacifiCorp's plans to continue to add renewable resources. However, robust and readily available quantitative analysis has been conducted on these greenhouse gas emissions impacts but this information is not incorporated into the DEIR.

The DEIR's lack of balance is also reflected in that its greenhouse gas evaluation considers potential emissions of methane from the hydroelectric reservoirs that would presumably be removed as part of the Proposed Project, even though there has been no thorough assessment of methane production at the Klamath Hydroelectric Project. As FERC (2007) stated, "Given the lack of any site specific data concerning methane production at the Klamath Hydroelectric Project, any attempt to estimate net bio-production of greenhouse gases would be speculative, at best." This remains the case, yet the DEIR assessed reduced methane emissions as a potential benefit of the Proposed Project, but completely fails to assess the greenhouse gas emissions impacts of removing qualified, non-emitting renewable resources.

The DEIR's analysis also does not address California's policies in Senate Bill (SB) 100 (De León). Senate Bill 100 increases California's renewable portfolio standard (RPS) to 60 percent by 2030 and establishes a state policy whereby renewable and zero-carbon resources are to supply 100 percent of retail sales to

California end-use customers by December 31, 2045. Any loss of a zero-carbon resource will make this standard more costly and difficult to meet. While removal of the Klamath Hydroelectric Project may not endanger PacifiCorp's ultimate compliance with California's RPS, it will make such compliance more costly. The intent of California' s RPS and its cap-and-trade program is to reduce greenhouse gas emissions and ultimately the impacts of climate change. The removal of an existing non-emitting resource that could continue to serve customers directly contradicts the purpose of these policies and thus should be more fully evaluated in the DEIR.

Additionally, both Oregon and Washington are considering sweeping climate change bills impacting the electric sector in 2019 legislative sessions. Oregon is considering adopting a cap-and-trade program that will link with California's program, while Washington is considering both a cap-and-trade program and a proposal that would require utilities in Washington to achieve 100 percent carbon neutral energy portfolios by 2030. While not certain to pass this year, it is likely that additional policies targeting emissions from the electric sector will be enacted in the near-term. Hydroelectric generation, which is more predictable and reliable than intermittent resources such as wind and solar, will be a critical component of the shift to a low- cost, reliable carbon-free future. In failing to even acknowledge the benefit of the non-emitting nature of the Klamath Hydroelectric Project and its relation to California's extensive climate change policies, the DEIR conflicts with the California RPS goals by not addressing the increase in carbon emissions resulting from implementation of the Proposed Project.

Response to Comment ORG46-9

This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Greenhouse Gas Emissions and Energy*).

Comment ORG46-10

2.6 Uncertainty in Salmon Production and Recolonization

The DEIR does adequately address the uncertainty associated with salmon production and recolonization and presents an unbalanced view of potential out comes. The DEIR states that the Proposed Project will increase fall-run Chinook Salmon abundance based solely on Hendrix (2011) modeling analysis. To be precise, the Hendrix (2011) analysis uses average habitat productivity data from Pacific Northwest streams to forecast that natural fall-run Chinook Salmon production will increase in the absence of harvest. That is, natural production of the important harvest species in the Klamath Basin will increase if there is no fishing for that species. The Hendrix (2011) analysis has significant limitations and does not present data for hatchery fish returning to Iron Gate Hatchery or Trini ty River Hatchery. This distinction is important because as the DEIR states, Iron Gate Hatchery produces about 50,000 adult fall-run Chinook annually (DEIR pg. 3- 248). This rate of supplementation by Iron Gate Hatchery supports a long-

term average harvest rate of about 28,000 fall-run Chinook (CAHSRG 201 2}. Hendrix (2011} estimates that the Iron Gate Dam to Keno Dam reach of the Klamath River would produce 23,000 adult natural origin fall-run Chinook if there was no harvest of those adults. Even using this flawed no harvest assumption, this is approximately 50 percent fewer fall-run Chinook than the corresponding number currently produced by Iron Gate Hatchery. The DEIR fails to recognize the inherent contradiction in these modeling results: namely, that under the most optimum outcomes, implementation of the Proposed Project would result in the production of substantially fewer fish than under existing conditions without allowing any harvest of those fall-run Chinook. If harvest were to occur at close to the historically average rate, even fewer fall-run Chinook would be available to return to the upper Klamath River.

This discussion illustrates how the DEIR underestimates the importance of fall-run Chinook produced at Iron Gate Hatchery. While the DEIR acknowledges that production targets at the hatchery will be changing under the Proposed Project, it does not accurately address the impacts that will occur from the proposed substantial reduction in Chinook production on fish populations or tribal, recreational, or commercial fisheries. The Proposed Project would reduce the yearling Chinook production by 87 percent and the smolt production by 33 percent. Yearling fall-run Chinook have better survival rates, contribute to the fisheries at a higher rate than Chinook released as smolts, and return to Iron Gate Hatchery at a long-term average rate that is about twice that of smolts (Giudice and Knechtle 2018). This makes the proposed 87 percent reduction in yearling production a much larger proportional impact on fall-run Chinook populations and fisheries. Coupled with this short coming, the DEIR does not adequately address the long-term impacts arising from the eventual elimination of Iron Gate Hatchery production 8 years after dam removal.

The DEIR fails to discuss the results from habitat modeling conducted during FERC relicensing (Oosterhout 2005; PacifiCorp 2005) that compared natural production to current hatchery production of adults. These results should be described in the DEIR to adequately inform the public and decision-makers about the potential impacts of the Proposed Project. The analyses by PacifiCorp (2005) and Oosterhout (2005) should be described, because these two analyses are thorough, incorporate habitat and water quality data specific to the Klamath River, and include potential dam removal scenarios. Unlike the Hendrix (2011} model, these two analyses incorporated actual measurements of stream habitat, water quality, and disease for virtually every river mile from Iron Gate Dam upstream. The data for the two analyses were collected by agencies and PacifiCorp as part of FERC relicensing process and data inputs to the models were reviewed and agreed to by the agencies. In contrast, the Hendrix (2011) model used the more simplified assumption that habitat quality is similar to other streams up and down the West Coast (even though the Klamath River is like no other stream on the West Coast). Thus, the analyses of PacifiCorp (2005} and

Oosterhout (2005} are based on basin-specific scientific information in contrast to Hendrix (2011} that uses generic data.

The DEIR acknowledges that there is uncertainty associated with the effects of the Proposed Project on Coho and Chinook. The DEIR notes that one of the reasons that Hendrix (2011) model results are used in the analysis is that it provided variance estimates of uncertainty, yet the results of this uncertainty analysis are not discussed in the DEIR. This uncertainly analysis needs to be described in the DEIR to fully inform decision-makers and public about the range of potential outcomes of the Proposed Project. The DEIR extensively references the Expert Panel report on Coho and Steelhead where Dunne et al. (2011} repeatedly reinforce the uncertainty around how the Proposed Project could affect the Coho population. Dunne et al. (2011} note that there may be a small increase in Coho production from newly accessible habitat, but also that disease and low ocean survival could easily offset this gain. Dunne et al. (2011) state that any increases in Coho populations are expected to be small through the first 10 years following the Proposed Project. This uncertainty was again voiced by the Expert Panel on Chinook where Goodman et al. (2011) stated that "...achieving substantial gains in Chinook salmon abundance and distribution in the Klamath Basin is contingent upon successfully resolving the following nine factors:"

1. *Resolve water quality issues in Upper Klamath Lake and Keno Reservoir*
2. *Address fish disease*
3. *Salmon successfully colonization of the upper basin*
4. *Harvest is managed to support adequate escapement*
5. *Hatchery straying does not adversely impact natural reproduction*
6. *Predation does not impact salmon populations*
7. *Climate change does not overwhelm production*
8. *Fall flows are adequate to minimize impacts to Chinook*
9. *Dam removal impacts do not have multi-year adverse effects*

While these nine items were written for the report on Chinook, they apply to Coho and the overall success of the Proposed Project as a whole. Because of unknown habitat quality upstream of Iron Gate Dam, the small population of Coho from which recolonization could occur (on average Iron Gate Hatchery annually receives 30 stray natural-origin adult Coho), and the fact that most of those fish are not adapted to habitat upstream of Iron Gate Dam, the DEIR conclusions regarding the success and speed of recolonization are overly optimistic. It is also important to recall that the determinations by both of these Expert Panels included the implementation of the KBRA. The KBRA in part provided funding and structure for basin-wide restoration which could address some of the nine factors listed above. The KBRA expired at the end of 2015 and has not been resuscitated. In Dunne et al. (2011) possible larger gains in Coho production were reported as being contingent on successful implementation of the KBRA. Given that this is no longer available, the level of uncertainty

surrounding the successful outcome of the Proposed Project is even higher than it was 2011. Additionally, the DEIR presents no analysis about potential harvest restrictions that could be necessary to support reintroduction and recolonization of Chinook into habitat areas upstream of Iron Gate Dam. Restrictions on harvest are often necessary to support reintroduction efforts to reduce pressure on populations that are attempting to recolonize formerly inaccessible or inadequate habitat areas. The DEIR provides no analysis of these potential impacts, or the duration of these impacts. Similarly, the Hendrix (2011) model provides no time-scale for natural production sufficient to replace hatchery production to occur and simply assumes that peak natural production occurs immediately after dam removal. There is great uncertainty about impacts to harvest from the Proposed Project which is not portrayed in the DEIR.

Response to Comment ORG46-10
Please refer to Master Response AQF-8. Regarding effects of reduced hatchery production, please refer to Master Response AQF-3 and response to comment ORG46-35. Regarding harvest, please refer to responses to comment ORG46-248, ORG46-481, and ORG46-487. Regarding actions associated with the Klamath Basin Restoration Agreement (KBRA), please refer to response to comment ORG46-250.

As the comment notes, the Draft Environmental Impact Report (DEIR) acknowledges the Expert Panel report's uncertainty regarding the effects of dam removal on key fish populations. Indeed, Dunne, et al. (2011) and Goodman, et al. (2011) both are referenced in the EIR, were considered as part of the State Water Board's analysis, and will be included in the administrative record. To the extent information was available to inform such analysis, the EIR includes discussion of the sources of uncertainty referenced by the comment, putting overall uncertainty regarding the effects of dam removal on key fish populations into appropriate and meaningful context for the public and decision makers. With regard to factor 1, please refer to Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Water Temperature* and Section 3.3.5.3 *Aquatic Resources – Potential Impacts and Mitigation – Water Quality – Upper Klamath River and Connected Waterbodies* for discussion of water quality in waters upstream of the Hydroelectric Reach under the Proposed Project. With regard to factor 2, please refer to Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites*. With regard to factor 3, please refer to Potential Impact 3.3-7. With regard to factor 4, please refer to Section 3.3.5.6 *Aquatic Resources – Potential Impacts and Mitigation – Fish Hatcheries* and Potential Impact 3.3-7. With regard to factor 5, please refer to Section 3.3.2.3 *Aquatic Resources – Potential Impacts and Mitigation – Fish Hatcheries – Habitat Attributes Expected to be Affected by the Proposed Project* and Section 3.3.5.6 *Aquatic Resources – Potential Impacts and Mitigation – Fish Hatcheries*. With regard to factor 6, please refer to Potential Impact 3.3-18. The best available evidence does not indicate that a shift in predation patterns is likely to

occur, during or after implementation of the Proposed Project, much less undermine improvements to salmonid populations resulting from conversion of the Hydroelectric Reach to a riverine system. With regard to factor 7, please refer to Potential Impact 3.2-1. With regard to factor 8, please refer to Potential Impact 3.3-7. With regard to factor 9, please refer to Potential Impact 3.3-7, Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project*, and Volume II Appendix E Section E.3.2. However, given that the Expert Panel report was just one of the several lines of evidence considered with respect to those effects – as noted in Master Response AQF-3 – it would be inappropriate to elevate the uncertainty identified by that report to the central role within the EIR's analysis that the commenter suggests. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*, including the subsections listed above.

Comment ORG46-11

• The DEIR does not accurately assess the magnitude of impacts from the Proposed Project on Coho. The DEIR identifies a threshold for a potentially significant impact to Coho Salmon as being a change in "...the abundance (greater than 50 percent reduction) of a year class for aquatic species." (DEIR pg. 3-258.) This definition ignores the fact that over 50 percent of the Coho population returns to the Trinity River (Naman and Perkins 2015; Kier et al. 2018) and would be substantially unaffected by the project. Under this questionable approach, even the extirpation of all Coho from the Klamath River upstream of the Trinity River would not be considered significant because it would affect less than SO percent of a year class of the population. Even though impacts to Coho Salmon may not exceed the significance threshold established by the DEIR, the small population of Coho in the mainstem Klamath River (see Major Issue 2.1) would still be substantially impacted, and should be considered a significant impact. See Communities for a Better Environment v. California Resources Agency (supra, 103 Cal. App. 4th 98).

Response to Comment ORG46-11

Please refer to Master Response AQF-9.

Comment ORG46-12

• The DEIR does not clearly and accurately assess the impacts of the Proposed Project from loss of reservoir storage. The DEIR asserts that because evaporation losses from Copco and Iron Gate reservoirs would be removed under the Proposed Project, more water would be available to the USBR for diversion. However, the loss of reservoir storage and downstream release facilities (namely Iron Gate Dam) would require USBR to release correspondingly larger volumes of water at Keno Dam to achieve required flows downstream to support aquatic and cultural river uses, which would result in flow demands significantly greater than the reduction in evaporative losses.

Response to Comment ORG46-12
Because United States Bureau of Reclamation (USBR) maintains its biological opinion obligations for the mainstem Klamath River regardless of the existence of the Lower Klamath Project, dam removal would not alter the amount of water required for environmental or cultural purposes, or the source of that water. The water source for USBR biological opinion flow obligations is Upper Klamath Lake, not the Lower Klamath Project reservoirs. The Lower Klamath Project reservoirs temporarily store water for hydropower production. By eliminating the evaporative losses that occur under existing conditions due to temporary hydropower storage in the Lower Klamath Project reservoirs, the Proposed Project would reduce the total water volume that USBR must release down the Klamath River to meet biological opinion flow requirements, and therefore, allow USBR to retain additional water available for upstream diversion in the Klamath Irrigation Project. Whether this increase in available supply would contribute to increased instream flows or be used upstream to supplement irrigation deliveries is uncertain, so the EIR discloses the potential increase but does not rely on it for conclusions regarding the impacts of the Proposed Project (see also Volume I Section 3.8.4 *Water Supply/Water Rights – Impacts Analysis Approach*).

Please also refer to Volume I Section 3.8.5 *Water Supply/Water Rights* Potential Impacts 3.8-1 and 3.8-2 (pages 3-676 to 3-680), which discuss the water borrowing agreements made between PacifiCorp and USBR in 2014 and 2018. It is unclear if further water borrowing would occur in the future due to the multiple constraints detailed by USBR and discussed in Potential Impact 3.8-2 (pages 3-679 to 3-680). The EIR's assessment of the unlikelihood of future water borrowing is further bolstered by USBR's elimination of this alternative from further consideration as part of its environmental assessment of the Klamath Irrigation Project operations (USBR 2019).

Comment ORG46-13
• *The DEIR inadequately addresses the impacts of sedimentation on Waters of the U.S. The Klamath River downstream of Iron Gate Dam is a jurisdictional Water of the U.S. and subject to regulation by Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act. The release of sediment (bedload movement and suspended sediments) from the Proposed Project will result in fill of these jurisdictional waters. The DEIR analysis does not evaluate or quantify the amount of fill to Waters of the U.S. that would occur downstream of Iron Gate Dam as a result of the Proposed Project.*

Response to Comment ORG46-13
Comment noted. As explained in Volume I Section 3.1.4 *Introduction – Impact Analysis Approach* (page 3-2), the EIR establishes criteria for evaluating the significance of the potential direct and reasonably foreseeable indirect effects on the environment associated with the implementation of the Proposed Project and analyzes those effects. This approach adequately discloses the environmental effects of the Proposed Project. For example, with respect to sedimentation, the

EIR estimates the amount of annual average load sediments from the Klamath River to the Pacific Ocean.

For information on potential impacts from sediment deposition related to geomorphology, flood hydrology, and aquatic and terrestrial habitat, please refer to: Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 (pages 3-765 to 3-775) and modifications to this impact in Volume III Attachment 1; Volume I Section 3.6.5.2 *Flood Hydrology – Potential Impacts and Mitigation – River Floodplain* Potential Impact 3.6-5 (page 3-634 to 3-635); Section 3.3 *Aquatic Resources*; and Section 3.5.5.1 *Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities* Potential Impact 3.5-3. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources* and Section 3.5.5.1 *Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities* Potential Impact 3.5-3.

Note that Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 has been clarified to discuss reach-averaged sediment deposition or erosion and bed elevation change results of both sets of SRH-1D simulations that were undertaken by the U.S. Bureau of Reclamation (i.e., forty eight 2-year simulations and three 50-year simulations) (USBR 2012a). The clarifying edits do not change the conclusions or significance determinations in Potential Impact 3.11-5. Please refer to Volume III Attachment 1 Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 for the revisions.

As stated in Volume II Appendix B: *Definite Plan* (pages 36 to 37 of the *Definite Plan*), Klamath River Renewal Corporation (KRRC) is coordinating with the U.S. Army Corps of Engineers regarding the Section 404 individual permit associated with implementation of the Definite Plan.

Comment ORG46-14

• *The DEIR's assessment of reservoir drawdown does not address the effects to downstream fish communities of releasing the entire population of Yellow Perch (or any other reservoir fish) from Copco and Iron Gate reservoirs. Hundreds of thousands of Yellow Perch from the reservoirs would be released into the lower river during and after drawdown of the reservoirs. The DEIR does not address the effect of Yellow Perch competing for the same habitat types used by Chinook, federally-threatened Coho, or Steelhead.*

Response to Comment ORG46-14

Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resources Impacts* analyzes the potential effects of introduced reservoir fish species, including yellow perch, competing for the same habitat as native aquatic species in the Klamath River downstream of the Hydroelectric Reach in Potential Impact 3.3-17. As discussed in this impact analysis, dam removal would result in

a conversion of lotic (calm water) reservoir habitat, to which yellow perch and other warm water fish species are adapted (Moyle 2002), to high velocity (turbulent) riverine habitat, to which yellow perch are not adapted. As discussed in Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species – Non-native Fish Species*, yellow perch and other non-native reservoir fish prefer habitat with low water velocity, low turbidity, and warm water temperatures. Under the Proposed Project, the conversion of reservoir to riverine habitat would occur during winter high flows, which would be likely to rapidly (within days) displace, and ultimately result in the mortality of, yellow perch and other introduced reservoir species. Additionally, Potential Impact 3.3-18 has been slightly revised to clarify the effect of reservoir conversion on non-native reservoir species. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Under current conditions, high flows can also result in transport of reservoir fish species over Iron Gate dam and into the Klamath River, such that the introduction of these species in the Klamath River would not be a new risk. Gough et al. (2015) report observations of yellow perch and other current reservoir fish species in the Klamath River directly downstream of Iron Gate Dam that have spilled over Iron Gate Dam (or been entrained though turbines), with very few observations of these species farther downstream. In a report prepared for PacifiCorp, CH2MHill (2003) state that reservoir species including yellow perch that survive passage downstream past Iron Gate Dam, "will eventually perish in the downstream riverine habitat."

Please also refer to the Klamath River Expert Panel findings (Buchanan et al. 2011a), where the panel was convened to assess Lower Klamath Project dam removal effects on resident fish and concluded that dam removal, "…would change reservoir habitat to free-flowing river, which would adversely affect non-native fishes in the lower Klamath basin between Keno Dam and Iron Gate Dam. Abundances of largemouth bass, yellow perch, bluegill, and brown bullhead would significantly decline or be eliminated because their preferred reservoir habitat would be gone."

Comment ORG46-15

• A critical effect of the Proposed Project on the river's periphyton community is absent from the DEIR' s analysis and discussion. Under the Proposed Project, the existing periphyton community downstream of Iron Gate Dam will shift upstream. Aquatic vegetation, currently absent under the reservoirs and in the J.C. Boyle Peaking Reach, will colonize the newly exposed stream reaches. Periphyton-related nitrogen fixation in the river would further increase the nutrient loading in the river, exacerbating nutrient impacts to the river and estuary. While the DEIR mentions the extension of periphyton upstream of Iron Gate Dam in the discussion of fish disease (DEIR pg. 3-278), this is not discussed in Section 3.4 Phytoplankton and Periphyton.

Response to Comment ORG46-15
Section 3.4 *Phytoplankton and Periphyton* does discuss the potential for periphyton colonization in the Hydroelectric Reach and changes in the periphyton community (i.e., shifts in the abundance of periphyton nitrogen-fixing species). Please refer to Volume I Potential Impact 3.4-4 (pages 3-435 to 3-437) and Potential Impact 3.4-5 (pages 3-437 to 3-440) for analysis of periphyton community variations under the Proposed Project due to increased nutrients from upstream dam removal and conversion of the reservoir areas to a free-flowing river.

Please also refer to ORG46-267 for a more detailed discussion of the anticipated changes in the periphyton community under the Proposed Project.

Comment ORG46-15.1
• The DEIR fails to assess the greenhouse gas emissions impacts of removing renewable generation facilities. Removing non-emitting hydroelectric generation facilities under the Proposed Project will result in millions of tons of additional greenhouse gas emissions, contrary to California climate change policies, and these significant impacts are not disclosed.

Response to Comment ORG46-15.1
This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Greenhouse Gas Emissions and Energy*).

Comment ORG46-16
2.8 Ceratonova shasta Fish Disease Discussion
The DEIR' s assertion that dam removal will lead to reductions in fish disease is based almost entirely on speculation and is unlikely to be realized. Fish disease hosts, triggers, and virulence are unlikely to be substantively changed with the Proposed Project. Recolonization of the project reach by infected salmon will spread the parasite C. shasta upstream of Iron Gate Dam where they will infect the highly abundant population of the polychaete host Manayunkia speciosa. In turn, the infected polychaetes will release the C. shasta actinospore that infects juvenile and adult salmon, which will cause infected salmon to contract the disease ceratomyxosis. The duration of actinospore exposure of juvenile salmon originating from upstream of Iron Gate Dam would be longer than for salmon populations downstream of this point as they must migrate farther to reach the estuary. Additionally, increased spring-time river temperatures following dam removal may increase the prevalence of infection among outmigrating juveniles.

In the analysis of the Proposed Project impacts on fish disease (Section 3.3.5.5), the DEIR indicates that existing conditions contributing to disease in salmonids include (DEIR pg. 3-276):

- *The availability of habitat for the polychaete hosts*

- *Static flows and low velocities that create appropriate microhabitats for polychaete hosts*
- *Congregations of spawned adult salmon with high actinospore loads*
- *Polychaete populations in proximity to spawning salmon*
- *Planktonic food sources for the polychaete hosts from Copco and Iron Gate reservoirs*
- *Water temperatures over 59°F (15°C)*

PacifiCorp agrees that these factors influence infection and mortality rates; however, the DEIR does not accurately represent the possible outcomes of the Proposed Project, or the alternatives, as it relates to disease, specifically ceratomyxosis.

Disease dynamics in the Klamath River from C. shasta infection are incredibly complex and the scientific understanding of them continue s to evolve at a rapid pace. The DEIR (in Section 3.3.2.3) does an insufficient job of presenting an up-to-date discussion of C. shasta effects on salmonids. While C. shasta infection rates have been high at times, the most recent highest levels (2014 and 2015) occurred during extreme drought conditions. The infection rates have declined dramatically since then (Voss et al. 2018), likely for a combination of reasons related to flow, temperature, and fish abundance.

The polychaete host for C. shasta, Manayunkia speciosa, is native to the Klamath River and found throughout the basin. While the densities of this polychaete vary within the basin in response to a variety of factors, they are abundant in the reach downstream of J.C. Boyle Dam, in the Williamson River, and at various locations in the mainstem lower Klamath River from the mouth upstream to Iron Gate Dam.

In Section 3.3 the DEIR recognizes that under the Proposed Project the expected increase in periphytic growth could provide habitat for the polychaetes (DEIR pg. 3-278). However, the DEIR then assumes other factors such as the restoration of bedload sediment transport would offset increases in periphyton-related habitat by enhancing potential scour of polychaetes. The DEIR does not inform the reader that there is very little bedload sediment supply for inducing scour in the Keno Reach, J.C. Boyle Reservoir, J.C. Boyle Bypass Reach, or J.C. Boyle Peaking Reach. The substrate in these reaches is large and the stream beds are stable because: (a) the flows are moderated by upstream dams and storage reservoirs; (b) no tributaries of any consequence enter the system (Spencer and Shovel creeks are not appreciable inputs of sediment); and (c) flows are notably lower here than in downstream reaches where active sediment transport occurs (especially downstream of the Scott River). In sum, these upper reaches will be prime polychaete habitat, with conditions well-suited for abundant polychaete densities, including appreciable organic matter, stable flows, stable stream bed, and stable substrate for polychaetes to colonize. Add to this the DEIR's expectation of producing tens of thousands of Chinook Salmon in this reach

which would provide the myxospores needed to infect polychaetes and expansion of C. shasta throughout the upper Klamath River would result.

Further, the DEIR does not make use of recent studies that have evaluated the effectiveness of scour as a mechanism for reducing polychaete concentrations. Recent research indicates that while polychaetes may respond to flow changes and be removed from substrates by increasing flows (with specific dislodgment flows that varied depending on the substrate), polychaetes also exhibited a variety of behavioral reactions to flow changes and proved to have relatively high survival rates (M alakauskas et al. 2013). Generally, this research suggests that polychaete populations likely exhibit high resilience to flow-mediated disturbances.

Additionally, the DEIR fails to acknowledge that recent research indicates that the magnitude of high flows that may be necessary to induce scour that could disrupt polychaete habitat (see Shea et al. 2016) are above the thresholds of flows that are expected to be achieved from the Proposed Project. That is, removal of the Klamath Hydroelectric Project is not anticipated to increase peak flows, that result in significant scour events, above conditions that are currently experienced with the hydroelectric dams in place. Thus, recent research indicates that scour may be ineffective at solely combating polychaete densities that contribute to high infectious rates in the Klamath River, and that the expected hydrologic changes from the Proposed Project are unlikely to result in flows that could accomplish scour anyway.

Research by Foott et al. (2016) has shown that relatively few very highly infected adult Chinook carcasses are capable of fully seeding the polychaete populations in the river reaches. This information indicates that C. shasta disease transmission will occur whether salmon spawner density increases of decreases. Reintroduction of Chinook and Coho spawners infected with C. shasta would infect the polychaete hosts through the release of myxospores from fish carcasses. As a result, the Chinook and Coho-specific genotypes of C. shasta would become established in the existing polychaete population and release spores in densities that result in infection of juvenile Chinook and Coho. Based on this information, the DEIR is incorrect to indicate that spreading out the salmon populations would reduce their proximity to polychaete populations and therefore reduce disease effects. In sum, the DEIR' s assumption that the Proposed Project would reduce disease effects is not support ed by the current understanding of fish disease dynamics in the Klamath River.

The DEIR makes reference to the planktonic algae released from Copco and Iron Gate reservoirs as an important polychaete food source that is partially responsible for the abundance of the polychaete host of C. shasta downstream of Iron Gate Dam. While these food sources would no longer be present if the Proposed Project were implemented, the DEIR acknowledges that Keno Reservoir would remain in place and continue to release large amounts of algae

into the Klamath River. Based on KHSA Interim Measure 15 monitoring data and using chlorophyll-a as a surrogate for planktonic algae, it is apparent that Keno Dam would remain a source of planktonic algae for the polychaetes, producing more planktonic algae than is released from Iron Gate Dam (Figure 9). Further, researchers from Oregon State University have routinely harvested polychaetes from the J.C. Boyle Bypass Reach because these populations are some of the densest anywhere in the river (Alexander et al. 2016b). The high densities in this reach are at least partially due to the food supplied from Keno Reservoir and Upper Klamath Lake.

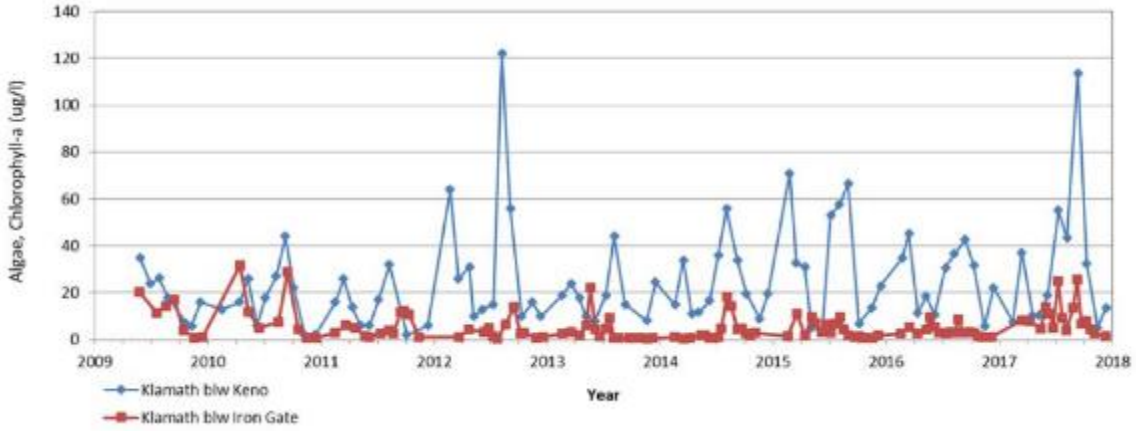


Figure 9. Chlorophyll-a concentrations downstream of Keno Dam and downstream of Iron Gate Dam collected as part of the Klamath Hydroelectric Settlement Agreement Interim Measure 15 monitoring program from 2009 through 2017.

The DEIR asserts that "Dam removal would mean cooler temperatures in the late summer and fall, but slightly warmer temperatures in the spring and early summer" (DEIR pg. 3-2 77). The Klamath Hydroelectric Project dams serve to cool water temperatures during the spring months, which may reduce C. shasta severity in the reach of the river downstream of Iron Gate Dam where the temperature signature from the Klamath Hydroelectric Project is greatest. The DEIR states, and PacifiCorp's prior water quality modeling (PacifiCorp 2006, 2014) confirms, that the spring water temperatures are higher under the Proposed Project. In fact, Figure 3.3-5 (DEIR pg. 3-275) is based on PacifiCorp's water quality modeling for 2002 and is used to describe temperature effects to salmon (Figure 10). The data show that water temperatures would exceed 15°C approximately 2 to 4 weeks earlier with implementation of the Proposed Project (Figure 10). This in turn could increase C. shasta disease rates because polychaete hosts develop spores more quickly under warmer water conditions (Ray et al. 2012). The DEIR spends a great deal of time noting the severity of C. shasta for Klamath River salmonid populations but fails to acknowledge that dam removal has the potential to also exacerbate C. shasta infection prevalence. The

DEIR is required to present both possible positive and negative effects of the Proposed Project.

According to Bartholomew and Foott (2010 as cited in the DEIR), the 59°F (15°C) water temperature criterion that is referenced in the DEIR applies when the infectious dose of C. shasta is low. However, DEIR fails to present the complete finding of Bartholomew and Foott (2010, page 38) that water temperature is not a strong predictor of survival when infectious dose is high. Specifically, Bartholomew and Foott (2010) show substantial effects on salmonids at temperatures ranging from about 55°F to almost 70°F (13°C to 21 °C). Simulated water temperature information presented in the DEIR indicates that water temperatures would reach 13°C in early April for the Proposed Project compared to early May for existing conditions (Figure 10). While the DEIR claims that warmer water temperatures in spring under the Proposed Project would result in earlier fry emergence for mainstem Chinook spawners, this would not be the case for tributary populations. Juvenile migration timing for tributary populations would remain unchanged and the majority of these fish would enter a warmer Klamath River under the Proposed Project, with all of its implications for disease.

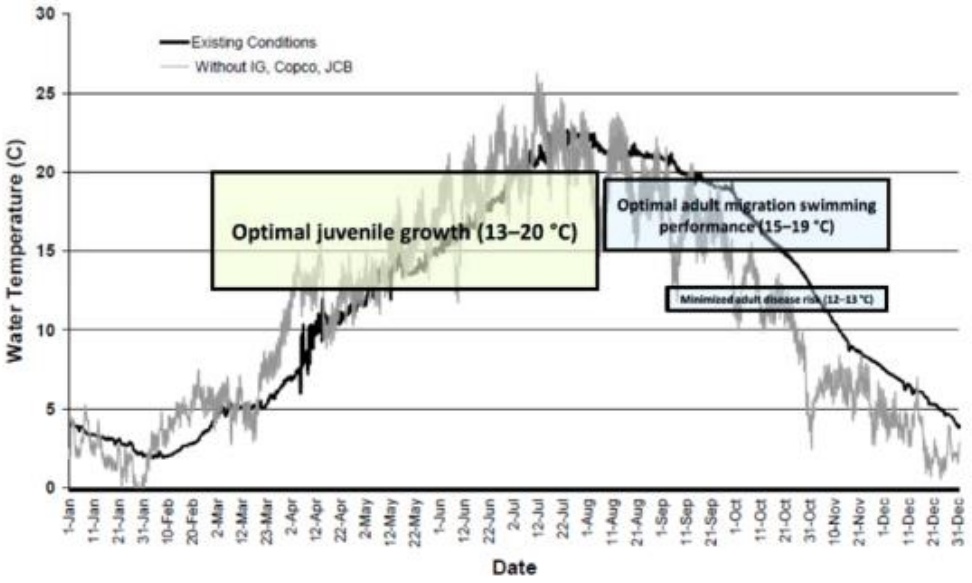


Figure 10. PacifiCorp (2005) simulated hourly water temperatures below Iron Gate Dam based on a dry water year (WY 2002) for existing conditions compared to the Proposed Project (without Lower Klamath Project dams), and USEPA (2003} water temperature criteria for salmonid growth and migration (Reproduction of DEIR Figure 3.3-5, DEIR pg. 3-275).

Routine monitoring of juvenile Chinook outmigration has indicated that water temperature may not be as important as flow in resulting disease infection rates and mortality (see True et al. 2017; Voss et al. 2018). In the discussion of disease, the DEIR should provide a more detailed and accurate summary of the

differences in river flow between alternatives so that possible flow effects on disease are clarified (see Major Issue 2. 2).

The DEIR indicates that high rates of C. shasta infection downstream of Iron Gate Dam are a function of the concentration of returning salmon spawners at Iron Gate Dam and the hatchery. The DEIR assumes that because the Proposed Project would allow access to new habitat, fish would no longer be concentrated and therefore the rates of C. shasta infection would be reduced. However, as noted by Som et al. (2016), the C. shasta infectious zone has shifted over the years. In the past, samples from Beaver Creek (RM 161) often had the highest actinospore concentrations, but peak concentrations have since moved downstream in some years and in 2016 peak spore counts were obtained near Orleans (RM 58) and Tully Creek (RM 38.5) (Bartholomew et al. 2017). Given that Chinook spawner density in these areas is substantially less than areas closer to Iron Gate Dam, large concentrations of nearby mainstem spawners are not required to produce areas with high C. shasta infection potential. The risk of C. shasta infection is based partially on the number of actinospores per liter of water because as this number increases, so does the dose for each exposed fish. Because flows upstream of Iron Gate Dam steadily decrease to Keno Dam (as fewer tributaries enter the reach), the shifting of adult spawners to upstream areas could result in a higher actinospore densities per liter of water and thus higher exposure rates and corresponding C. shasta disease risk. Thus, the DEIR's assumption that the Proposed Project would spread the spawning adults over a wider area, and that this would in turn reduce C. shasta infection rates and resultant salmonid mortality, is not supported by recent analyses.

The DEIR also does not acknowledge that because water quality conditions in Keno Reservoir could constitute a water quality barrier to adult salmon migration, returning spawners may congregate downstream of Keno Dam. Using the DEIR's logic, a concentration of Chinook in this area would form a new C. shasta infectious hot-spot as this area is just upstream of the J.C. Boyle Bypass Reach, which has some of the largest densities of polychaetes measured in the basin (Alexander et al. 2016b; Bartholomew and Hallett 2017).

The DEIR fails to accurately address the specific Proposed Project objective to "Ameliorate conditions underlying high disease rates among Klamath River salmonids" (DEIR pg. 2-1). The DEIR needs to update the discussion in Section 3.3 to reflect the current understanding of C. shasta on the Klamath River as it relates to Chinook and Coho and then conduct an analysis of potential impacts of the Proposed Project and the alternatives on fish disease. The DEIR should specifically evaluate potential impacts the Proposed Project and the alternatives could have in relation to fish disease. This includes an evaluation of:

- *The impact of a wider range of water temperatures including a complete and accurate analysis of water temperatures as they relate to the different life stages of C. shasta and the susceptible salmonids.*

- *Evaluate the potential for a C. shasta infectious zone to develop downstream of Keno Dam and the impact this would have on salmon recolonization and production.*
- *Evaluate the potential of the river reach extending from Keno Dam to Iron Garn to Dam support polychaete populations and implications for salmon production.*
- *Revisit assumptions regarding salmon spawner density effects, spawner location, and salmon C. shasta infection rates on corresponding polychaete C. shasta infection.*
- *Accurately describe and compare changes in flow between alternatives and how these changes may affect C. shasta infection rates on salmonids.*

Response to Comment ORG46-16
The EIR provides an analysis of the potential risk of fish disease, including *C. shasta*, under the Proposed Project in Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites*, which is based on extensive review of existing scientific information regarding factors controlling fish disease in the Klamath River. Please refer to Volume III Attachment 1 for the final Section 3.3 Aquatic Resources. Please also refer to Master Response AQF-6 for a detailed discussion of actinospore density, changes in water temperature downstream of Iron Gate Dam under the Proposed Project, and implications for disease risk. Master Responses AQF-5 and AQF-6 also address flows, and implications for disease risk under the alternatives.

Comment ORG46-17
2.9 Salmonid Migration, Spawning, and Rearing Water Temperature Analysis
This section describes information pertaining to the effects of water temperature conditions on anadromous fish species downstream of Iron Gate Dam. The focus here is to present an evaluation of the effects of water temperature conditions on anadromous salmonid migration, spawning, and rearing in the Klamath River downstream of Iron Gate Dam. This is necessary because the DEIR simply reports conditions as being warmer, or cooler, or more "natural" under the Proposed Project, existing conditions, or an alternative but does not discuss the biological significance, if any, of these changes or differences in temperature. In the following discussion the existing conditions are essentially analogous to the existing conditions within the DEIR, and the without-Project discussion approximates the Proposed Project in the DEIR.

This information and analysis was previously included in PacifiCorp's (2014) application to the State Water Resources Control Board for water quality certification of the Klamath Hydroelectric Project under Section 401 of the federal Clean Water Act. The PacifiCorp (2014) application analyzes water quality conditions within the Klamath Hydroelectric Project area in California, and the controllable water quality factors reasonably available to address the Klamath Hydroelectric Project's contribution to compliance with water quality objectives and protection of beneficial uses as designated in the Water Quality Control Plan

for the North Coast Region (Basin Plan). The DEIR does not reference this available and relatively recent analysis in any way. Current distributions of anadromous species in the lower Klamath River Basin are discussed in the DEIR Section 3.3 and the current population status for Coho Salmon is discussed in Section 2.1 of PacifiCorp' s comments.

2.9.1 Methods and Criteria
The extent to which the Klamath Hydroelectric Project contributes to current water temperature conditions in the Klamath River downstream of Iron Gate Dam are described in PacifiCorp {2014) based on field observations and supported by water temperature modeling of existing conditions for years 2000 through 2004 at several locations in the Klamath Hydroelectric Project reaches in California. Detailed discussions of water temperature modeling methods and results for the Klamath Hydroelectric Project are provided in PacifiCorp 2004a, 2004b, 200Sa, 200Sb, and 2014.

The potential effects of the Klamath Hydroelectric Project on water temperatures released downstream of Iron Gate Dam were evaluated specifically for fall-run Chinook Salmon, Coho Salmon, and Steelhead (PacifiCorp 2014). Average daily water temperature ranges were used to define suitable, low-to-moderate stress, and high stress/lethal effects for these species (Table 2). Suitable conditions reflect a water temperature range behaviorally selected by a species within which growth and survival are high, and susceptibility to other stressors (e.g., disease) is reduced. Low to moderate stressful conditions reflect water temperatures where growth rates are reduced, behavioral avoidance may occur, and susceptibility to other stressors is increased. High stress/lethal temperatures result in severe physiological impairment, loss of equilibrium, and/or direct mortality (e.g., incipient lethal threshold LT10). The temperature ranges have been synthesized from information available in the scientific literature on the biological response of salmonid life -history stages to water temperature conditions including, but not limited to, McCullough (1999), Sullivan et al. (2000), McCullough et al. (2001), Myrick and Cech (2001), and USEPA (2003).

- *These analyses were performed using the average daily water temperatures derived from modeling for 2000 and 2001existing conditions (with the Klamath Hydroelectric dams present) and without-Project (with dams removed akin to the Proposed Project) scenarios. Three metrics were used for this analysis: annual exposure, degree-day exposure, and habitat suitability. These are the same metric previously used by Bartholow et al. (2005) to evaluate the effects of dam removal on water temperature conditions and habitat suitability for Chinook in the Klamath River .*
- *Annual exposure equals the number of days during the year that water temperatures exceed the literature-based criteria for suitable habitat conditions (referred to as index of annual exposure).*

- *Degree-day exposure equals the sum of the differences between mean daily water temperatures above and below a range of suitable temperatures during the appropriate time periods and locations within the river.*
- *Habitat suitability equals the linear distance within a river reach that average daily water temperatures were within the range identified as suitable habitat conditions. Habitat suitability was also evaluated based on average weekly water temperatures at various locations downstream of Iron Gate Dam (running average).*

Table 2. Literature-based Ranges of Average Daily Water Temperature for Designation of Suitable and Stressful ta Lethal Effects for Target Salmon Species in the Klamath River.

Species	Life-History Stage	Suitable	Low to Moderate Stress	High Stress
Fall-run Chinook Salmon	Adult migration, pre-spawning, spawning	<17	18-21	>21
	Egg to emergence	<12	13-14	>14
	Juvenile rearing and emigration	<15	16-23	>23
Coho Salmon	Adult migration, pre-spawning, spawning	<17	18-21	>21
	Egg to emergence	<12	13-14	>14
	Juvenile rearing and emigration	<15	16-23	>23
Steelhead	Adult migration, pre-spawning, spawning	<17	18-21	>21
	Egg to emergence	<12	13-14	>14
	Juvenile rearing and emigration	<15	16-23	>23
	Steelhead smoltification	<12	13-18	>18

The seasonal distribution of the various salmonid life-history stages in the Klamath River assumed in the assessment (Table 3) are somewhat different than those presented in the DEIR (see Table 3.3-5 for example), but the overall range of life stages is roughly analogous. The seasonal periodicity assumptions reflect when various life stages of a target species will occur in the river and when life stage-specific water temperature criteria apply.

Table 3. Estimated Fish Periodicity-Klamath River, updated to include stakeholder comments to PacifiCorp. Current and potential life history strategies from Iron Gate to Link River dams.

Species/Life stage	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Fall Chinook-Type II (fall juvenile migrant)												
Adult migration												
Adult spawning												
Incubation												
Fry emergence												
Rearing												
Juvenile Outmigration												
Fall Chinook-Type I (ocean type)												
Adult migration												
Adult spawning												
Incubation												
Fry emergence												
Rearing												
Juvenile Outmigration												
Coho												
Adult migration												
Adult spawning												
Incubation												
Fry emergence												
Rearing												
Juvenile Outmigration												
Steelhead-Fall/Winter												
Adult migration												
Adult spawning												
Incubation												
Fry emergence												
Rearing												
Juvenile Outmigration												

Note: For anadromous juvenile emigration, timing reflects fish migration from Klamath Hydroelectric Project area, not when they reach the estuary. Anadromous salmonid life histories represent stocks currently in the Klamath Basin from Iron Gate Dam to Salmon River. Dark shading equals peak use period.

In addition to the application of the criteria listed previously (Table 2), there is also the California water temperature objective applicable to the Klamath Hydroelectric Project as set forth in Section 3 of the Basin Plan. The state water temperature objective is:

> *Temperature objectives for COLD interstate waters, WARM interstate waters, and Enclosed Bays and Estuaries are as specified in the "Water Quality Control Pion for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays of California" including any revisions thereto.*
>
> *In addition, the following temperature objectives apply to surface waters:*
>
> > *The natural receiving water temperature of intrastate waters shall not be altered unless it can be demonstrated to the satisfaction of the Regional Water Board that such alteration in temperature does not adversely affect beneficial uses.*
> >
> > *At no time or place shall the temperature of any COLD water be increased by more than 5°F above natural receiving water temperature.*
> >
> > *At no time or place shall the temperature of WARM intrastate waters be increased more than 5°F above natural receiving water temperature.*

Response to Comment ORG46-17

Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Water Temperature* provides a thorough analysis of water temperature dynamics and effects on aquatic resources, including the biological implications of different temperature ranges, under existing conditions. The effects of water temperature on aquatic resources under the Proposed Project are discussed in Section 3.3.5.4 *Aquatic Resources – Potential Impacts and Mitigation – Water Temperature*. The EIR's analysis of water temperature effects on aquatic resources and conclusions are supported by the substantial evidence discussed in these sections and there are no data provided in PacifiCorp (2014) that are substantially divergent from the data analyzed in the EIR. Please see response to ORG46-127 for a complete discussion of the PacifiCorp (2014) water temperature data analysis. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment ORG46-18

2.9.3 Water Temperature Effects on Anadromous Fish Downstream of Iron Gate Dam

The following discussion summarizes the potential effects of water temperature under existing conditions and a without-Project conditions (analogous to the Proposed Project analyzed in the DEIR) on Chinook, Coho, and Steelhead.

Chinook Salmon

Fall-run Chinook Salmon use the Klamath River downstream of Iron Gate Dam for adult migration, spawning and egg incubation, juvenile rearing, and juvenile emigration. Although fall-run Chinook respond to both high and low water temperatures, the primary focus of concern regarding Klamath Hydroelectric Project operations on habitat suitability has been on seasonally elevated temperatures. As a result, the following analyses emphasize the occurrence of elevated water temperatures (e.g., seasonally low temperatures have been included within the thermal zone identified, for purposes of the analysis of suitable habitat conditions for a given life stage of fall-run Chinook Salmon and other salmonids).

Adult fall-run Chinook Salmon migrate upstream within the Klamath River during the seasonal period from August to October (Table 3). Results of water temperature modeling show a general seasonal pattern with elevated temperatures occurring during August and declining during September and October. Results of the water temperature modeling showed a consistent pattern of diminishing differences in water temperatures between existing and hypothetical without-Project conditions as a function of distance downstream from Iron Gate Dam (RM 190).

Results of the temperature modeling also show that during the fall migration period water temperatures under both existing and without-Project conditions reach a thermal equilibrium where water temperatures are virtually identical under existing and without-Project conditions in the lower reaches of the river below Seiad Valley (RM 129). Klamath Hydroelectric Project operations at Iron Gate Dam, therefore, have no effect on water temperature conditions in these reaches and would not affect water temperature conditions, thermal exposure, or behavioral response of adult fall-run Chinook Salmon entering the Klamath River .

Water temperatures within the Klamath River show a consistent pattern of temperatures considered to be unsuitable for adult upstream migration throughout the entire reach from Iron Gate Dam to Turwar

(RM 6) during August under both existing and without-Project conditions with temperatures decreasing seasonally during September into the range considered to be low to moderately stressful throughout the mainstem river (Table 4). Water temperatures generally decreased and remained within a range considered to be suitable for adult upstream migration beginning in early October and continuing through the end of the migration period. The seasonal pattern in water temperatures was generally similar between 2000 and 2001.

Results of the comparison of the average weekly temperatures (Table 5) showed temperatures above a l6°C average weekly average during approximately 75 to 80 percent of the days within the migration period. The frequency of these average weekly temperatures was similar at mainstem locations extending from Iron Gate Dam downstream to Turwar. This pattern was similar under both existing and without-Project conditions based on analyses of average weekly temperature (Table 5).

The biological significance of the incremental temperature exposure in the reach just downstream of Iron Gate Dam under existing conditions was evaluated to assess potential effects of temperature exposure to pre-spawning adults on subsequent egg viability and hatching success. An investigation of the relationship between temperature exposure for pre-spawning fall-run Chinook Salmon and egg viability was conducted by Mann and Peery {2005). The observed relationship between pre-spawning adult temperature exposure, expressed as degree days above 18 and 20°C and corresponding estimates of percent mortality for incubating eggs from each female, show that the incremental increase in egg mortality over a range of pre-spawning adult temperature exposures is typically less than approximately 5 percent.

Table 4. Habitat suitability based on overage daily water temperatures far adult fall-run Chinook Salmon migration at locations downstream from Iran Gate Dom based on 2000 and 2001 water temperature modeling results for existing conditions (EC) and hypothetical without-Project (WOP) scenarios.

Date	Scenario	Iron Gate Dam RM 190.5	Above Shasta River RM 177.5	At Walker Bridge RM 156.8	Above Scott River RM 143.9	At Seiad Valley RM 129.0	Above Clear Creek RM 99.0	Above Salmon River RM 66.9	At Orleans RM 57.6	Above Bluff Creek RM 49.0	Above Trinity River RM 43.3	At Martins Ferry RM 39.5	At Blue Creek RM 15.9	At Turwar RM 5.3
8/15/2001	EC	21.9	23.1	23.8	23.8	23.7	23.5	23.5	23.5	23.1	22.9	22.6	22.6	22.8
	WOP	21.3	22.3	22.8	23.2	23.5	23.5	23.5	23.5	23.1	22.9	22.6	22.5	22.8
8/29/2001	EC	21.4	22.7	23.5	23.7	23.8	23.9	23.9	23.8	23.2	22.8	21.0	22.2	22.7
	WOP	19.6	21.2	23.0	23.6	23.9	23.8	23.9	23.7	23.2	22.9	21.1	22.2	22.7
9/12/2001	EC	20.4	20.3	19.8	19.7	20.0	20.1	20.0	19.9	19.6	19.4	18.9	19.1	19.4
	WOP	16.5	17.5	18.2	18.7	19.4	19.7	19.8	19.7	19.4	19.3	18.8	19.2	19.5
9/26/2001	EC	18.9	18.1	17.6	17.6	18.0	18.8	19.0	18.9	18.5	18.3	17.9	18.0	18.2
	WOP	14.3	15.0	15.8	16.2	17.3	18.4	18.8	18.8	18.5	18.5	18.0	18.1	18.2
10/10/2001	EC	17.2	16.4	15.3	14.9	14.5	14.9	15.2	15.2	15.0	14.9	14.9	14.8	14.8
	WOP	10.1	10.4	11.2	11.7	12.6	14.2	14.6	14.8	14.8	14.8	14.8	14.9	14.9
10/24/2001	EC	14.1	13.1	11.8	11.4	11.7	12.4	12.2	12.2	12.2	12.3	12.5	12.5	12.4
	WOP	7.2	8.0	9.1	9.7	10.6	11.8	11.7	11.8	12.0	12.1	12.5	12.5	12.4
11/7/2001	EC	11.0	10.3	9.5	9.4	9.5	9.6	9.3	9.6	9.9	10.0	10.5	10.5	10.4
	WOP	6.0	6.7	7.5	8.0	8.4	9.0	8.9	9.4	9.9	10.1	10.6	10.6	10.6
11/21/2001	EC	8.6	8.4	8.2	8.1	8.4	8.3	7.7	8.3	8.4	8.5	9.0	9.1	9.2
	WOP	6.5	6.6	7.1	7.3	7.9	7.9	7.3	8.1	8.2	8.3	9.0	9.1	9.2
12/5/2001	EC	5.5	5.2	5.1	4.9	5.0	5.4	5.4	5.8	6.1	6.4	6.9	7.0	7.1
	WOP	1.4	1.8	2.9	3.0	3.6	4.7	5.0	5.5	5.9	6.1	6.8	6.9	7.0
*12/19/2001	EC	3.1	2.9	3.3	3.3	4.1	4.7	4.7	5.5	5.7	5.9	6.7	6.8	6.7
	WOP	2.4	2.3	2.9	3.0	3.8	4.4	4.6	5.4	5.6	5.8	6.7	6.7	6.7

*Life stage ends 12/15/2001, but for the sake of including the period from 12/19/2001 through the end of the life stage, this date is also shown

suitable: <17°C | low to moderate stress: 17-21 °C | high stress: >21 °C

Table 5. Number of days during life stages that running overage weekly temperature is above the threshold, based on 2000 and 2001 water temperature modeling results for existing conditions (EC) and hypothetical without-Project (WOP) scenarios.

Species/Life Stage	Life Stage Period			Temp. Threshold (C)	Number of Days Temperature Above Threshold							
					Blw Iron Gate Dam		At Seiad Valley		Abv Trinity River		At Turwar	
	Start	End	No. Days		EC	WOP	EC	WOP	EC	WOP	EC	WOP
Chinook Salmon												
Adult Migration	Aug 1	Oct 31	92	16	73	49	70	60	69	68	69	69
Egg to emergence	Oct 1	Mar 31	182	12	28	18	27	21	23	27	31	32
Juvenile Rearing	Feb 1	Jun 30	150	15	45	55	58	64	49	50	46	48
Juvenile Emigration	Apr 1	Jul 31	122	15	76	86	89	93	80	81	77	79
Coho Salmon												
Adult Migration	Sep 15	Jan 31	139	16	28	11	25	17	24	23	24	24
Egg to emergence	Nov 1	Apr 15	166	12	0	8	0	11	0	11	9	12
Juvenile Rearing	Jan 1	Dec 31	365	15	157	147	166	165	157	153	154	155
Juvenile Emigration	Feb 1	Jul 31	181	15	76	86	89	95	80	81	77	79
Steelhead												
Adult Migration	Sep 1	Nov 30	91	16	42	18	39	29	38	37	38	38
Egg to emergence	Dec 1	Jun 30	212	12	55	74	59	77	66	81	78	84
Juvenile Rearing	Jan 1	Dec 31	365	15	157	147	166	165	157	153	154	155
Smoltification	Mar 1	Jul 15	137	12	70	89	92	100	92	96	93	94

Assuming that a female adult Chinook Salmon entered the Klamath River on September 15 and migrated upstream to spawn in the reach downstream of Iron Gate Dam (equal duration of exposure to temperatures within each reach) the degree-day exposure to water temperatures above 18 and 20°C was estimated to be 14.5 and 59.2 degree-days, respectively under existing conditions and 13.2 and 46.4 degree days under hypothetical without-Project conditions. Under these simulated conditions, temperature exposure under existing conditions would be similar to without-Project conditions and would be expected to contribute to an incremental increase in egg mortality of less than 5 percent. Results of these analyses are consistent with observations for fall-run Chinook Salmon spawned at the Iron Gate Hatchery, which show high egg viability under existing conditions (Kim Rushton, former Iron Gate Hatchery Manager, CDFW).

Fall-run Chinook Salmon egg incubation occurs between October and March (Table 3). Water temperatures show a typical seasonally declining trend during the early portion of egg incubation followed by a seasonal increase in water temperatures during the later period of incubation prior to fry emergence in the spring. Examination of the average weekly temperatures during the egg incubation period (Table 6) showed a similar pattern with approximately 21 percent of the observations exceeding 10°C within the reach immediately downstream of Iron Gate Dam, 20 percent within reach upstream of Shasta River, 25 percent upstream of the Scott River, and 28 percent upstream of Clear Creek under existing project operations. Under the without-Project conditions average weekly water temperatures exceeded 10°C in 17 percent of the observations within the reach immediately downstream of Iron Gate Dam, 18 percent within reach upstream of Shasta River, 20 percent upstream of the Scott River, and 24 percent upstream of Clear Creek.

Results of a comparison of habitat suitability conditions for egg incubation (using criteria in Table 2) under existing and without-Project conditions show a consistent pattern of exposure to elevated water temperatures under both existing and without-Project conditions in early October (Table 6). Water temperature exposure under existing project operations, although declining seasonally, are within the range during early October that would contribute to reduced egg viability. The significance of egg exposure to elevated temperatures during early October under existing project operations is reduced, in part, as a result of fewer salmon spawning during the early portion of the spawning period. The peak of Chinook Salmon spawning occurs during the latter portion of October when seasonally declining water temperatures have less effect on the viability and successful hatching of incubating eggs.

Habitat conditions for egg incubation in the reach down stream of Iron Gate Dam potentially could be improved if water temperatures released from the dam during early to mid-October could be reduced under existing conditions. Reducing early to mid-October water temperatures would be expected to improve potential egg viability for those adult Chinook Salmon spawning early while continuing to

provide water temperatures during the late fall that would be warmer when compared to hypothetical without-Project conditions. Continuing to provide warmer water temperatures under existing conditions that are suitable for egg incubation would accelerate embryonic development and early fry emergence (see Section 2.9.4 below).

Juvenile Chinook Salmon (ocean type migrants) rearing and emigration occurs between February and July (Table 3). Results of water temperature modeling during the juvenile rearing period has shown that water temperatures are cooler under existing conditions when compared to hypothetical without- Project conditions in the reach immediately downstream of Iron Gate Dam. Temperature modeling has shown that differences in water temperature between existing and without-Project conditions diminish as a function of distance downstream from the dam as water temperatures reach thermal equilibrium within the river.

Table 6. Habitat suitability based on average daily water temperatures for fall-run Chinook Salmon egg incubation at locations downstream from Iron Gate Dam based on 2000 and 2001 water temperature modeling results for existing conditions (EC) and hypothetical without-Project (WOP) scenarios.

Date	Scenario	Iron Gate Dam RM 190.5	Above Shasta River RM 177.5	At Walker Bridge RM 156.8	Above Scott River RM 143.9	At Seiad Valley RM 129.0	Above Clear Creek RM 99.0	Above Salmon River RM 66.9	At Orleans RM 57.6	Above Bluff Creek RM 49.0	Above Trinity River RM 43.3	At Martins Ferry RM 39.5	At Blue Creek RM 15.9	At Turwar RM 5.3
10/1/2000	EC	18.0	18.6	19.1	19.3	19.6	19.7	19.8	19.7	19.4	19.3	18.8	19.0	19.2
	WOP	16.6	17.7	18.4	18.6	19.0	19.5	19.6	19.6	19.3	19.2	18.7	18.9	19.2
10/15/2000	EC	15.5	15.2	15.0	15.0	15.0	14.9	14.7	14.6	14.5	14.4	14.4	14.5	14.6
	WOP	11.2	11.7	12.3	12.5	12.9	13.3	13.3	13.4	13.5	13.6	13.8	14.1	14.2
10/29/2000	EC	11.9	11.3	10.8	10.6	10.6	11.0	11.1	11.0	11.1	11.1	11.3	11.3	11.4
	WOP	6.8	7.4	8.4	8.8	9.3	10.0	10.1	10.3	10.4	10.5	10.9	11.2	11.3
11/12/2000	EC	8.8	8.0	7.5	7.0	6.5	6.1	6.0	5.9	6.3	6.4	7.0	7.1	7.1
	WOP	2.6	2.7	3.6	3.7	3.9	4.4	4.9	5.2	5.6	5.9	6.7	6.9	6.9
11/26/2000	EC	5.5	5.3	5.1	5.0	5.3	5.7	6.0	6.4	6.7	6.8	7.1	7.4	7.5
	WOP	2.5	2.3	2.8	2.9	3.6	4.4	5.1	5.5	5.9	6.1	6.5	7.0	7.1
12/10/2000	EC	3.9	4.1	4.5	4.7	5.1	5.5	5.6	6.0	6.3	6.5	7.1	7.3	7.3
	WOP	4.2	4.3	4.4	4.6	5.0	5.5	5.7	6.1	6.4	6.6	7.2	7.4	7.4
12/24/2000	EC	2.4	2.6	3.1	3.3	3.9	4.8	5.1	5.4	5.5	5.6	6.1	6.1	6.1
	WOP	3.0	3.3	3.7	3.9	4.5	5.0	5.2	5.5	5.6	5.6	6.1	6.1	6.1
1/7/2001	EC	3.9	4.2	4.5	4.5	4.4	4.6	4.6	4.7	4.9	5.1	5.3	5.5	5.5
	WOP	3.3	3.9	4.3	4.3	4.3	4.5	4.5	4.6	4.9	5.1	5.3	5.5	5.5
*1/21/2001	EC	3.0	3.8	4.1	4.0	4.0	3.9	4.1	4.1	4.4	4.6	4.9	5.1	5.1
	WOP	3.3	3.5	3.9	3.9	3.7	3.2	3.4	3.5	3.8	4.0	4.5	4.7	4.8

*Life stage ends 1/15/2001, but for the sake of including the period from 1/7/2001 through the end of the life stage, this date is also shown.

suitable: <12°C | low to moderate stress: 13-14°C | high stress: >14°C

For example, for juvenile rearing, the running average weekly temperatures exceeded temperature criterion on 45 days (30 percent) under existing conditions within the Iron Gate Dam reach when compared with 55 days (37 percent) under hypothetical without-Project conditions. In contrast, there was no difference in the frequency of exceeding the temperature criterion between existing and without-Project conditions in the lower reaches of the river upstream of the confluence with the Trinity River or at Turwar (Table 4).

Results of a comparison of habitat suitability at various locations within the river for juvenile rearing and emigration show that water temperature condition s under both existing and without-Project conditions are within the range considered to be suitable for juvenile rearing and emigration throughout the river through approximately late April (Table 7). Beginning in May and continuing through June, water temperatures throughout the river under both existing and without-Project conditions were within the range considered to reflect low to moderate stress. Temperature conditions, particularly within the lower reaches of the river in July were within the range characterized by high stress/lethal under both existing and without-Project conditions.

Exposure of juvenile Chinook Salm on to seasonally cooler water temperatures under existing project operations, primarily within the reach down stream of Iron Gate Dam, would be expected to benefit the overall health and condition of juvenile rearing salmon. Exposure to reduced water temperatures within the Iron Gate Dam reach during the spring and early summer juvenile rearing period would contribute to reduced vulnerability of juveniles to disease and infection Operation of Iron Gate Dam also serves to substantially reduce daily variation in water temperatures during the spring and early summer, which would contribute to a reduction in variation in metabolic demands on rearing juveniles and improve growth, when compared to more highly variable temperature conditions that would occur under without-Project conditions.

Although exposure of juvenile salmon to seasonally reduced water temperatures during the spring and early summer rearing period offers benefits in terms of a reduced risk of disease and infection, it was also determined that exposure to cooler water temperatures under existing project operations would not result in reduced juvenile growth rates. Results of studies by Marine and Cech (2004) show that juvenile Chinook growth rates are virtually identical over a temperature ranges from 13-16°C and 17-20°C reflecting the general range of seasonal temperatures expected to occur during the juvenile rearing period under existing conditions in the reach downstream of Iron Gate Dam. Results of these growth studies show no evidence that lower spring and early summer water temperatures under existing project operations would adversely impact juvenile salmon growth rates.

These analyses demonstrate that existing conditions within the Klamath River reach downstream of Iron Gate Dam provide better rearing conditions for juvenile

fall-run Chinook Salmon when compared to water temperature conditions occurring under hypothetical without-Project conditions. As a result of thermal warming within the river, the benefits of project operations on juvenile rearing habitat diminish with distance downstream of the dam. Within the lower reaches of the river, project operations have no effect on water temperature conditions affecting habitat suitability for juvenile rearing period.

PacifiCorp's conclusions with regard to Project-related water temperature effects on fall-run Chinook Salmon are supported by other recent independent analyses. In an analysis of the effects on fall Chinook of hypothetical temperature conditions with and without Klamath Hydroelectric Project dams and reservoirs, Bartholow et al. {2005) concluded that water temperature conditions for juvenile rearing life stages are better with Klamath Hydroelectric Project dams and reservoirs than without, especially immediately downstream of Iron Gate Dam. In a subsequent analysis of factors limiting fall Chinook production potential, Bartholow and Henriksen (2006) concluded that water temperature during

Table 7. Habitat suitability based on overage doily water temperatures for juvenile fall-run Chinook Salmon rearing at locations downstream from Iron Gate Dam based on 2000 and 2001 water temperature modeling results for existing conditions (EC) and hypothetical without-Project scenarios.

Date	Scenario	Iron Gate Dam RM 190.5	Above Shasta River RM 177.5	At Walker Bridge RM 156.8	Above Scott River RM 143.9	At Seiad Valley RM 129.0	Above Clear Creek RM 99.0	Above Salmon River RM 66.9	At Orleans RM 57.6	Above Bluff Creek RM 49.0	Above Trinity River RM 43.3	At Martins Ferry RM 39.5	At Blue Creek RM 15.9	At Turwar RM 5.3
2/1/2001	EC	2.1	2.3	2.6	2.6	2.9	3.3	3.8	4.1	4.5	4.7	5.1	5.3	5.4
	WOP	2.1	1.9	2.1	2.2	2.5	3.2	3.8	4.0	4.4	4.6	5.0	5.3	5.3
2/15/2001	EC	2.1	2.5	3.1	3.3	3.7	4.2	4.6	4.8	5.1	5.3	5.5	5.9	6.0
	WOP	3.3	3.4	3.6	3.6	3.9	4.2	4.6	4.7	5.0	5.2	5.5	5.9	6.0
3/1/2001	EC	2.6	3.1	4.3	4.7	5.5	6.5	7.0	7.1	7.2	7.3	7.1	7.4	7.5
	WOP	4.5	5.0	5.7	6.0	6.4	7.1	7.5	7.4	7.5	7.6	7.2	7.4	7.5
3/15/2001	EC	4.1	4.8	6.2	6.8	8.0	9.0	9.3	9.3	9.2	9.2	8.9	9.2	9.3
	WOP	7.5	8.0	8.8	9.1	9.7	10.0	9.9	9.8	9.6	9.6	9.1	9.4	9.5
3/29/2001	EC	7.3	8.9	10.7	11.6	12.7	12.5	12.1	12.0	11.8	11.7	11.7	11.6	11.7
	WOP	12.1	12.7	13.0	13.0	13.4	12.9	12.5	12.3	12.1	12.0	11.8	11.7	11.8
4/12/2001	EC	7.9	8.6	9.0	9.3	9.8	10.5	10.6	10.6	10.6	10.6	10.4	10.6	10.8
	WOP	7.7	8.4	9.1	9.4	9.9	10.3	10.5	10.5	10.4	10.4	10.3	10.5	10.6
4/26/2001	EC	9.1	11.0	13.4	14.6	16.0	15.8	15.6	15.6	15.2	15.0	14.7	14.8	15.0
	WOP	17.1	17.5	18.1	18.2	18.5	17.4	16.6	16.2	15.7	15.5	15.0	14.9	15.0
5/10/2001	EC	12.4	13.8	15.4	15.9	17.1	16.2	15.8	16.0	15.4	15.2	14.9	14.8	15.0
	WOP	16.2	17.3	18.0	18.3	18.7	17.5	16.4	16.4	15.6	15.3	14.9	14.8	15.0
5/24/2001	EC	16.3	17.7	19.2	19.8	20.4	19.2	18.5	18.9	17.8	17.6	17.3	17.0	17.3
	WOP	21.2	21.6	22.0	21.8	21.7	19.6	18.8	19.1	18.1	17.7	17.4	17.1	17.4
6/7/2001	EC	18.2	18.8	19.2	19.2	19.4	18.7	18.4	18.4	17.8	17.6	17.3	17.2	17.4
	WOP	17.3	17.5	17.7	17.8	18.1	17.7	17.6	17.8	17.3	17.1	17.0	16.9	17.1
6/21/2001	EC	18.5	20.0	21.4	22.0	22.5	22.8	23.1	22.9	22.3	22.0	21.2	21.3	21.7
	WOP	20.5	21.4	22.2	22.5	22.8	22.7	22.9	22.8	22.1	21.9	21.1	21.2	21.5
*7/5/2001	EC	19.0	22.1	24.6	25.3	25.7	25.9	26.3	26.0	25.1	24.8	24.0	24.1	24.5
	WOP	23.0	24.6	25.5	25.8	26.0	26.1	26.3	26.0	25.2	24.9	24.1	24.2	24.6

* Life stage ends 7/01/2001, but for the sake of including the period from 7/05/2001 through the end of the life stage, this date is also shown

suitable: <15°C | low to moderate stress: 16-23 °C | high stress: >23 °C

spawning and egg incubation is not a significant factor affecting fall-run Chinook freshwater production in the Klamath River.

Coho Salmon

Coho Salmon use the mainstem Klamath River primarily as a migration corridor for the upstream movement of adults and downstream movement of juveniles. Although the majority of Coho spawning, egg incubation, and a substantial portion of juvenile rearing occurs within the tributaries that are not affected by existing Klamath Hydroelectric Project operations, this analysis assumed all life stages of Coho inhabit the Klamath River, and the analysis is useful for those Coho that do spawn in the mainstem. Coho juveniles are known to use the Klamath River throughout the year (Soto et al. 2016; Manhard et al. 2018)

Coho are sensitive to seasonal water temperature conditions that affect quality and availability of habitat for various life stages, growth and survival, behavior, vulnerability to disease, and other biological responses. Although the seasonal time periods of occurrence of Coho vary from those described for Chinook Salmon temperature criteria used in this analysis are similar for the two species (Table 2).

Adult Coho Salmon upstream migration within the Klamath River occurs from approximately mid- September through January (Table 3). Results of temperature analyses show that water temperatures are cooling during the fall and winter Coho adult migration period. As a result of the seasonally cooling temperature conditions, habitat is generally suitable throughout the river under both existing conditions and hypothetical without-Project conditions beginning in approximately October and extending through January (Table 8). In general, there is very little difference in the suitability of river temperature conditions for adult Coho migration under existing and without-Project conditions (Table 8).

Coho Salmon egg incubation occurs from November through April (Table 3). Water temperature conditions during the winter and early spring are naturally low and are generally within the range considered to be suitable for Coho egg incubation. Habitat suitability criteria (Table 9) consistently show that water temperatures are typically within the range considered to be suitable for Coho egg incubation. A comparison of water temperature conditions within the Iron Gate reach show the frequency of occurrence of elevated water temperatures during the Coho egg incubation period is less under existing project operations when compared to hypothetical without-Project conditions (Table 5).

Juvenile Coho Salmon rear within freshwater rivers and tributaries throughout the year (Table 3). Klamath Hydroelectric Project operations result in cooler water temperatures during the spring and early summer months within the reach immediately downstream of Iron Gate Dam when compared to without-Project conditions. Cooler water temperatures during the spring and early summer months within the Iron Gate reach under existing project operations would

improve opportunities and conditions for juvenile Coho rearing and emigration. During the spring and summer months, water temperatures increase within the river, and differences in water temperature conditions between existing conditions and hypothetical without-Project conditions become less as a function of distance downstream from the dam (Table 10). During the mid-summer water temperatures, particularly in the lower reaches of the river, may reach levels under both existing and without-Project conditions that are considered to be highly stressful for juvenile Coho rearing (Table 10).

Although juvenile Coho may use the mainstem Klamath River throughout the year, this analysis focuses on those fish that use the mainstem Klamath River as a migratory corridor from February through July (Table 3). Water temperature conditions throughout the Klamath River are within the range considered to be suitable for juvenile Coho Salmon emigration during the period from February through approximately mid-May (Table 10). Water temperatures during the spring and early summer months are

Table 8. Habitat suitability based on overage daily water temperatures for adult Coho Salmon migration at locations downstream from Iron Gate Dam based on 2000 and 2001 water temperature modeling results for existing conditions (EC) and hypothetical without-Project scenarios.

Date	Scenario	Iron Gate Dam RM 190.54	Above Shasta River RM 177.52	At Walker Bridge RM 156.79	Above Scott River RM 143.86	At Seiad Valley RM 129.04	Above Clear Creek RM 99.04	Above Salmon River RM 66.91	At Orleans RM 57.58	Above Bluff Creek RM 49.03	Above Trinity River RM 43.33	At Martins Ferry RM 39.5	At Blue Creek RM 15.95	At Turwar RM 5.28
9/15/2000	EC	19.2	19.3	19.7	20.1	20.3	20.3	20.5	20.5	20.2	20.2	20.0	20.0	20.1
	WOP	18.3	19.1	20.1	20.3	20.4	20.3	20.5	20.4	20.2	20.1	19.9	19.9	20.1
9/29/2000	EC	18.1	18.4	18.5	18.6	18.7	18.3	18.1	18.1	17.9	17.8	17.5	17.7	17.8
	WOP	16.1	17.0	17.6	17.9	18.1	17.9	17.8	17.9	17.7	17.6	17.4	17.6	17.8
10/13/2000	EC	15.9	15.7	15.1	14.8	14.6	14.3	14.1	14.1	14.1	14.1	14.1	14.2	14.3
	WOP	10.6	10.8	10.9	11.0	11.5	12.4	13.0	13.3	13.4	13.5	13.8	14.1	14.2
10/27/2000	EC	12.6	12.3	11.9	11.8	11.6	11.4	11.7	11.8	11.9	11.9	12.0	12.0	12.0
	WOP	8.5	9.0	9.3	9.3	9.8	10.7	11.1	11.1	11.1	11.2	11.5	11.6	11.6
11/10/2000	EC	9.3	8.6	7.9	7.7	7.6	7.6	7.8	7.9	8.1	8.2	8.7	8.8	8.8
	WOP	3.9	4.1	4.8	5.1	5.7	6.4	6.9	7.2	7.5	7.7	8.3	8.5	8.5
11/24/2000	EC	6.0	5.7	5.6	5.5	5.8	5.9	5.9	6.1	6.4	6.5	6.9	7.0	6.9
	WOP	3.8	3.6	3.8	3.6	4.0	4.9	5.5	6.0	6.4	6.6	7.3	7.5	7.5
12/8/2000	EC	4.1	4.1	4.3	4.3	4.5	4.8	4.9	5.2	5.6	5.8	6.5	6.6	6.6
	WOP	3.3	3.4	3.9	3.9	4.3	4.6	4.9	5.2	5.6	5.8	6.5	6.6	6.6
12/22/2000	EC	2.9	3.8	4.6	4.7	4.7	4.4	4.5	4.8	5.1	5.3	5.7	5.8	5.9
	WOP	3.8	4.3	4.8	4.8	4.7	4.3	4.3	4.7	5.0	5.1	5.6	5.8	5.9
1/5/2001	EC	3.9	4.1	4.3	4.4	4.3	4.3	4.4	4.4	4.7	4.9	5.2	5.4	5.4
	WOP	3.6	3.8	4.0	4.0	4.2	4.3	4.1	4.2	4.5	4.7	5.1	5.4	5.4
1/19/2001	EC	2.8	3.1	3.1	2.9	3.1	3.1	3.2	3.3	3.8	3.9	4.3	4.5	4.6
	WOP	1.7	1.4	1.5	1.5	1.6	2.0	2.6	2.9	3.4	3.6	4.1	4.4	4.4
2/2/2001	EC	2.1	3.0	3.7	3.7	3.9	4.2	4.4	4.6	4.9	5.1	5.5	5.7	5.8
	WOP	3.7	3.7	3.7	3.5	3.7	3.9	4.3	4.5	4.8	4.9	5.4	5.6	5.7

*Life stage ends 1/31/2001, but for the sake of including the period from 2/2/2001 through the end of the life stage, this date is also shown.

suitable: <17°C | low to moderate stress: 18-21 °C

Table 9. Habitat suitability based on average daily water temperatures for Coho Salmon egg incubation at locations downstream from Iron Gate Dam based on 2000 and 2001 water temperature modeling results for existing conditions (EC) and hypothetical without-Project (WOP) scenarios.

Date	Scenario	Iron Gate Dam RM 190.54	Above Shasta River RM 177.52	At Walker Bridge RM 156.79	Above Scott River RM 143.86	At Seiad Valley RM 129.04	Above Clear Creek RM 99.04	Above Salmon River RM 66.91	At Orleans RM 57.58	Above Bluff Creek RM 49.03	Above Trinity River RM 43.33	At Martins Ferry RM 39.5	At Blue Creek RM 15.95	At Turwar RM 5.28
11/1/2000	EC	11.4	11.0	10.8	10.7	10.5	10.3	9.9	10.0	10.1	10.2	10.6	10.7	10.7
	WOP	6.8	7.2	8.0	8.2	8.3	8.5	9.0	9.2	9.4	9.5	10.1	10.3	10.4
11/15/2000	EC	8.0	7.4	7.0	6.6	6.5	5.8	5.4	5.5	5.7	5.9	6.3	6.3	6.2
	WOP	2.5	2.5	3.1	3.0	3.4	3.8	3.9	4.2	4.7	5.0	5.7	5.8	5.8
11/29/2000	EC	4.4	5.2	5.9	6.0	6.1	6.6	6.7	7.2	7.3	7.5	8.0	8.1	8.2
	WOP	5.3	5.7	5.8	5.9	5.8	6.0	6.1	6.7	6.9	7.1	7.7	7.9	8.0
12/13/2000	EC	3.6	3.5	3.6	3.5	3.5	3.8	4.0	4.5	4.9	5.2	5.9	6.1	6.2
	WOP	2.3	2.2	2.4	2.2	2.6	3.6	4.1	4.6	5.0	5.2	5.9	6.2	6.2
12/27/2000	EC	2.3	2.3	2.5	2.6	2.8	3.2	3.6	4.1	4.4	4.7	5.3	5.5	5.5
	WOP	1.7	1.8	2.1	2.2	2.5	3.2	3.8	4.2	4.6	4.8	5.4	5.6	5.7
1/10/2001	EC	3.7	3.3	3.3	3.2	3.6	4.2	4.8	4.9	5.2	5.3	5.6	5.6	5.6
	WOP	1.8	2.0	2.6	2.8	3.2	4.0	4.7	4.9	5.1	5.2	5.6	5.7	5.7
1/24/2001	EC	2.7	2.9	3.9	4.3	5.1	5.3	5.5	5.7	5.9	6.0	6.2	6.3	6.3
	WOP	3.6	3.8	4.7	4.9	5.4	5.5	5.4	5.6	5.7	5.8	6.1	6.1	6.1
2/7/2001	EC	2.1	1.8	2.0	2.1	3.0	4.7	5.4	5.6	5.8	6.0	6.1	6.5	6.6
	WOP	1.6	1.9	3.0	3.6	4.5	5.7	6.2	6.2	6.5	6.6	6.5	7.0	7.1
2/21/2001	EC	2.3	3.8	5.5	6.0	6.7	6.9	7.1	7.2	7.3	7.4	7.4	7.6	7.7
	WOP	5.2	5.8	6.4	6.7	7.2	7.3	7.4	7.5	7.5	7.6	7.5	7.7	7.8
3/7/2001	EC	3.1	4.7	6.6	7.3	8.1	8.6	8.6	8.6	8.6	8.5	8.4	8.5	8.5
	WOP	9.0	9.1	9.2	9.2	9.3	8.8	8.5	8.5	8.5	8.4	8.4	8.3	8.3
3/21/2001	EC	5.0	7.2	9.1	9.9	11.4	11.9	12.2	12.1	11.8	11.7	11.3	11.4	11.6
	WOP	13.1	13.4	13.8	14.0	14.2	13.6	13.2	12.8	12.4	12.3	11.6	11.6	11.7
4/4/2001	EC	8.5	8.7	8.7	8.7	9.0	9.0	9.3	9.4	9.5	9.5	9.5	9.7	9.8
	WOP	6.5	6.9	7.3	7.5	8.2	9.0	9.7	9.7	9.8	9.9	9.7	10.0	10.1
4/18/2001	EC	7.9	8.1	9.3	9.9	11.1	11.9	12.2	12.3	12.2	12.1	12.0	12.2	12.3
	WOP	10.3	10.6	11.2	11.5	12.3	12.7	12.6	12.6	12.4	12.3	12.1	12.2	12.3
5/2/2001	EC	11.3	11.5	11.4	11.5	12.5	12.9	12.9	13.1	12.8	12.7	12.7	12.6	12.7
	WOP	9.9	10.9	12.0	12.5	13.3	13.3	13.0	13.2	12.9	12.8	12.7	12.7	12.7

*Life stage ends 4/30/2001, but for the sake of including the period from 5/2/2001 through the end of the life stage, this date is also shown.

suitable: <12°C | low to moderate stress: 13-14 °C | high stress: >14 °C

Table 10. Habitat suitability based on overage doily water temperatures for juvenile Coho Solman rearing at locations downstream from Iron Gate Dam based on 2000 and 2001 water temperature modeling results for existing conditions (EC) and hypothetical without-Project (WOP) scenarios.

Date	Scenario	Iron Gate Dam RM 190.54	Above Shasta River RM 177.52	At Walker Bridge RM 156.79	Above Scott River RM 143.86	At Seiad Valley RM 129.04	Above Clear Creek RM 99.04	Above Salmon River RM 66.91	At Orleans RM 57.58	Above Bluff Creek RM 49.03	Above Trinity River RM 43.33	At Martins Ferry RM 39.5	At Blue Creek RM 15.95	At Turwar RM 5.28
1/1/2001	EC	4.0	4.1	3.8	3.9	4.0	4.1	4.1	4.2	4.5	4.5	4.9	4.8	4.6
	WOP	2.2	3.0	3.8	3.9	4.1	4.1	4.1	4.2	4.4	4.5	4.9	4.7	4.4
1/15/2001	EC	3.1	2.8	2.7	2.6	2.9	3.6	4.0	4.3	4.6	4.8	5.4	5.5	5.5
	WOP	1.0	1.1	1.6	1.7	2.5	3.4	3.7	4.0	4.3	4.5	5.2	5.3	5.2
1/29/2001	EC	2.3	2.7	3.2	3.1	3.6	4.1	4.5	4.7	4.9	5.1	5.6	5.7	5.7
	WOP	2.4	2.6	3.0	3.1	3.5	3.9	4.2	4.4	4.7	4.9	5.4	5.6	5.6
2/12/2001	EC	1.9	2.1	2.5	2.7	3.3	4.1	4.4	4.5	4.8	5.0	5.4	5.6	5.6
	WOP	1.9	2.1	2.5	2.6	3.4	4.1	4.1	4.3	4.5	4.7	5.2	5.4	5.5
2/26/2001	EC	2.5	3.5	4.7	5.2	5.6	6.2	6.6	6.7	6.8	6.9	7.1	7.3	7.4
	WOP	5.4	5.5	5.5	5.5	5.6	6.2	6.7	6.8	7.0	7.0	7.2	7.4	7.5
3/12/2001	EC	3.5	4.7	6.0	6.5	7.6	8.2	8.6	8.7	8.7	8.7	8.6	8.8	9.0
	WOP	7.8	7.7	7.7	7.8	8.3	8.6	9.1	9.2	9.2	9.2	8.9	9.1	9.2
3/26/2001	EC	6.9	7.6	8.9	9.4	10.9	11.6	12.0	11.6	11.4	11.3	10.7	10.8	10.9
	WOP	9.5	10.0	11.3	11.9	12.5	12.8	13.0	12.3	12.1	12.1	11.1	11.3	11.4
4/9/2001	EC	8.0	8.3	8.5	8.7	9.1	9.2	9.4	9.4	9.5	9.5	9.5	9.6	9.7
	WOP	6.7	6.8	7.0	7.4	8.3	8.9	9.4	9.5	9.5	9.6	9.5	9.6	9.7
4/23/2001	EC	8.3	9.8	11.0	11.4	12.3	12.4	12.5	12.6	12.4	12.4	12.2	12.2	12.4
	WOP	13.4	13.3	13.0	12.8	13.1	12.9	12.8	12.8	12.5	12.4	12.3	12.2	12.3
5/7/2001	EC	12.1	13.7	15.0	15.5	16.4	15.4	15.0	15.1	14.5	14.4	14.1	14.0	14.3
	WOP	15.6	15.9	16.1	16.2	17.0	15.8	15.2	15.2	14.6	14.4	14.1	14.0	14.3
5/21/2001	EC	15.8	17.3	18.5	18.9	19.5	18.3	17.8	18.2	17.2	16.9	16.6	16.4	16.7
	WOP	18.1	18.9	19.8	20.0	20.2	18.4	17.9	18.2	17.3	17.0	16.7	16.4	16.6
6/4/2001	EC	18.4	18.1	17.7	17.4	17.1	16.5	16.4	16.6	16.2	16.1	15.9	15.8	15.9
	WOP	13.6	14.0	14.6	14.8	15.5	16.0	16.5	16.7	16.3	16.2	15.9	15.8	16.0
6/18/2001	EC	18.2	18.6	18.8	19.0	19.6	20.4	20.7	20.7	20.2	20.0	19.5	19.5	19.7
	WOP	16.6	17.5	18.3	18.8	19.5	20.3	20.6	20.6	20.1	20.0	19.4	19.4	19.6
7/2/2001	EC	18.5	21.0	22.4	22.7	22.9	22.7	22.7	22.5	22.1	21.8	21.2	21.3	21.6
	WOP	21.0	22.0	22.1	22.2	22.3	22.4	22.4	22.3	21.8	21.6	21.1	21.1	21.4
7/16/2001	EC	20.1	20.5	21.0	21.2	21.3	21.3	21.4	21.5	21.2	21.0	21.0	20.7	20.8
	WOP	19.0	20.1	21.0	21.3	21.4	21.4	21.4	21.5	21.3	21.2	21.1	21.0	21.2

Date	Scenario	Iron Gate Dam RM 190.54	Above Shasta River RM 177.52	At Walker Bridge RM 156.79	Above Scott River RM 143.86	At Seiad Valley RM 129.04	Above Clear Creek RM 99.04	Above Salmon River RM 66.91	At Orleans RM 57.58	Above Bluff Creek RM 49.03	Above Trinity River RM 43.33	At Martins Ferry RM 39.5	At Blue Creek RM 15.95	At Turwar RM 5.28
7/30/2001	EC	20.9	21.0	21.0	21.3	22.0	22.2	22.3	22.4	22.0	21.8	21.7	21.6	21.8
	WOP	17.8	19.5	20.5	21.1	22.0	22.0	22.3	22.4	21.9	21.7	21.7	21.6	21.9
8/13/2001	EC	21.6	22.1	22.6	22.8	22.9	23.3	23.3	23.3	22.8	22.7	22.4	22.3	22.5
	WOP	20.0	21.4	22.6	22.9	23.0	23.4	23.3	23.2	22.8	22.6	22.4	22.5	22.8
8/27/2001	EC	21.5	22.5	23.5	23.7	23.5	23.0	22.8	22.7	22.2	22.0	21.6	21.7	22.0
	WOP	20.0	21.5	22.6	23.0	23.0	22.8	22.7	22.6	22.2	22.0	21.5	21.7	22.1
9/10/2001	EC	20.6	20.8	21.0	20.9	20.6	20.2	20.4	20.4	20.1	19.9	19.7	19.7	19.9
	WOP	16.8	18.3	19.3	19.7	19.7	19.7	20.1	20.2	20.0	20.0	19.7	19.8	20.1
9/24/2001	EC	19.1	18.8	18.8	18.9	19.3	19.6	19.5	19.4	19.0	18.8	18.3	18.5	18.7
	WOP	15.5	16.8	17.9	18.3	18.7	19.2	19.4	19.3	18.9	18.8	18.3	18.5	18.8
10/8/2001	EC	17.7	17.3	17.2	17.2	17.3	17.5	17.5	17.4	16.9	16.8	16.5	16.5	16.6
	WOP	12.8	14.8	15.6	16.1	16.5	17.1	17.3	17.2	16.7	16.6	16.3	16.5	16.7
10/22/2001	EC	14.6	14.7	14.6	14.5	14.4	14.1	13.9	13.9	13.6	13.6	13.5	13.6	13.7
	WOP	10.8	11.9	12.7	12.9	13.0	13.1	13.1	13.3	13.3	13.3	13.4	13.6	13.7
11/5/2001	EC	11.4	11.5	11.4	11.4	11.5	10.8	10.6	10.9	11.0	11.1	11.4	11.6	11.7
	WOP	8.6	9.4	9.8	9.9	10.3	10.1	10.3	10.7	10.8	10.9	11.3	11.6	11.7
11/19/2001	EC	8.6	9.2	9.1	8.8	8.4	7.7	7.6	8.3	8.6	8.8	9.4	9.5	9.5
	WOP	6.4	7.0	7.4	7.3	7.3	7.4	7.6	8.2	8.5	8.7	9.4	9.5	9.5
12/3/2001	EC	5.9	5.3	5.0	4.9	5.3	5.7	5.8	6.1	6.4	6.6	7.2	7.2	7.2
	WOP	2.3	2.5	3.1	3.2	3.8	4.8	5.2	5.7	6.0	6.2	6.9	7.0	7.0
12/17/2001	EC	3.7	3.6	4.3	4.4	5.0	5.0	4.9	5.6	5.8	6.1	6.8	6.9	6.9
	WOP	2.5	2.5	3.6	3.8	4.6	4.7	4.6	5.4	5.6	5.8	6.7	6.8	6.8
12/31/2001	EC	1.9	2.0	2.8	2.9	3.9	4.5	4.7	5.8	5.8	6.1	7.5	7.3	7.2
	WOP	4.1	3.7	3.9	3.8	4.4	4.7	4.8	5.8	5.8	6.0	7.4	7.3	7.2

*Life stage ends 4/30/2001, but for the sake of including the period from 5/2/2001 through the end of the life stage, this date is also shown.

suitable: <15°C | low to moderate stress: 16-23 °C | high stress: >23 °C

colder within the reach immediately downstream of Iron Gate Dam under existing Klamath Hydroelectric Project operations. Water temperatures within the lower reaches of the river that serve as the migratory corridor for Coho Salmon are not affected by Klamath Hydroelectric Project operations.

Steelhead

Steelhead are sensitive to exposure to elevated water temperatures. Like Coho Salmon, Steelhead primarily use the mainstem Klamath River as a migratory corridor for upstream adult and downstream juvenile movement. Spawning, egg incubation, and juvenile rearing primarily occur within the tributaries.

Adult Steelhead upstream migration within the Klamath River occurs from approximately September through November (Table 3). Results of temperature analyses show that during the adult Steelhead migration period, water temperatures are cooling during the fall and winter months. As a result of the seasonally cooling temperatures, conditions are generally suitable throughout the river under both existing and without-Project conditions beginning in approximately October and extending through January. In general, there is very little difference in the suitability of river temperature conditions for adult Steelhead migration under existing and without-Project conditions at locations in the lower reaches of the river (Table 11). As a result of the elevated water temperatures within the lower reaches of the river under both existing and without-Project conditions during September, behavior response and entry of adult Steelhead into the river would be independent of Klamath Hydroelectric Project operations.

Steelhead egg incubation occurs from December through April with fry emergence between March and June (Table 3). Water temperature conditions during the winter and early spring are naturally cool and are generally within the range considered to be suitable for Steelhead egg incubation and fry emergence (Table 12). Analysis of average weekly temperatures show that the frequency of temperatures above 12°C is greater under hypothetical without Project conditions within the Iron Gate reach when compared to existing project operations with the differences declining with distance downstream of the dam (Table 5).

During the latter part of the egg incubation period, water temperatures under existing conditions are colder than spring temperatures predicted under the without-Project scenario. Therefore, existing operations would provide better habitat conditions for Steelhead egg incubation and fry emergence within the reach immediately downstream of Iron Gate Dam (both egg viability and rate of embryonic development) when compared to without-Project conditions. Warming within the river during the spring months reduces the temperature difference between existing operations and without-Project conditions as a function of distance downstream from the dam.

Juvenile Steelhead rear within freshwater rivers and tributaries throughout the year (Table 3). As discussed above, seasonal water temperature conditions significantly affect habitat quality and availability for juvenile rearing within the mainstem Klamath River. Klamath Hydroelectric Project operations result in cooler water temperatures during the spring and early summer months within the reach immediately downstream of Iron Gate Dam under existing operations when compared to hypothetical without-Project conditions (Table 13). Cooler water temperatures during the spring and early summer months within the Iron Gate reach under existing project operations would improve opportunities and conditions for juvenile Steelhead rearing. During the spring and summer months water temperatures increase within the river and differences in water temperature conditions between existing and without-Project conditions become less as a function of distance downstream from Iron Gate Dam.

Table 11. Habitat suitability based on overage doily water temperatures for adult Steelhead migration at locations downstream from Iron Gate Dam based on 2000 and 2001 water temperature modeling results for existing conditions (EC) ond hypothetical without-Project scenarios.

Date	Scenario	Iron Gate Dam RM 190.54	Above Shasta River RM 177.52	At Walker Bridge RM 156.79	Above Scott River RM 143.86	At Seiad Valley RM 129.04	Above Clear Creek RM 99.04	Above Salmon River RM 66.91	At Orleans RM 57.58	Above Bluff Creek RM 49.03	Above Trinity River RM 43.33	At Martins Ferry RM 39.5	At Blue Creek RM 15.95	At Turwar RM 5.28
9/1/2000	EC	21.2	18.9	18.4	18.4	18.9	18.8	18.6	18.6	18.5	18.5	18.6	18.4	18.4
	WOP	15.2	16.2	17.3	17.8	18.4	18.5	18.4	18.5	18.4	18.3	18.6	18.3	18.4
9/15/2000	EC	19.2	19.3	19.7	20.1	20.3	20.3	20.5	20.5	20.2	20.2	20.0	20.0	20.1
	WOP	18.3	19.1	20.1	20.3	20.4	20.3	20.5	20.4	20.2	20.1	19.9	19.9	20.1
9/29/2000	EC	18.1	18.4	18.5	18.6	18.7	18.3	18.1	18.1	17.9	17.8	17.5	17.7	17.8
	WOP	16.1	17.0	17.6	17.9	18.1	17.9	17.8	17.9	17.7	17.6	17.4	17.6	17.8
10/13/2000	EC	15.9	15.7	15.1	14.8	14.6	14.3	14.1	14.1	14.1	14.1	14.1	14.2	14.3
	WOP	10.6	10.8	10.9	11.0	11.5	12.4	13.0	13.3	13.4	13.5	13.8	14.1	14.2
10/27/2000	EC	12.6	12.3	11.9	11.8	11.6	11.4	11.7	11.8	11.9	11.9	12.0	12.0	12.0
	WOP	8.5	9.0	9.3	9.3	9.8	10.7	11.1	11.1	11.1	11.2	11.5	11.6	11.6
11/10/2000	EC	9.3	8.6	7.9	7.7	7.6	7.6	7.8	7.9	8.1	8.2	8.7	8.8	8.8
	WOP	3.9	4.1	4.8	5.1	5.7	6.4	6.9	7.2	7.5	7.7	8.3	8.5	8.5
11/24/2000	EC	6.0	5.7	5.6	5.5	5.8	5.9	5.9	6.1	6.4	6.5	6.9	7.0	6.9
	WOP	2.5	2.5	3.0	3.2	3.8	4.5	4.8	5.1	5.5	5.6	6.3	6.5	6.5
12/8/2000	EC	4.1	4.1	4.3	4.3	4.5	4.8	4.9	5.2	5.6	5.8	6.5	6.6	6.6
	WOP	3.3	3.4	3.9	3.9	4.3	4.6	4.9	5.2	5.6	5.8	6.5	6.6	6.6

*Life stage ends 11/30/2000, but for the sake of including the period from 11/24/2001 through the end of the life stage, this date is also shown.

suitable: <17°C | low to moderate stress: 18-21 °C | high stress: >21 °C

Table 12. Habitat suitability based on overage doily water temperatures for Steelhead egg incubation and fry emergence at locations downstream from Iron Gate Dam based on 2000 and 2001 water temperature modeling results for existing conditions (EC) and hypothetical without-Project (WOP) scenarios.

Date	Scenario	Iron Gate Dam RM 190.54	Above Shasta River RM 177.52	At Walker Bridge RM 156.79	Above Scott River RM 143.86	At Seiad Valley RM 129.04	Above Clear Creek RM 99.04	Above Salmon River RM 66.91	At Orleans RM 57.58	Above Bluff Creek RM 49.03	Above Trinity River RM 43.33	At Martins Ferry RM 39.5	At Blue Creek RM 15.95	At Turwar RM 5.28
12/1/2000	EC	4.7	4.5	4.5	4.5	4.9	5.7	6.1	6.5	6.7	6.8	7.5	7.7	7.7
	WOP	3.7	3.9	4.5	4.7	5.3	5.9	6.0	6.4	6.6	6.7	7.5	7.6	7.6
12/15/2000	EC	3.4	4.3	4.8	4.8	4.7	4.8	4.8	5.2	5.4	5.5	6.2	6.2	6.2
	WOP	3.3	4.1	4.3	4.3	4.2	4.2	4.3	4.7	4.9	5.0	5.8	5.9	6.0
12/29/2000	EC	2.3	2.3	2.4	2.4	2.5	2.9	3.3	3.6	4.1	4.3	4.8	5.1	5.1
	WOP	2.1	2.2	2.3	2.1	2.2	2.8	3.2	3.5	4.0	4.2	4.8	5.1	5.1
1/12/2001	EC	3.5	3.4	3.7	3.6	3.8	3.9	4.0	4.3	4.6	4.8	5.3	5.5	5.6
	WOP	2.3	2.3	2.5	2.5	2.9	3.4	3.8	4.1	4.4	4.6	5.2	5.4	5.5
1/26/2001	EC	2.6	2.6	2.7	2.7	3.2	3.8	4.5	4.8	5.1	5.3	5.7	5.8	5.8
	WOP	1.6	1.7	2.4	2.7	3.3	4.1	4.8	5.0	5.3	5.4	5.7	5.9	5.9
2/9/2001	EC	2.2	1.9	2.0	1.9	2.2	2.7	3.1	3.3	3.8	4.1	4.5	4.9	4.9
	WOP	1.1	0.7	0.9	1.1	1.8	2.6	3.5	3.8	4.3	4.5	4.8	5.2	5.3
2/23/2001	EC	2.4	2.7	3.4	3.8	4.9	6.0	6.6	6.7	6.9	6.9	7.0	7.1	7.2
	WOP	4.1	4.2	4.7	5.0	5.8	6.4	6.8	6.9	7.0	7.1	7.0	7.2	7.3
3/9/2001	EC	3.2	4.0	5.7	6.5	7.9	8.6	8.8	8.9	8.8	8.8	8.6	8.7	8.8
	WOP	7.3	8.1	9.3	9.7	10.2	10.0	9.7	9.5	9.4	9.3	8.8	8.9	8.9
3/23/2001	EC	5.2	7.9	10.3	11.3	12.9	13.2	13.2	13.0	12.8	12.6	12.2	12.4	12.5
	WOP	14.0	14.7	15.1	15.2	15.4	14.8	14.5	13.9	13.6	13.5	12.6	12.7	12.8
4/6/2001	EC	8.6	8.4	8.9	9.1	9.9	10.0	10.0	10.0	9.9	9.9	9.8	9.9	9.9
	WOP	7.6	8.2	8.7	8.8	9.6	9.5	9.6	9.7	9.7	9.7	9.7	9.8	9.9
4/20/2001	EC	7.9	8.6	9.3	9.6	10.1	10.5	11.1	11.2	11.3	11.3	11.1	11.5	11.7
	WOP	10.2	10.3	10.5	10.7	10.9	11.2	11.7	11.7	11.8	11.9	11.4	11.7	11.9
5/4/2001	EC	11.3	12.4	13.5	13.9	14.7	13.9	13.6	13.9	13.5	13.4	13.3	13.3	13.5
	WOP	13.2	13.5	13.7	13.7	14.4	13.7	13.8	14.0	13.6	13.5	13.3	13.3	13.5
5/18/2001	EC	15.5	16.4	16.9	17.0	16.9	15.8	15.4	15.5	15.0	14.8	14.5	14.3	14.5
	WOP	16.3	16.8	17.6	17.7	17.2	16.0	15.4	15.5	15.0	14.7	14.5	14.3	14.4
6/1/2001	EC	17.8	18.5	19.8	20.3	20.7	20.0	19.4	19.7	18.6	18.3	17.9	17.7	18.0
	WOP	19.6	20.5	21.1	21.0	21.0	19.6	19.2	19.5	18.6	18.3	17.9	17.7	18.0

Date	Scenario	Iron Gate Dam RM 190.54	Above Shasta River RM 177.52	At Walker Bridge RM 156.79	Above Scott River RM 143.86	At Seiad Valley RM 129.04	Above Clear Creek RM 99.04	Above Salmon River RM 66.91	At Orleans RM 57.58	Above Bluff Creek RM 49.03	Above Trinity River RM 43.33	At Martins Ferry RM 39.5	At Blue Creek RM 15.95	At Turwar RM 5.28
6/15/2001	EC	18.0	18.6	19.1	19.4	19.8	20.0	20.0	19.9	19.5	19.3	18.9	18.9	19.0
	WOP	17.2	18.0	18.3	18.4	18.7	18.9	19.4	19.5	19.2	19.1	18.7	18.7	18.9
6/29/2001	EC	18.6	19.8	20.7	21.1	21.3	21.2	21.3	20.9	20.6	20.4	19.8	19.8	20.0
	WOP	18.4	19.1	19.5	19.7	20.2	20.9	21.1	20.7	20.3	20.1	19.6	19.5	19.7
7/13/2001	EC	20.0	21.7	22.9	23.2	23.6	24.0	24.5	24.4	23.9	23.6	23.1	23.1	23.5
	WOP	21.1	22.5	23.1	23.3	23.8	24.1	24.5	24.4	23.9	23.6	23.1	23.1	23.5

* Life stage ends 6/30/2000, but for the sake of including the period from 6/29/2001 through the end of the life stage, this date is also shown

suitable: <12°C | low to moderate stress: 13-14°C | high stress: >14°C

Table 13. Habitat suitability based on overage doily water temperatures for juvenile Steelhead rearing at locations downstream from Iron Gate Dam based on 2000 and 2001 water temperature modeling results for existing conditions (EC) and hypothetical without-Project (WOP) scenarios.

Date	Scenario	Iron Gate Dam RM 190.54	Above Shasta River RM 177.52	At Walker Bridge RM 156.79	Above Scott River RM 143.86	At Seiad Valley RM 129.04	Above Clear Creek RM 99.04	Above Salmon River RM 66.91	At Orleans RM 57.58	Above Bluff Creek RM 49.03	Above Trinity River RM 43.33	At Martins Ferry RM 39.5	At Blue Creek RM 15.95	At Turwar RM 5.28
1/1/2001	EC	4.0	4.1	3.8	3.9	4.0	4.1	4.1	4.2	4.5	4.5	4.9	4.8	4.6
	WOP	2.2	3.0	3.8	3.9	4.1	4.1	4.1	4.2	4.4	4.5	4.9	4.7	4.4
1/15/2001	EC	3.1	2.8	2.7	2.6	2.9	3.6	4.0	4.3	4.6	4.8	5.4	5.5	5.5
	WOP	1.0	1.1	1.6	1.7	2.5	3.4	3.7	4.0	4.3	4.5	5.2	5.3	5.2
1/29/2001	EC	2.3	2.7	3.2	3.1	3.6	4.1	4.5	4.7	4.9	5.1	5.6	5.7	5.7
	WOP	2.4	2.6	3.0	3.1	3.5	3.9	4.2	4.4	4.7	4.9	5.4	5.6	5.6
2/12/2001	EC	1.9	2.1	2.5	2.7	3.3	4.1	4.4	4.5	4.8	5.0	5.4	5.6	5.6
	WOP	1.9	2.1	2.5	2.6	3.4	4.1	4.1	4.3	4.5	4.7	5.2	5.4	5.5
2/26/2001	EC	2.5	3.5	4.7	5.2	5.6	6.2	6.6	6.7	6.8	6.9	7.1	7.3	7.4
	WOP	5.4	5.5	5.5	5.5	5.6	6.2	6.7	6.8	7.0	7.0	7.2	7.4	7.5
3/12/2001	EC	3.5	4.7	6.0	6.5	7.6	8.2	8.6	8.7	8.7	8.7	8.6	8.8	9.0
	WOP	7.8	7.7	7.7	7.8	8.3	8.6	9.1	9.2	9.2	9.2	8.9	9.1	9.2
3/26/2001	EC	6.9	7.6	8.9	9.4	10.9	11.6	12.0	11.6	11.4	11.3	10.7	10.8	10.9
	WOP	9.5	10.0	11.3	11.9	12.5	12.8	13.0	12.3	12.1	12.1	11.1	11.3	11.4
4/9/2001	EC	8.0	8.3	8.5	8.7	9.1	9.2	9.4	9.4	9.5	9.5	9.5	9.6	9.7
	WOP	6.7	6.8	7.0	7.4	8.3	8.9	9.4	9.5	9.5	9.6	9.5	9.6	9.7
4/23/2001	EC	8.3	9.8	11.0	11.4	12.3	12.4	12.5	12.6	12.4	12.4	12.2	12.2	12.4
	WOP	13.4	13.3	13.0	12.8	13.1	12.9	12.8	12.8	12.5	12.4	12.3	12.2	12.3
5/7/2001	EC	12.1	13.7	15.0	15.5	16.4	15.4	15.0	15.1	14.5	14.4	14.1	14.0	14.3
	WOP	15.6	15.9	16.1	16.2	17.0	15.8	15.2	15.2	14.6	14.4	14.1	14.0	14.3
5/21/2001	EC	15.8	17.3	18.5	18.9	19.5	18.3	17.8	18.2	17.2	16.9	16.6	16.4	16.7
	WOP	18.1	18.9	19.8	20.0	20.2	18.4	17.9	18.2	17.3	17.0	16.7	16.4	16.6
6/4/2001	EC	18.4	18.1	17.7	17.4	17.1	16.5	16.4	16.6	16.2	16.1	15.9	15.8	15.9
	WOP	13.6	14.0	14.6	14.8	15.5	16.0	16.5	16.7	16.3	16.2	15.9	15.8	16.0
6/18/2001	EC	18.2	18.6	18.8	19.0	19.6	20.4	20.7	20.7	20.2	20.0	19.5	19.5	19.7
	WOP	16.6	17.5	18.3	18.8	19.5	20.3	20.6	20.6	20.1	20.0	19.4	19.4	19.6
7/2/2001	EC	18.5	21.0	22.4	22.7	22.9	22.7	22.7	22.5	22.1	21.8	21.2	21.3	21.6
	WOP	21.0	22.0	22.1	22.2	22.3	22.4	22.4	22.3	21.8	21.6	21.1	21.1	21.4

Date	Scenario	Iron Gate Dam RM 190.54	Above Shasta River RM 177.52	At Walker Bridge RM 156.79	Above Scott River RM 143.86	At Seiad Valley RM 129.04	Above Clear Creek RM 99.04	Above Salmon River RM 66.91	At Orleans RM 57.58	Above Bluff Creek RM 49.03	Above Trinity River RM 43.33	At Martins Ferry RM 39.5	At Blue Creek RM 15.95	At Turwar RM 5.28
7/16/2001	EC	20.1	20.5	21.0	21.2	21.3	21.3	21.4	21.5	21.2	21.0	21.0	20.7	20.8
	WOP	19.0	20.1	21.0	21.3	21.4	21.4	21.4	21.5	21.3	21.2	21.1	21.0	21.2
7/30/2001	EC	20.9	21.0	21.0	21.3	22.0	22.2	22.3	22.4	22.0	21.8	21.7	21.6	21.8
	WOP	17.8	19.5	20.5	21.1	22.0	22.0	22.3	22.4	21.9	21.7	21.7	21.6	21.9
8/13/2001	EC	21.6	22.1	22.6	22.8	22.9	23.3	23.3	23.3	22.8	22.7	22.4	22.3	22.5
	WOP	20.0	21.4	22.6	22.9	23.0	23.4	23.3	23.2	22.8	22.6	22.4	22.5	22.8
8/27/2001	EC	21.5	22.5	23.5	23.7	23.5	23.0	22.8	22.7	22.2	22.0	21.6	21.7	22.0
	WOP	20.0	21.5	22.6	23.0	23.0	22.8	22.7	22.6	22.2	22.0	21.5	21.7	22.1
9/10/2001	EC	20.6	20.8	21.0	20.9	20.6	20.2	20.4	20.4	20.1	19.9	19.7	19.7	19.9
	WOP	16.8	18.3	19.3	19.7	19.7	19.7	20.1	20.2	20.0	20.0	19.7	19.8	20.1
9/24/2001	EC	19.1	18.8	18.8	18.9	19.3	19.6	19.5	19.4	19.0	18.8	18.3	18.5	18.7
	WOP	15.5	16.8	17.9	18.3	18.7	19.2	19.4	19.3	18.9	18.8	18.3	18.5	18.8
10/8/2001	EC	17.7	17.3	17.2	17.2	17.3	17.5	17.5	17.4	16.9	16.8	16.5	16.5	16.6
	WOP	12.8	14.8	15.6	16.1	16.5	17.1	17.3	17.2	16.7	16.6	16.3	16.5	16.7
10/22/2001	EC	14.6	14.7	14.6	14.5	14.4	14.1	13.9	13.9	13.6	13.6	13.5	13.6	13.7
	WOP	10.8	11.9	12.7	12.9	13.0	13.1	13.1	13.3	13.3	13.3	13.4	13.6	13.7
11/5/2001	EC	11.4	11.5	11.4	11.4	11.5	10.8	10.6	10.9	11.0	11.1	11.4	11.6	11.7
	WOP	8.6	9.4	9.8	9.9	10.3	10.1	10.3	10.7	10.8	10.9	11.3	11.6	11.7
11/19/2001	EC	8.6	9.2	9.1	8.8	8.4	7.7	7.6	8.3	8.6	8.8	9.4	9.5	9.5
	WOP	6.4	7.0	7.4	7.3	7.3	7.4	7.6	8.2	8.5	8.7	9.4	9.5	9.5
12/3/2001	EC	5.9	5.3	5.0	4.9	5.3	5.7	5.8	6.1	6.4	6.6	7.2	7.2	7.2
	WOP	2.3	2.5	3.1	3.2	3.8	4.8	5.2	5.7	6.0	6.2	6.9	7.0	7.0
12/17/2001	EC	3.7	3.6	4.3	4.4	5.0	5.0	4.9	5.6	5.8	6.1	6.8	6.9	6.9
	WOP	2.5	2.5	3.6	3.8	4.6	4.7	4.6	5.4	5.6	5.8	6.7	6.8	6.8
12/31/2001	EC	1.9	2.0	2.8	2.9	3.9	4.5	4.7	5.8	5.8	6.1	7.5	7.3	7.2
	WOP	4.1	3.7	3.9	3.8	4.4	4.7	4.8	5.8	5.8	6.0	7.4	7.3	7.2

Life stage ends 6/30/2000, but for the sake of including the period from 6/29/2001 through the end of the life stage, this date is also shown

suitable: <15°C | low to moderate stress: 16-23°C | high stress: >23°C

During the summer and early fall months, water temperatures throughout the river increase to a range considered a low to moderately stressful for juvenile Steelhead rearing. During the mid-summer, water temperatures may reach levels under both existing and without-Project conditions that are considered to be highly stressful for juvenile Steelhead rearing, particularly in the lower reaches of the river (Table 13). The occurrence of these high temperatures, under both existing and without-Project conditions, limits year-round Steelhead rearing within the mainstem Klamath River (perhaps with the exception of limited microhabitat areas providing coldwater refuges).

Juvenile Steelhead outmigration using the mainstem Klamath River as a migratory corridor occurs primarily during the period from March through June and potentially early July (Table 3). Water temperature conditions throughout the Klamath River are within the range considered be suitable for juvenile Steelhead emigration during the period from March through approximately mid-May (Table 13). Water temperatures during the spring and early summer months are colder within the reach immediately downstream of Iron Gate Dam under existing project operations, however temperatures within the lower reaches of the river that serve as the migratory corridor for Steelhead are independent of project operations. Under existing conditions and without-Project conditions seasonal water temperatures increase during the summer, particularly in the lower reaches of the river, where temperatures are typically within the range considered to be low to moderately stressful during June and high stress/lethal during July.

Summary

As discussed in PacifiCorp (2014), Klamath Hydroelectric Project operations and the presence of Copco and Iron Gate reservoirs do not affect temperature in the Klamath River to an extent that causes biologically significant adverse effects to anadromous fish species that use the reach downstream of Iron Gate Dam at the time of migration, spawning, and egg incubation. Copco and Iron Gate reservoirs create a thermal lag that causes Iron Gate Dam release temperature to be slightly cooler in the spring and slightly warmer during the fall than would theoretically occur in the absence of the reservoirs. However, the thermal lag effect is not detrimental, and may be beneficial, to certain life stages of Chinook, Coho, and Steelhead that use the river downstream of Iron Gate Dam. In addition, as a result of basin climatological conditions and tributary inflows in the lower basin, Klamath Hydroelectric Project operations have no effect on water temperature conditions for Chinook, Coho, and Steelhead within the lower reaches of the Klamath River. The DEIR should incorporate a similar evaluation of the Proposed Project and alternatives to allow for an accurate understanding of the Proposed Project's potential effects on salmonid use of the Klamath River.

PacifiCorp' s conclusions in this regard are support ed by other recent independent analyses. In an analysis of the effects on fall-run Chi nook of hypothetical temperature conditions with and without Klamath Hydroelectric Project facilities, Bartholow et al. (2005) concluded that water temperature

conditions for juvenile rearing life stages are better with the Klamath Hydroelectric Project dams and reservoirs in place than without, especially immediately downstream of Iron Gate Dam. In a subsequent analysis of factors limiting fall-run Chinook production potential, Bartholow and Henriksen (2006) concluded that water temperature during spawning and egg incubation is not a significant factor affecting fall-run Chinook freshwater production in the Klamath River. In the 2006 EPAct trial-type proceeding, the presiding administrative judge ruled, based on the testimony of agency fisheries experts, that existing temperatures conditions will not preclude the various life stages of anadromous fish from successfully utilizing habitat either below or above Iron Gate Dam (McKenna 2007).

Response to Comment ORG46-18
The modeling results provided in PacifiCorp (2014) do not change EIR conclusions on potential effects on salmonid use of the Klamath River because the PacifiCorp (2014) data do not substantially differ from the data analyzed in the EIR. For additional detail, please refer to response to comment ORG46-17.

Comment ORG46-19
2.9.4 Fall-run Chinook Fry Emergence Timing and Juvenile Growth
The DEIR puts forth a hypothesis regarding the effect that changes in river temperature from the Proposed Project would have on fall-run Chinook fry emergence timing and implications regarding juvenile growth, migration timing, and stress and disease (DEIR pg. 3-272).

The DEIR analysis claims that fall-run Chinook emergence timing would be earlier with the Proposed Project compared to existing conditions. This difference in emergence timing is theorized to result because of warmer water temperatures in the spring under the Proposed Project (Figure 11). However, an inspection of the temperature data in the DEIR (see bottom panel in Figure 11 below) shows that fall water temperatures are about 2 to 5°C cooler and spring temperatures 1 to 2°C warmer for the Proposed Project compared to existing conditions. In short, the degree days lost in the fall are about 2 to 5 times higher than the degree days gained in the spring. A total of 889 degree days are required for fry emergence and is calculated from the day the fish spawned. Thus, it is a combination of fall, winter, and spring water temperature that determines fry emergence date. The DEIR in correctly looks only at the spring degree-days to conclude that emergence timing is delayed under existing conditions as compared to the Proposed Project.

Review of DEIR Analysis
While text presented throughout the DEIR claims an earlier fry emergence timing for fall-run Chinook under the Proposed Project, the data (Figure 11) do not support such an assertion. In fact, the data indicate emergence timing is later for fish spawning on similar dates for the Proposed Project compared to existing conditions. For example, a dot ted line in the middle panel of Figure 11 shows

that under the Proposed Project there are about 120 days to emergence, compared to 60 days for existing conditions for fish spawning mid-September. This results in fry emergence dates of January (Proposed Project) and November (existing conditions) (Figure 11, top panel). This relationship (i.e., later emergence date for Proposed Project) holds for fish spawning until about late November, when emergence date becomes similar for the two alternative, with emergence timing being marginally earlier for the Proposed Project.

What is unclear in the DEIR, is the meaning of the solid lines in the days to emergence and emergence date panels (Figure 11 middle and top panels). No explanation is provided in the DEIR text as to what the lines denote. Perry et al. (2011), the reference to which this figure is linked, has temperature data but nothing on emergence timing. It is unclear from the DEIR how this figure was actually derived or if Perry et al. (2011) is even the correct source.

<u>Emergence Timing Analysis</u>
Because data from graphs are difficult to precisely interpret and the source material does not contain an adequate explanation, water temperature data for 2004 (an average water year) were used to perform a similar emergence timing analysis in order to verify the conclusions made from interpreting Figure 11. The results of this analysis show fall-run Chinook fry emergence timing is earlier under existing conditions for spawn dates between September 1 and December 1. After this date, emergence timing is predicted to be earlier for the Proposed Project (Table 14). Using data from 2004 and 2006 water years and the same type of analysis generates similar results.

For emergence timing under the Proposed Project to be similar to existing conditions, fall-run Chinook spawning must be approximately 2 to 3 weeks earlier for the Proposed Project. For example, fish spawning on September 29 in the Proposed Project would have about the same fry emergence timing as fish spawning between October 13 and 20 under existing conditions (Table 14). Even with similar fry emergence timing, river temperatures would be warmer at emergence for the Proposed Project.

Whether fall-run Chinook migration or spawn-timing changes under the Proposed Project would be highly dependent on resulting fall stream temperatures. Cooler stream temperatures in the fall should equate to earlier adult migration timing as conditions become more favorable for earlier arriving fish.

However, while the DEIR indicates that stream temperatures in the fall at Iron Gate Dam for the Proposed Project would be cooler, water temperatures would remain largely unchanged downstream of the Scott River (RM 143) through the Klamath Estuary and into the marine near shore environment. Because stream temperatures in the lower river are not affected by the Proposed Project, it is highly uncertain that adult run-timing would change dramatically for fall-run Chinook because they would still encounter warm water temperatures in the

lower Klamath River as they do currently. These conditions, which currently limit upstream migration timing and cause fish to hold in the lower river, would persist under the Proposed Project.

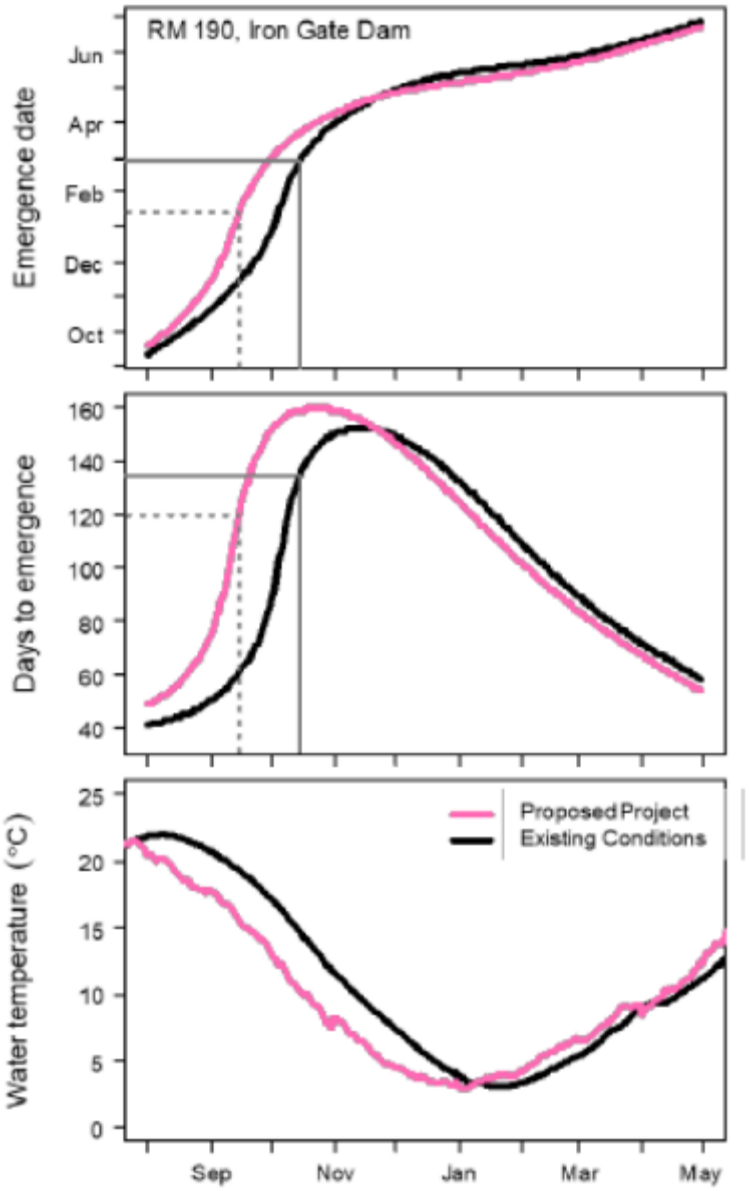


Figure 11. Perry et al. (2011) Modeled Time Series of Average Daily Mean Water Temperature (lower panel) Predicted at Iron Gate Dam (RM 193.1) Under the Proposed Project and existing conditions. Days to emergence (middle panel) and date of emergence (upper panel) for fall-run Chinook Salmon was estimated as a function of spawning date assuming that emergence would occur at 889 degree days (accumulated heat related to development) after spawning (Perry et al. 2011). (Reproduction of DEIR Figure 3.3-4, pg. 3-274).

*Table 14. Spawning date versus emergence timing for the existing conditions and Without Dams (represents Proposed Project alternative) where green cells indicate the alternative with earlier emergence timing.**

	Existing Conditions		Without-Project	
Spawning Date	Emergence Date	#Days	Emergence Date	#Days
1-Sep	19-Oct	49	11-Nov	72
8-Sep	30-Oct	53	13-Dec	97
15-Sep	12-Nov	59	28-Jan	136
22-Sep	28-Nov	68	21-Feb	153
29-Sep	24-Dec	87	11-Mar	164
6-Oct	2-Feb	120	23-Mar	169
13-Oct	13-Mar	152	3-Apr	173
20-Oct	28-Mar	160	10-Apr	173
27-Oct	8-Apr	164	14-Apr	170
3-Nov	16-Apr	165	19-Apr	168
10-Nov	24-Apr	166	23-Apr	165
17-Nov	30-Apr	165	27-Apr	162
24-Nov	4-May	162	29-Apr	157
1-Dec	8-May	159	1-May	152
8-Dec	11-May	155	1-May	145
15-Dec	14-May	151	3-May	140
22-Dec	16-May	146	5-May	135
29-Dec	17-May	140	6-May	129

*Analysis assumes 889-degree days from spawning to emergence. The without-Project data set is from PacifiCorp's (2014) Without Project (WOP) 2004 temperature data.

Disease

Assuming the fry emergence timing analysis above is correct, the statements in the DEIR regarding temperature effects of fish disease on juvenile salmon need to be revisited. For example, water temperatures for the Proposed Project are warmer in the spring than for existing conditions which means losses resulting from C. shasta may also be higher for the Proposed Project as compared to existing conditions simply because of the difference in water temperature (See Major Issue 2.8)

Juvenile Growth

The DEIR (pg. 3-272) states that juvenile Chinook growth rates would be higher for the Proposed Project and this would encourage earlier juvenile outmigration

compared to existing conditions. This statement is correct only when Chinook fry emergence timing is the same; as was discussed above, fry emergence timing is not the same for the Proposed Project as compared to existing conditions (Table 14). Fall-run Chinook fry emergence is earlier for existing conditions for the same spawn date through December 1. Thus, although spring water temperatures are warmer for the Proposed Project, Chinook fry may have up to 30 more days to grow under existing conditions.

Conclusion
The analysis of fall-run Chinook fry emergence timing and growth for the Proposed Project, existing conditions, and all alternatives to the Proposed Project should be rerun. Once this analysis is complete, the discussion and conclusions in the DEIR need to be reevaluated to accurately present the potential impacts of the Proposed Project and the alternatives in relation to existing conditions. As it stands, the DEIR analysis is incorrect and does not support the conclusions in the DEIR that water temperature changes as a result of the Proposed Project will benefit Coho, Chinook, and Steelhead.

Response to Comment ORG46-19
The EIR considers fall-run Chinook salmon emergence timing under the Proposed Project in Section 3.3.5.4 *Aquatic Resources – Potential Impacts and Mitigation –Water Temperature*, including Figure 3.3-4. The analysis does not look only at spring-degree days in relation to fry emergence, but it considers a variety of factors that affect emergence timing, including fall river water temperatures.

The Federal Energy Regulatory Commission (FERC) 2007 Environmental Impact Statement (EIS) concluded that without J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate dams, more rapid cooling of river water temperatures in the fall may also allow for fall Chinook salmon spawning to occur earlier in the fall. This, in turn, would likely result in earlier emergence and growth, and encourage earlier emigration. Contrary to the PacifiCorp comment, the EIR does not claim that earlier spawning timing would necessarily result in earlier migration timing.

Section 3.3.5.4 *Aquatic Resources – Potential Impacts and Mitigation – Water Temperature – Middle and Lower Klamath River* has been revised to clarify the analysis presented in Figure 3.3-4 and the caption was revised to clarify the solid and dashed lines, and source data. Please refer to Volume III Attachment 1 Section 3.3.5.4 *Aquatic Resources – Potential Impacts and Mitigation – Water Temperature – Middle and Lower Klamath River* for the revisions.

Comment ORG46-20

- *The DEIR Lacks Over all Clarity. The DEIR does not comply with CEQA's requirements that Environmental Impact Reports (ElRs) be organized and written in a manner that will make them "meaningful and useful to decision makers and to the public," (Pub . Res. Code§ 21003 (b)) and that EIRs be*

written in plain language and drafted to be understandable to decision-makers and the public (14 Cal. Code Regs. § 15140; 15147). Throughout the DEIR, the data and information is not presented in a manner designed to adequately inform the public and decision-makers.

A non-exhaustive list of examples of this problem include:

- *In Section 2 of the DEIR, the project description presents 'dam removal year 1' as being up through December 2020 and 'dam removal year 2' starts in January 2021. Actual removal of facilities is currently scheduled to take place in 2021. As the DEIR discusses impacts in terms of 'dam removal year 1' or 'dam removal year 2', it is easy to get confused about when an event might actually happen. This confusion is compounded in the effects analysis for example, where the DEIR discusses the end of hatchery supplementation in 'post dam removal' year 7, which is presumably 'dam removal year 2' plus 7 years (DEIR pg. 3- 315). Another example of this can be found in Section 3.4.3 (DEIR pg. 3-422) where "short-term" and "long-term" are defined as: "This period [short-term] corresponds to pre-dam removal years 1 and 2, dam removal year 1, dam removal year 2, and post-dam removal year 1 (Table 2.7-1). Long-term is defined as occurring after post-dam removal year 1 (i.e., greater than three years after dam removal begins)." Terminology such as this will confuse the public and decision-makers and should be clarified in the recirculated DEIR; it would be much clearer to use calendar years.*
- *The discussion of cultural resources is so vague and non-specific that it is impossible to tell if the resources potentially affected by the Proposed Project are accurately described. PacifiCorp recognizes the extremely sensitive nature of these resources. There are, however, ways to present information in such a manner that readers understand that the impact analysis was performed correctly and understand the magnitude of the impact.*
- *The analysis of impacts to Chinook and Coho are presented in terms of percent increased mortality with no discussion of population sizes (Appendix Tables E-8 and E-1 0). The impacts to Steelhead however, are presented in actual numbers of fish (Appendix Table E-12). There is an abundance of population data for Chinook and Coho that is not included or considered in the DEIR, which when added in a recirculated DEIR, would allow an analysis to be done in a manner similar to that for Steelhead. By failing to do this analysis, the DEIR disguises the actual effects of the Proposed Project in percentages that the reader is not able to connect to actual populations-particularly populations of Coho that are exceptionally small.*
- *The definition of "short-term impacts" in Section 3.3 Aquatic Resources, is 5 years. In Appendix F, which discusses potential impacts of bedload transport of sediment to aquatic resources, the short-term period is 2 years. Similarly, Section 3.2 Water Quality uses a 2-year period as short*

term. The disparity in these timeframes makes the connection between the analysis in one section of the DEIR and the analysis in another extremely difficult to follow. For example, the effects analysis in Section 3.3 discusses short-term impacts to fish from bedload transport and references Appendix F which covers two of these years. The DEIR does not explain what happens in the three extra short-term years necessary to meet the definition of short term in Section 3.3. As a result, the reader' s ability to understand short-term impacts (i.e., Proposed Project impacts occurring over a consistently defined period of years) is compromised.

Response to Comment ORG46-20

The Lower Klamath Project EIR meets the requirements of Public Resources Code section 21003, subdivision (b), which states that an EIR should be organized and written in a manner that will be meaningful and useful to decision makers and to the public. The EIR contains a list of its contents, including sections to third-level headings, all figures, tables, and appendices; a key for acronyms and abbreviations; an executive summary; an introduction section that plainly and succinctly describes the authorization, purpose, and use of EIR, an overview of the scope and content of the EIR, and summaries of the public process, public involvement, and agency consultation during preparation of the EIR; a detailed description of the Proposed Project and a discussion of the intended uses of the EIR; a thorough analysis and discussion of the environmental resources that may be affected by the Proposed Project, including potential cumulative effects, where each environmental resource area analyzed includes five parts (Area of Analysis, Environmental Setting, Significance Criteria, Impact Analysis Approach, Potential Impacts and Mitigation); a discussion of the alternatives selection process and a detailed analysis of each of six alternatives to the Proposed Project; and numerous technical appendices that present additional, supporting information.

Further, the Lower Klamath Project EIR meets the requirements of CEQA Guidelines section 15140, which states that EIRs shall be written in plain language and may use appropriate graphics so that decision makers and the public can rapidly understand the documents. There are approximately 250 figures in the EIR, many of which were developed to assist the reader in understanding complex scientific concepts (e.g., Figure 2.7-1 depicting the dam removal schedule and the distribution and life-history timing of aquatic species in the Klamath Basin; Figure 3.2-2 depicting the general seasonal pattern of physical, chemical, and biological processes in reservoirs such as the Lower Klamath Project reservoirs, where these processes are relevant to the impact analyses; Figure 3.3-2 and Figure 3.3-3 depicting the lifecycles of organisms that cause fish disease; Figure 3.4-10 depicting the transport of blue-green algae from the Upper Klamath Lake into the Upper Klamath River, which is relevant to the impact analyses). Where technical terms must be used in the EIR to succinctly and accurately support the analyses, the technical terms are defined at

first use, using parenthetical definitions for short statements, and footnotes for longer statements.

The Lower Klamath Project EIR also meets the requirements of CEQA Guidelines section 15147 regarding technical detail, which states that information contained in an EIR shall include summarized technical data, maps, plot plans, diagrams, and similar relevant information sufficient to permit full assessment of significant environmental impacts by reviewing agencies and members of the public. Of the roughly 200 figures in the EIR, many are maps and schematics that convey spatial information relevant to the EIR analyses in a clear and concise manner. Highly technical and specialized analysis and data (e.g., modeling results) are presented in Volume II of the Lower Klamath Project EIR, which contains the EIR scoping report (Appendix A), the Klamath River Renewal Corporation's (KRRC's) Definite Plan (Appendix B), and nineteen technical appendices, along with excerpted Tribal Trust information and additional information incorporated by reference.

With respect to the comment's assertion that the approach to presenting the facilities removal schedule in the EIR is confusing, because the proposed dam removal activities would span two calendar years, with construction activities (e.g., recreation area facilities removal, power generation facilities removal at Copco No. 1, modifications to dam diversion tunnels) occurring prior to actual dam removal and early drawdown of Copco No. 1 Reservoir beginning prior to drawdown of the other reservoirs, the terminology "dam removal year 1" and "dam removal year 2" are used in the EIR to indicate the anticipated timeframe for removal. Volume I Section 2 *Proposed Project* Table 2.7-1 (page 2-27) presents the proposed Lower Klamath Project schedule and defines the proposed project activities as pre-dam removal years 1−3, dam removal year 1, dam removal year 2, and post-dam removal years 1 through 10, as informed by the KRRC's Definite Plan. Table 2.7-1 is referenced in numerous locations throughout the EIR impact analyses, as appropriate. The aquatic resources analysis also contains a resource-specific schedule that ties the impact analysis to the dam removal years in Table 2.7-1 (i.e., Table 3.3-11 presents the timing of hatchery releases and adult returns under the Proposed Project using the dam removal year terminology). Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

With respect to the comment regarding the use of 'dam removal year 1' and 'dam removal year 2' terminology rather than calendar years, the 'dam removal year' terminology does not tie the EIR analyses to particular calendar years, which may change as the Proposed Project process continues. For example, in 2019, following issuance of the Draft EIR, the KRRC indicated that the project schedule has shifted by a year such that dam removal pre-construction actions would occur May–December 2021 and reservoir drawdown, construction, and mitigation actions would be completed in 2022. Minor updates have been made to Table

2.7-1 based on the information provided in KRRC (2019b); these updates are presented in Volume III Attachment 1 Section 2 *Proposed Project*.

With respect to the comment's assertion that the discussion of cultural resources is vague and non-specific, the EIR presents the available public information characterizing tribal cultural resources in an effort to help the public and decision-makers understand the conclusion that particular impacts under the Proposed Project would be significant and unavoidable (Public Resources Code section 21082.3, subdivision (b)). Any apparent non-specificity or vagueness in the cultural resource descriptions contained within the EIR is a necessary consequence of the need to maintain confidentiality regarding these resources, as CEQA requires (Public Resources Code section 21082.3, subdivision (c)). Please also refer to responses to comments ORG46-292 to ORG46-304. Volume III Attachment 1 presents the final Section 3.12 *Historical Resources and Tribal Cultural Resources*.

With respect to the comment's assertion that the use of percent increased mortality for characterizing the potential effects of dam removal on fish species is not appropriate, please refer to response to comment ORG46-504.

With respect to the comment regarding the varying definitions of short term in the water quality and aquatic resources analyses, please refer to responses to comments ORG46-30 and ORG46-199. Please note that Section 3.5.4 *Terrestrial Resources – Impact Analysis Approach* has been revised to clarify the definition of short-term effects. Please refer to Volume III Attachment 1 Section 3.5.4 *Terrestrial Resources – Impact Analysis Approach* for the revisions.

Comment ORG46-21

- *The DEIR Relies on Out of Date Information. The Klamath Basin is a data rich environment. The DEIR background and analyses, however, does not rely on recent data; instead, it relies on older information prepared in the FERC (2007) EIS and the KHSA 2012 EIR/ EIS (DOI and CDFW 2012) that was developed in connection with the Secretarial Determination. There has not been a consistent effort made to present an up-to-date analysis of potential impacts based on the best available data and information. CEQA requires adequate information to ensure that "decisions be informed, and therefore balanced" (Association of Irritated Residents v. County of Modero (2003) 107 Cal. App. 4th 1383, 1398; see also North Coast Rivers Alliance v. Mar in Municipal Water Dist. Bd. af Directors (2013) 216 Cal. App. 4th 614, 642-643).*

  A non-exhaustive list of examples of this issue include:

  - *The stream flow data relies on KBRA flow data and does not take in to account mandatory flows being implemented by the USBR under its 2013 BiOp {NM FS and USFWS 2013). Even the information in the*

DEIR shows that these flows are quite different in some months (see DEIR Figures 3.1-1 and 3.1-2) (See Major Issue 2.2). Data reflecting actual mandatory flows should be used.

- *The DEIR does not reference any of the information and extensive analysis presented in PacifiCorp's (2014) Section 401 Water Quality Certification application for the Klamath Hydroelectric Project. The State Water Board should focus on incorporation of the up-to-date water quality modeling which includes results for water temperatures, dissolved oxygen, nutrients, pH, and other constituents, for Existing Conditions and without-Project conditions as presented in PacifiCorp (2014). PacifiCorp' s application is being provided electronically to the State Water Board with these comments.*
- *The DEIR only includes selective elements from the water quality analysis and data collected under the comprehensive water quality monitoring effort conducted under the KHSA Interim Measure 15 program. The Interim Measure 15 program was developed specifically to inform water quality analysis related to dam removal, is readily available on PacifiCorp's Klamath Hydroelectric Project website2 and is annually updated. All of the Interim Measure 15 data is being provided electronically to the State Water Board with these comments.*
- *The aquatic resources section does not include up-to-date information relating to the status of the Coho Salmon population in the upper Klamath River. Specifically, there is no mention of the annual reports prepared for Iron Gate Hatchery, the Scott River, Shasta River, or Bogus Creek, or the results of Coho spawning surveys on the tributaries between Iron Gate dam and Portuguese Creek which PacifiCorp has been conducting annually since 2015 (see CDFW 2018a , 2018b; Knecht le and Giudice 2018b; MKWC 2016, 2017, 2018; Chesney and Knechtle 2017; Knecht le and Chesney 2017).*
- *It is not clear if the data regarding cultural resources potentially affected by the Proposed Project was updated to reflect the field work conduct ed by the KRRC over the last 2 years.*
- *The recreational use data cited in the DEIR is from 2007, while the Definite Plan provided by the KRRC (see DEIR Appendix B) provides data from 2015. Similarly, use data for whitewater boating used in the DEIR is from 2011 or 2007 when annual data is readily available from the Bureau of Land Management.*

Response to Comment ORG46-21

In compliance with CEQA requirements, the EIR has made a consistent effort to present up-to-date analyses based on the best available data and information.

The statement in the comment that the Draft EIR does not take into account the 2013 Biological Opinion (BiOp) Flows is incorrect. The Draft EIR presents a detailed discussion of the 2013 BiOp Flows in Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*, and Section 3.1.6.2

Comparison of Klamath River Flows under 2013 BiOp Flows and KBRA Operations Criteria discussed why the hydrologic model outputs previously developed using the Klamath Basin Restoration Agreement (KBRA) Flows for the 2012 KHSA EIS/EIR are sufficient to estimate conditions under 2013 BiOp Flows. Please also refer to responses to comments ORG46-6, ORG46-24, ORG46-24.1, ORG46-25, ORG46-82, ORG46-203, and ORG46-215.

The statement in the comment that the Draft EIR does not reference any information presented in PacifiCorp's 2014 Section 401 Water Quality Certification application for the Klamath Hydroelectric Project (KHP) is incorrect. Please refer to the numerous references to PacifiCorp's current Reservoir Management Plan (Plan), and reports cited within the Plan, in Section 3.2 *Water Quality* and the water quality-related subsections of the No Project Alternative (Volume I Section 4.2) and the Continued Operations with Fish Passage Alternative (Volume I Section 4.4). Volume III Attachment 1 presents the final Section 3.2 *Water Quality*. The water quality modeling reported in PacifiCorp's 2014 Section 401 Water Quality Certification application for the Klamath Hydroelectric Project does not appear to use the 2013 BiOp Flows as the basis for Klamath River hydrology.

With respect to water quality data collected under the Klamath Hydropower Settlement Agreement (KHSA) Interim Measure 15 (IM15) program, please refer to Master Response WQ-4. As noted, the IM15 data was reviewed for the EIR, and does not present a general departure from previous data sets. The IM15 data was added to prior data analyses, figures, and tables where the IM15 data provided additional information. However, in many instances, consideration of the new data did not warrant changes to existing analyses, figures, or tables.

Regarding the status of the coho population in the Upper Klamath River, please refer to responses to comments ORG46-159 and ORG46-187.

The comment does not specify which field work conducted by the Klamath River Renewal Corporation (KRRC) over the last two years is of concern. Given that PacifiCorp's comment was submitted in 2019, the State Water Board presumes that PacifiCorp is referring to field work conducted during 2017 and/or 2018. As noted in Section 6.2.2 of Appendix L of Appendix B: *Definite Plan*, disposal site areas within the Limits of Work that were not previously surveyed were subject to pedestrian surveys by KRRC in 2017. More specifically, in July 2017, KRRC conducted a cultural resources pedestrian survey inventory of approximately 27 acres at the Iron Gate Dam disposal site. The inventory identified one historic-period archaeological site (LKP-RB-1) and one historic-period isolated find (LKP-EN1-IF). The State Water Board is unaware of additional field work efforts by KRRC in the last two years.

Section 3.12.2.3 *Historical Resources and Tribal Cultural Resources – Environmental Setting – Known Tribal and Historical Resources in the Vicinity of*

the Proposed Project – Summary of California Historical Resources Information System Record Searches, including Table 3.12-1, has been revised to clarify that these two sites were identified in the 2017 pedestrian survey. Please refer to Volume III Attachment 1 Section 3.12.2.3 *Historical Resources and Tribal Cultural Resources – Environmental Setting – Known Tribal and Historical Resources in the Vicinity of the Proposed Project – Summary of California Historical Resources Information System Record Searches* for the revisions.

Please also refer to Volume III Attachment 1 Section 3.12.5 *Historical Resources and Tribal Cultural Resources – Potential Impacts and Mitigation* Potential Impact 3.12-12, which analyzes pre-dam-removal activities that involve disturbance of the landscape, including activities at disposal sites among other locations within the Limits of Work, and Potential Impact 3.12-16, which analyzes ground disturbance associated disposal site restoration along with other sites within the Limits of Work. The two historic-period sites noted above are included in the EIR analyses.

Please note that not all of the required cultural resources inventory and significance analyses will be completed prior to certification of this EIR. Please refer to the introductory paragraphs of Section 3.12 *Historical Resources and Tribal Cultural Resources*. Volume III Attachment 1 presents the final Section 3.12 *Historical Resources and Tribal Cultural Resources*. Please also refer to response to comment LA9-73. Additionally, as stated in Volume I Section 2.7.8.5 *Proposed Project – Proposed Project – Other Project Components – Cultural Resources* (page 2-95), KRRC is preparing a Cultural Resources Plan (Volume II Appendix B: *Definite Plan – Appendix L*) that would identify the cultural resources studies that KRRC has completed, those that are currently ongoing, and others that KRRC anticipates completing in order to comply with regulatory requirements under Section 106 of the National Historic Preservation Act and California Assembly Bill 52.

With respect to available recreational data, information requests were submitted to corresponding facilities and reservoir representatives (e.g., PacifiCorp, California Department of Fish and Wildlife [CDFW], and Bureau of Land Management [BLM]) to obtain the most recent recreational data for Section 3.20 *Recreation* and related analyses in the EIR. Where available, updated information has been added to the EIR. The additional data do not constitute significant new information (CEQA Guidelines section 15088.5(a)). Please also refer to responses to comments ORG46-332 to ORG46-342.

Comment ORG46-22

- *Modifying Language Contained Throughout the DEIR May be Interpreted as Bias towards Certain Outcomes and Conclusions. The DEIR presents information that is misleading, based on opinion without adequate factual or technical support, may be interpreted as suggesting a bias towards certain outcomes and conclusions, and fails to adequately inform the*

public and decision-makers about the environmental consequences of the Proposed Project. This conflicts with CEQA' s policy that ElRs "provide decision makers with information that enables them to make a decision which intelligently takes account of environmental consequences" (14 Cal. Code Regs. § 15151). CEQA requires that an EIR contain facts and analysis, not just an agency' s bare conclusions or opinions (Citizens of Goleta Valley v. Board of Supervisors (1990) 52 Cal. 3d 553, 568), and should, when looked at as a whole, provide a reasonable, good faith disclosure and analysis of potential environmental impacts (Laurel Heights Improvement Ass' n v. Regents of Univ. of Cal. (1988) 47 Cal. 3d 376; California Oak Found. V. Regents of Univ. of Cal. {2010} 188 Cal. App. 4th 227, 269)). An EIR must state the bases for its findings; a bare conclusion regarding an environmental impact without an explanation of its factual and analytical basis is not sufficient (Laurel Heights, supra at 404; Whitman v. Board of Supervisors (1979) 88 Cal. App. 3d 397; People v. County of Kern (19 74) 39 Cal. App . 3d. 830, 841; see also 14 Cal. Code Regs. § 15151).

A non-exhaustive list of examples of this problem include:

- *In the discussion of screening criteria for chemical contamination, the ecological and human health-based screening levels are intermingled, and it is impossible to tell which is being discussed (DEIR pg. 3-42).*
- *The DEIR references the "current degraded condition" without specifically defining what degraded means or analyzing the meaning or significance of the term (DEIR pg. ES-24).*
- *The DEIR dismissively states that "...some commenters indicated their belief that the Lower Klamath Project reservoirs improve water quality by serving as a sink for phosphorus..." (DEIR pg. 3-14). The fact that Copco and Iron Gate reservoirs are nutrient sinks is not a belief; but rather a fact that the DEIR acknowledges on page 3-27 (See also Kann and Asarian 2007; Asarian and Kann 2005; Asarian et al. 2009). The DEIR provides no analysis of the potential impact of increased nutrient delivery to the Klamath River downstream of Iron Gate Dam, or, importantly, to the estuary after the reservoirs are drawn down.*
- *The DEIR states that "(o]n an annual basis, the majority of nutrients entering a reservoir from a watershed are eventually discharged downstream, with only a small fraction being retained in the reservoir sediments" (DEIR pg. 3 -20). The "only a small" modifier is unsubstantiated and unexplained, and should be replaced with the actual quantity of retention in both the percent of annual loading and mass (in tons).*
- *The DEIR states that "[s]tress associated with high water temperatures can make cold water species more vulnerable to disease and parasites, and have been associated with fish kills in the Klamath River downstream of Iron Gate Dam during low flow periods in late*

summer..."(DEIR pg. 3-236). This sentence misconstrues the effects of Iron Gate Dam on water temperature and in correctly relates the existence of Iron Gate Dam to fish kills in the Klamath River. Taken individually, the various components of this sentence are true: warmer water does make fish more susceptible to disease, disease and parasites have been associated with fish kills in the Klamath River, and the fish kills have occurred downstream of Iron Gate Dam. However, this information is presented in a way to lead the reader to believe that Iron Gate Dam has resulted in fish kills, which is incorrect. Analysis of the 2002 fish kill does not specifically attribute effects from Klamath Hydroelectric Project facilities on the key factors considered to have caused the fish kill (i.e., large returns of Chinook, low flows, warm water temperatures, the pathogens lchthyophthirius and Columnaris) over 150 miles downstream of Iron Gate Dam (CDFG2004).

- *Regarding gravel augmentation downstream of Iron Gate Dam per the Coho Habitat Conservation Plan, the DEIR (pg. 3-235) states that "...details on the extent of downstream movement have not been reported." This statement implies monitoring of gravel placed into the Klamath River was a requirement of the project that was not met. However, downstream movement monitoring was not a requirement of the project, although mobilization of the gravel from its placement site has been reported consistent with the project objectives and gravel monitoring plan established for this work.*
- *Regarding populations of polychaetes, the DEIR (pg. 3-242) states that "abundant polychaete populations that are found in atypically stable habitats." Polychaetes are found in stable and unstable stream habitat and there is nothing atypical about either of these habitat types.*

Response to Comment ORG46-22

The comment addresses the commenter's disagreement with the use of terminology or presentation of information in the Draft EIR. The use of terms and presentation of information in the EIR is intended to enable decisionmakers and the public to understand the factors that have contributed to the existing environmental condition, and how the Proposed Project and the various alternatives would alter the existing condition. In addition, because the EIR is intended to inform the State Water Board's decision with respect to potential issuance of a water quality certification for the proposed project under the federal Clean Water Act, the terms and presentation of information are intended to convey the effect of the Proposed Project and various alternatives on water quality at a general level, not just with reference to changes to the existing condition. This is particularly important because the Proposed Project is a restoration project intended to improve the environment over the existing condition in the long term. To accomplish these goals, the EIR uses modifying terms that assist a lay reader's understanding of the available data. Terms such as "small" or "degraded" are useful in conveying the import of raw data numbers. Although some parties might argue with a specific use of terminology or prefer

that information be presented in different ways, the EIR provides the information that allows the public to understand the connection between the existing evidence and the selected action.

Regarding sediment screening criteria, please refer to response to comment ORG46-115.

With respect to use of the phrase “current degraded condition” in Volume I *Executive Summary – Issues to be Resolved* (paragraph 2, page ES-24), the text has been revised to provide additional context for use of this phrase. Please refer to Volume III Attachment 1 *Executive Summary* for the revisions.

Regarding the comment’s assertion that use of the term “belief” is problematic in the referenced sentence, please note that each environmental resource area analyzed in Section 3 for the Proposed Project begins with a summary of public comments received during the scoping process for the Lower Klamath Project and in that context it is appropriate to use the term belief. The comment is correct that the Draft EIR cites the scientific literature regarding nutrient retention in the reservoirs. The comment’s assertion that the Draft EIR does not analyze the potential impacts of increased nutrient transport to the Middle and Lower Klamath River and the Klamath River Estuary is incorrect; please refer to Section 3.2.5.8 *Water Quality – Potential Impacts and Mitigation – Nutrients* Potential Impact 3.2-7 and Potential Impact 3.2-8 for analysis of the potential short-term and long-term effects of dam removal on nutrient transport. Volume III Attachment 1 presents the final Section 3.2 *Water Quality*. Please also refer to Volume I Section 3.4.5.2 *Phytoplankton and Periphyton – Potential Impacts and Mitigation – Periphyton* Potential Impact 3.4-3 for a discussion of the potential for short-term increase in growth of nuisance periphyton species due to increases in sediment-associated nutrients from release of sediments currently trapped behind the Lower Klamath Project dams (pages 3-433 to 3-435), and Potential Impact 3.4-4 for a discussion of potential alterations in growth of nuisance periphyton species in the Hydroelectric Reach due to increased nutrients and available low-gradient channel margin habitat formed by conversion of the reservoir areas to a free-flowing river and the elimination of hydropower peaking operations (pages 3-435 to 3-437). Please also refer to response to comments ORG46-139, ORG46-140, ORG46-142, ORG46-143, ORG46-145, and ORG46-267.

With respect to the “only small” modifier mentioned in the comment, please refer to responses to comments ORG46-88, ORG46-97, ORG46-98, and ORG46-381.

Regarding the comment’s assertion that the Draft EIR misconstrues the effects of Iron Gate Dam on water temperature as related to fish kills in the Klamath River, please refer to response to comment ORG46-174.

With respect to the comment regarding gravel augmentation and PacifiCorp monitoring activities, Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Bed Elevation and Grain Size Distribution* has been revised for clarity. Please refer to Volume III Attachment 1 Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Bed Elevation and Grain Size Distribution* for the revisions.

With respect to the use of the term “atypically” to describe preferred riverine habitat for polychaetes, please refer to response to comment ORG46-183.

Please refer to responses to comments ORG46-98, ORG46-380, ORG46-447, ORG46-453, and ORG46-465, which discuss use of the modifier “adverse” in the Draft EIR alternative analysis.

Comment ORG46-23

- *The DEIR Should Propose Enforceable Mitigation for Significant Environmental Effects. The DEIR states that some mitigation measures are outside the State Water Board's regulatory reach but that they expect "...that the KRRC may agree to implement certain mitigation measures through good neighbor agreements or other legally enforceable mechanisms..." (DEIR pg. 3-2). An EIR must "propose and describe mitigation measures to minimize the significant environmental effects identified" (Pub. Res. Code§§ 21002.l(a), 21100(b)(3;) 14 Cal. Code Regs § 15126.4), and mitigation measures adopted by the agency must be fully enforceable through permit conditions, legally enforceable agreements, or other measures (Pub. Res. Code§ 21081.6; 14 Cal. Code Regs. § 15126 .4(a)(2); see also Pub. Res. Code§§ 21002.l (a), 21100(b)(3); 14 Cal. Code Regs§ 15126.4; ..." Tracy First v. City of Tracy (2009) 177 Cal. App. 4th 912, 937).*

  Additionally, the DEIR concludes that numerous impacts of the Proposed Project are significant and unavoidable, but lacks a consistent discussion regarding why mitigation is not feasible or why an impact is considered unavoidable. The DEIR should set forth the bases for its findings on a project's environmental impacts, and contain an explanation of the reasoning and evidence supporting the DEIR's impact findings (Association of Irritated Residents v. County of Madero (2003) 107 Cal. App. 4th 1383; Napa Citizens for Honest Gov' t v. Napa County Bd. of Supervisors (2001) 91 Cal. App. 4th 342, 359).

  A non-exhaustive list of examples of the problems presented above include:

  - *Recommended, but non-enforceable, mitigation measures are explicitly called out in Section 3.5 Terrestrial Resources in*

Recommended Measures TER-1 through TER-12; Section 3.17 Public Services in Recommended Measure PS-1; Section 3.22 Transport ation and Traff ic in Recommended Measure TR-1.

- *Mitigation Measure WSWR-2, which requires the KRRC to relocate the City of Yreka's water supply pipeline, may have environmental effects of its own that are not analyzed in the DEIR (beyond a brief discussion of construction-generated noise and vibration) per the requirements of Pub. Res. Code Regs. § 15126.4(a)(1)(D).*
- *In Section 3.11 Geology, Soils, and Mineral Resources, Mitigation Measure GE0-1, requires the KRRC to monitor slopes and implement any necessary slope stabilization measures (including roads, structures, etc.). Slope stability for water quality protection may be within the State Water Board's jurisdiction, but roads, structures, and other infrastructure are clearly outside the State Water Board's jurisdiction.*
- *In Section 3.12 Historical Resources and Tribal Cultural Resources, Mitigation Measures TCR-6, TCR-7, and TCR-8 are clearly beyond the State Water Board's ability to enforce.*
- *In Section 3.17 Public Services, Potential Impact 3.17-1 is listed as being potentially significant and unavoidable with mitigation, yet no mitigation is included in the DEIR (DEIR pg. 3-913 to 3-915).*
- *Examples of significant and unavoidable impacts that do not include a discussion of potential mitigation measures or any reasoning as to why that mitigation is not feasible include but are not limited to:*
  - *Impacts 3.23-1, 2, 4, 5, and 6 which all relate to noise levels associated with working two shifts during facilities removal. Mitigation would appear to be feasible by simply scheduling work to occur during normal daytime hours, but the DEIR simply calls the impact significant and unavoidable without any reasoning.*
  - *Impact 3.11-5 regarding deposition of sediment downstream of Iron Gate Dam provides no reasoning for why the impact is considered unavoidable.*
  - *Impact 3.2-3 regarding suspended sediments released by the Proposed Project throughout the Klamath River provides no reasoning for why the impact is considered unavoidable. Mitigation through a slower drawdown or a phased multi-year removal could be considered as a potential mitigation measure to reduce sediment concentrations released into the river.*
  - *Impact 3.2-9 regarding potentially low levels of dissolved oxygen downstream of Iron Gate Dam following removal and release of sediments is categorized as significant and unavoidable with no discussion of potential mitigation. The analysis indicates that reaeration alleviates the impact naturally at points downstream of the Salmon River (RM 65), but does not discuss the possibility of artificial aeration at upstream locations or why this is not feasible.*

Response to Comment ORG46-23
With respect to the comment's general assertion that the Draft EIR does not comply with Pub. Res. Code sections 21002.1(a) and 21100(b)(3) and 14 Cal. Code Regs section 15126.4, please refer to Master Response CEQ-2 for a discussion of the scope of Federal Power Act preemption and how the EIR applied that principle to responsible agencies and to Recommended Measures and Mitigation Measures.

With respect to the comment's general assertion that the EIR needs more discussion regarding why mitigation is not feasible or why an impact is considered unavoidable, please see the responses below to the bulleted list of examples provided by PacifiCorp in its comment, as well as responses to comments ORG46-38, ORG46-73, ORG46-303, and ORG46-306. The comment indicates that the list of examples is "non-exhaustive"; however, CEQA does not require the Lead Agency to speculate regarding other possible examples that the commenter may have intended to include in the comment.

Regarding recommended measures TER-1 through TER-12, PS-1, and TR-1, please refer to Master Response CEQ-2.

With respect to the comment's assertion that Mitigation Measure WSWR-2 does not meet the requirements of CEQA Guidelines section 15126.4(a)(1)(D), please note that relocation of the City of Yreka water supply pipeline after drawdown of Iron Gate Reservoir is included in the set of primary construction activities under the Proposed Project, as described in Volume I Section 2.7.7 *Proposed Project – Proposed Project – City of Yreka Water Supply Pipeline Relocation* (pages 2-84 to 2-86). The potential impacts of this action on water supply/water rights are analyzed in Volume I Section 3.8.5 *Water Supply/Water Rights – Potential Impacts and Mitigation* Potential Impact 3.8-4 (pages 3-682 to 3-683), which is also where Mitigation Measure WSWR-2 is presented. The purpose of Mitigation Measure WSWR-2 is to limit the water delivery outage necessary to reconnect the replacement pipe for the City of Yreka's current water supply pipeline to a maximum of 12 hours for the section of pipe that crosses Iron Gate Reservoir, and to ensure that any work the Klamath River Renewal Corporation (KRRC) undertakes with respect to the water supply intake screens and compliance with fish screen criteria would be completed within the same water delivery outage period. Mitigation Measure WSWR-2 does not propose other construction activities that would be outside of those covered under the Proposed Project, in terms of the spatial location within the Limits of Work, and with respect to the timing of construction activities that would occur during dam removal year 1 and dam removal year 2 (Volume III Attachment 1 Table 2.7-1).

Construction activities associated with the relocation of the City of Yreka water supply pipeline are considered along with the suite of other construction activities under the Proposed Project in the following analyses:

- Volume III Attachment 1 Potential Impact 3.2-4;

- Volume I Potential Impact 3.5-1 (see also Volume I page 3-454 for Proposed Project activities that have the potential to affect terrestrial resources at particular locations including the City of Yreka pipeline location), Potential Impact 3.5-6, Potential Impact 3.5-7, Potential Impact 3.5-9, Potential Impact 3.5-10, Potential Impact 3.5-11, Potential Impact 3.5-12, Potential Impact 3.5-13, Potential Impact 3.5-14, and Potential Impact 3.5-15, as modified in Volume III Attachment 1;
- Volume I Potential Impact 3.11-2;
- Volume III Attachment 1 Potential Impact 3.12-1 and Potential Impact 3.12-12;
- Volume I Potential Impact 3.17-1;
- Volume III Attachment 1 Potential Impact 3.19-6 and Potential Impact 3.19-7;
- Volume III Attachment 1 Potential Impact 3.20-1;
- Volume I Potential Impact 3.21-1, Potential Impact 3.21-2, and Potential Impact 3.21-3;
- Volume I Potential Impact 3.22-1, Potential Impact 3.22-2, and Potential Impact 3.22-3;
- Volume I Potential Impact 3.23-1.

Further, Potential Impact 3.3-22 specifically focuses on the potential impacts to aquatic resources due to short-term noise disturbance and water quality alterations from deconstruction activities and long-term fish screen upgrades from the relocation of the City of Yreka Water Supply Pipeline under the Proposed Project.

As potential construction-related impacts associated with Mitigation Measure WSWR-2 are analyzed with construction-related impacts analyzed under the Proposed Project, and there would be no other potential environmental impacts of this mitigation measure, the EIR is consistent with CEQA Guidelines section 15126.4(a)(1)(D). For construction-related potential impacts associated with air quality, greenhouse gases (GHG), and energy, these portions of the Draft EIR were recirculated on December 21, 2019. Please refer to the recirculated document (*Air Quality* and *Greenhouse Gas Emissions and Energy*).

Regarding the comment's assertion that the aspects of Mitigation Measure GEO-1 that specify measures to avoid or minimize the impacts of slope instability on structures, and roads are outside of water quality certification authority, and that mitigation measures TCR-6, TCR-7, and TCR-8 are beyond the State Water Board's ability to enforce, please refer to Master Response CEQ-2, and specifically the subsection entitled "Other Recommended or Mitigation Measures".

The comment is incorrect that Potential Impact 3.17-1 does not include mitigation. As stated in Volume I Section 3.17.5 *Public Services – Potential*

Impacts and Mitigation Potential Impact 3.17-1 (pages 3-913 to 3-915) Mitigation Measure HZ-1 and Mitigation Measure TR-1 would reduce the potential impacts related to construction activities. The text goes on to state that implementation of these two measures would reduce the potential for a short-term increase in personal and public health and safety risks due to the Proposed Project as related to emergency response services. Table ES-1 also indicates that Mitigation Measure HZ-1 is associated with Potential Impact 3.17-1. Mitigation Measure HZ-1 is under the State Water Board's water quality certification authority and can be found in Volume III Attachment 1 Section 3.21 *Hazards and Hazardous Materials*.

Regarding the comment's concern that significant and unavoidable impacts for Potential Impacts 3.23-1, 3.23-2, 3.23-4, 3.23-5, and 3.23-6 are due to noise levels associated with working two construction shifts and do not include a discussion of why mitigation to schedule construction work during "normal daytime hours" is not feasible, the comment is incorrect that noise impacts under Potential Impact 3.23-1, Potential Impact 3.23-2, Potential Impact 3.23-4, and Potential Impact 3.23-6 are due to noise levels associated with working two construction shifts. As stated in Volume I Section 3.23.5 *Noise – Potential Impacts and Mitigation* Potential Impact 3.23-1 (specifically page 3-1093), given the maximum allowable noise levels identified in the Siskiyou County General Plan Noise Element (Siskiyou County 1978), any use of dozers, jackhammers, and/or tractors during the Proposed Project would constitute an exceedance of County maximum allowable noise levels and this would be a significant impact. As stated in Volume I Section 3.23.5 *Noise – Potential Impacts and Mitigation* Potential Impact 3.23-2 (specifically page 3-1096), construction work during both shifts exceeds the significance criteria at all times because of the high source noise level. As stated in Volume I Section 3.23.5 *Noise – Potential Impacts and Mitigation* Potential Impact 3.23-5 (page 3-1098), noise associated with reservoir restoration activities would add to already significant noise levels for other construction activities and thus would be significant and unavoidable (i.e., is not associated with working two construction shifts). As stated in Volume I Section 3.23.5 *Noise – Potential Impacts and Mitigation* Potential Impact 3.23-6 (pages 3-1098 and 3-1099), blasting at each dam is proposed to occur infrequently, would be restricted to the time between 8 a.m. and 6 p.m., and would be dependent on scheduling; however, daytime vibration impacts to humans would remain significant and unavoidable for outdoor receptors during the blasting activities. While the comment does not define what is meant by "normal daytime hours", proposed blasting activities analyzed under Potential Impact 3.23-6 would occur between 8 a.m. and 6 p.m., which is within "daytime hours" defined as 7 a.m. to 10 p.m. by USEPA (1974) such that the significant and unavoidable impact determination is not associated with working two construction shifts.

With respect to the potential for mitigation to require construction work during "normal daytime hours" for Potential Impact 3.23-4, the Proposed Project schedule requires that major earthworks and removal activities would be

performed using two 10-hour shifts (i.e., 20 hours in each 24-hour period), six days per week. Based on analysis of information provided in the Definite Plan, restricting construction activities to a total of fifteen daytime hours (i.e., 7 a.m. to 10 p.m. [USEPA 1974]) would not feasibly allow the amount of excavation and other construction activities required to remove Iron Gate Dam and restoration to occur in the timeframe proposed by KRRC (Appendix B: *Definite Plan)*. Extending the period of construction and restoration activities beyond the timeframe proposed in Table 2.7-1 (please refer to Volume III Attachment 1), would also extend the period of noise and vibration impacts. Regardless, for the reasons described above, an extension of the period of construction would not reduce the significant and unavoidable impacts.

The comment is incorrect that Potential Impact 3.2-3 provides no reasoning for why the impact is considered unavoidable. Please refer to Volume III Attachment 1 Section 3.2.5 *Water Quality – Potential Impacts and Mitigation* Potential Impact 3.2-3 for a discussion of why the short-term significant impact of increased suspended sediment concentrations (SSCs) due to dam removal cannot be avoided or substantially decreased through reasonably feasible mitigation, including physical removal of reservoir bottom sediments prior to drawdown, slower drawdown to potentially mobilize less sediment, or altering the timing of drawdown to lessen the potential of precipitation after drawdown and before plantings have stabilized sediments. Given that the mechanism for short-term sediment deposition in the Klamath River downstream of Iron Gate Dam, which is analyzed in Potential Impact 3.11-5, is erosion of the reservoir sediment deposits that results in elevated SSCs as analyzed in Potential Impact 3.2-3, the reasons that the impacts cannot be avoided or substantially decreased through reasonably feasible mitigation described in Potential Impact 3.2-3 also apply to Potential Impact 3.11-5.

With respect to the possibility of artificial aeration to reduce the occurrence of low dissolved oxygen in the Klamath River downstream of Iron Gate Dam during reservoir drawdown, where this water quality impact is analyzed in Potential Impact 3.2-9, the process of re-aeration in a river, including enhancement by artificial means, requires a turbulent mixing distance to incorporate additional oxygen. While adding air or oxygen directly to the river could reduce the distance along the river in which dissolved oxygen concentrations remain below the Basin Plan water quality objective of 90 percent saturation, it would not be possible to ensure that no stretch of river downstream of J.C. Boyle, Copco No. 1, and/or Iron Gate dams would exhibit substantial biochemical oxygen demand (BOD) at the scale of the reservoir drawdown peak monthly flows (i.e., 1,000 to 8,700 cfs in Table 3.2-14) given the relatively high BOD of the suspended sediments that would be mobilized from the reservoirs. Thus, artificial aeration would only provide a marginal benefit to fish during drawdown. Additionally, it would not be feasible to subject the reservoir sediments to pre-oxygenation or pre-aeration prior to reservoir drawdown in order to exhaust the sediment BOD prior to the flows entering the river downstream of J.C. Boyle, Copco No. 1, and

Iron Gate dams, because in the absence of plausible predictions of which sediment deposits would mobilize and which deposits would remain in place, all sediments would have to be oxygenated throughout their entire thickness, where the deposits extend greater than ten feet deep in some locations (Volume I Section 2.7.3 *Proposed Project – Proposed Project – Reservoir Sediment Deposits and Erosion During Drawdown* Figures 2.7-7, 2.7-8, 2.7-9 [pages 2-62 to 2-64]). There is currently no known sediment oxygenation technique that could accomplish this degree of pre-oxygenation or pre-aeration at the scale of J.C. Boyle, Copco No. 1, and Iron Gate reservoirs. Overall, the short-term significant impact of increased oxygen demand and decreased dissolved oxygen in the Middle Klamath River upstream of the Salmon River cannot be avoided or substantially decreased through reasonably feasible mitigation involving artificial re-aeration (or oxygenation).

Comment ORG46-24

- *The DEIR Baseline for the Project Is Inconsistent. Baseline conditions are inconsistently described throughout the Draft EIR. Under CEQA, the baseline must be based on conditions at the time the Notice of Preparation (NOP) for the Proposed Project was issued in 2016 (14 Cal. Code Reg s. § 15125(a)). "Environmental conditions must be described as they exist when the notice of preparation is published, or, if a notice of preparation has not been published, at the time the environmental analysis begins" (14 Cal. Code Regs. § 151 25(a)). "These existing physical conditions 'will normally constitute the baseline physical conditions by which a lead agency determines whether an impact is significant" (14 Cal. Code Regs. § 15125(a); see also Neighbors for Smart Rail v. Exposition Metro Line Constr. Auth. (2013) 57 Cal. 4th 439, 448; Communities for a Better Env't v. South Coast Air Quality Mgmt. Dist. (2010) 48 Cal. 4th 310, 320.)*

  A non -exhaustive list of examples of this problem include:

  - *In the fish disease discussion (Section 3.3.5.5), the DEIR does not present the effects of routine implementation of Court-ordered disease management flows (i.e., surface flushing, deep flushing, or dilution) as part of the existing conditions (see Hoopa Valley Tribe v. National Marine Fisheries Service et al., 230 F. Supp. 3d 1106 (2017)). The DEIR does, however, discuss the effects of these flows on the polychaetes that host C. shasta. While these flows are not included in the modeling used in the DEIR (flows, sediment transport, or water quality) and they are not part of the Proposed Project, USBR will be implementing them through the removal period and has proposed surface flushing flows in their Biological Assessment for reconsultation (USBR 2018 a).*

- *In Section 3.19 Aesthetics, the DEIR misleadingly uses a pre-dam construction baseline to evaluate effects of the Proposed Project and justify a less-than-significant impact to visual resources.*
- *In the alternative s analysis, Section 4, the aesthetics analysis consistently uses the pre-dam construction baseline conditions.*

Response to Comment ORG46-24
As stated in Volume I Section 3.1.2 *Environmental Setting* (page 3-2), pursuant to CEQA Guidelines section 15125, subdivision (a), the environmental setting for comparison is conditions at the time of issuance of the Notice of Preparation for the Proposed Project, which is December 2016 for the Lower Klamath Project EIR. The EIR consistently uses this baseline to define existing conditions for the Proposed Project and the alternatives, although in some cases where information characterizing the baseline is only available using older studies, the analyses acknowledge how those older studies are still relevant to the Proposed Project and the EIR.

Regarding consideration of the 2017 court-ordered flushing and emergency dilution flows in Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease*, the EIR acknowledges the re-initiation of consultation on the 2013 BiOp Flows by considering the 2017 court-ordered flushing and emergency dilution flow requirements downstream of Iron Gate Dam as interim flow requirements until completion of formal consultation. The 2017 court-ordered flushing and emergency dilution flows were not modeled as part of existing conditions hydrology for the Proposed Project because they went into effect in February 2017 after the December 2016 Notice of Preparation was filed. Note that the Final EIR has been updated to also include consideration of the 2019 BiOp Flows, as summarized in Master Response HYD-1.

With respect to how the EIR describes the existing condition baseline for aesthetics, please refer to responses to comments ORG46-321, ORG46-323, ORG46-324, ORG46-325, ORG46-326, ORG46-328, ORG46-329, and ORG46-330. Volume III Attachment 1 presents the final Section 3.19 *Aesthetics*. The alternatives analysis of potential aesthetic impacts has been clarified to remove reference to natural conditions.

Comment ORG46-24.1

- *The DEIR Should Reanalyze the No Project Alternative. The DEIR's discussion of the No Project Alternative (DEIR Section 4.2) falls short of CEQA's requirement that analysis of the no project alternative give decision-makers a gauge for measuring the environmental advantages and disadvantages of the project and the alternatives to it (Planning & Conserv. League v. Castaic Lake Water Agency, supra, 180 Cal. App. 4th at 247).*

An EIR's discussion of alternatives to a project must include a no project alternative, including an analysis of the impacts of that alternative. The purpose of discussing the no project alternative is to allow the public and agencies to compare the environmental impacts of approving the proposed project with the effects of not approving it (14 Cal. Code Regs. § 15126.6(e)(1)). "The no-project alternative is a fact-based forecast of the environmental effects of maintaining the status quo" (Planning and Conserv. League v. Castaic Lake Water Agency (2009) 180 Cal. App. 4th 210, 247). Also the no-project alternative allows decision-makers to compare impacts of a proposed project with impacts of no project (Mira Mar Mobile Community v. City of Oceanside (2004) 119 Cal. App. 4th 477) and is necessary to provide decision-makers and public with basic information on impacts of project (Planning & Conserv. League v. Department of Water Resources (2000) 83 Cal. App. 4th 892, 917).

A non -exhaustive list of examples of this problem include:

- *The DEIR indicates that the long-term effects of the No Project Alternative are not discussed because they "would be speculative…and would be contrary to the CEQA Guidelines' mandate to discuss and assess the environmental impacts that would 'reasonably be expected to occur in the foreseeable future'" (DEIR pg. 4-15). The DEIR could have assumed that existing operations simply continued into the future making a uniform set of conditions in both the short and long term against which the Proposed Project and the alternatives could have been compared.*
- *The No Project Alternative analysis includes analysis of the 2017 Court-ordered flushing and dilution flows. The DEIR should make it clear that this order was directed at USBR and not PacifiCorp's operations. The inclusion in this section of the DEIR is confusing because USBR (2018a) proposed to only include surface flushing flows in their update to their operations that is currently undergoing consultation under Section 7 of the Endangered Species Act, a process that is expected to be complete in 2019, well within the short-term period analyzed in the DEIR. The DEIR does not include operations under a new 2019 USBR BiOp in the short-term No Project Alternative.*
- *The hydrology under the 2013 BiOp should have been included in the baseline conditions for the Proposed Project analysis. Using 2013 BiOp flows for the No Project Alternative analysis makes comparisons of this alternative and the Proposed Project inconsistent.*

Response to Comment ORG46-24.1

The EIR is consistent with CEQA Guidelines section 15126.6(e)(2), which states that the No Project analysis shall discuss the existing conditions at the time the

Notice of Preparation is published, or if no Notice of Preparation is published, as well as what would be reasonably expected to occur in the foreseeable future if the project were not approved, based on current plans and consistent with available infrastructure and community services.

As stated in Volume I *Executive Summary – No Project Alternative* (page ES-16), the No Project Alternative describes the environment should the Klamath River Renewal Corporation's (KRRC's) Proposed Project − to decommission the four dams and associated facilities − not proceed. While the EIR describes the foreseeable existing conditions that would continue in the short term under the No Project Alternative, the EIR also clearly discloses that there is significant uncertainty about the long-term disposition of the Lower Klamath Project facilities if the KRRC's Proposed Project does not proceed. Projecting one specific No Project scenario for the long term would be speculative, in light of the fact that the continued operation of the Lower Klamath Project as permitted under annual licenses is infeasible, and would be contrary to the CEQA Guidelines' mandate to disclose and assess the environmental impacts that would "reasonably be expected to occur in the foreseeable future." Please also refer to Volume I Section 4.1.1.1 *Alternatives – Alternatives Selection/Overview – Alternatives Selection – Alternatives Carried Forward for More Detailed Analysis* for additional discussion of the short term and long term conditions associated with the No Project Alternative, as well as Volume I Section 4.2.1.1 *Alternatives – No Project Alternative – Alternative Description* (pages 4-15 to 4-23) for detailed discussion of foreseeable short-term operations, including hydrology, Total Maximum Daily Loads (TMDLs), and Klamath Hydropower Settlement Agreement (KHSA) Interim Measures.

Regarding the 2013 BiOp Flows, the 2017 court-ordered flushing and emergency dilution flows, and the 2019 BiOp Flows, please refer to Volume III Attachment 1 Section 3.1.6 *Introduction – Summary of Available Hydrology Information for the Proposed Project*, which has been revised to include discussion of the 2019 BiOp Flows that were adopted after issuance of the Draft EIR in 2018. The Draft EIR did include the 2013 BiOp Flows as the hydrologic baseline for the EIR analyses, including the baseline for the analysis of the Proposed Project; for additional information, please refer to Volume III Attachment 1 for the final Section 3.1.6 *Introduction – Summary of Available Hydrology Information for the Proposed Project.*

Additionally, Section 4.2.1.1 *Alternatives – No Project Alternative – Alternative Description* has been revised to include discussion of the 2019 BiOp Flows that were adopted after issuance of the Draft EIR in 2018. Please refer to Volume III Attachment 1 Section 4.2.1.1 *Alternatives – No Project Alternative – Alternative Description* for the revisions. Please also refer to Master Response HYD-1 for additional discussion of how the EIR considers the 2019 BiOp Flows.

Comment ORG46-25

- *The DEIR Should Reanalyze Alternatives. The DEIR does not uniformly to present, discuss, and analyze each of the alternatives, including comparing both short- and long-term effects; therefore, it does not satisfy CEQA's requirement that the EIR provide information sufficient to allow an informed comparison of the impacts of the project with those of the alternatives (Kings County Farm Bureau v. City of Hanford (1990) 221 Cal. App. 3d 692, 733 [absence of comparative data precluded meaningful consideration of alternatives]). Omitting such a meaningful analysis prevents decision-makers and the public from making informed comparisons bet ween the alternatives and the Project, precluding meaningful public participation (Laurel Heights, supra.; City of Rancho Palos Verdes v. City Council (1976) 59 Cal. App. 3d 869, 892 [An EIR's analysis of alternatives must be specific enough to allow informed decision-making and public participation; alternatives should be described in sufficient detail to provide information to governmental body that will act and public that will respond through political process]).*

A non-exhaustive list of examples of this problem include:

  - *The Partial Removal Alternative includes a series of detailed tables (DEIR Tables 4.3-1 to 4.3-6) with the recommended eligibility of various Klamath Hydroelectric Project facilities under the National Register of Historic Places. This same information was not provided in the No Project Alternative even though that alternative would result in preservation of these resources.*
  - *The Continued Operations with Fish Passage Alternative includes implementation of the USBR' s 2013 BiOp flows. These are not included in the existing conditions or Proposed Project discussions.*
  - *Climate change effects appear to be included in the Continued Operations with Fish Passage Alternative, but not in the other alternatives or the Proposed Project.*
  - *There are no spring-run Chinook Salmon in the Klamath River upstream of the Salmon River. It is unclear why the alternatives evaluate the impacts to a species that does not occur (e.g., DEIR pg. 4-140).*
  - *While Table ES-1 presents an alternatives comparison of sorts, not all of the alternatives are evaluated for every impact.*

Response to Comment ORG46-25

The EIR analyzes the alternatives in both the short term and the long term, consistent with the Proposed Project. Please also refer to responses to comments ORG46-201, ORG46-374, ORG46-406, ORG46-422, ORG46-438, and ORG46-439 for discussion of the EIR's approach to assessing short-term and long-term potential impacts under the Proposed Project and the alternatives.

With respect to the comment's concern regarding historical information presented in the No Project Alternative, Volume I Section 4.2.12 *No Project Alternative – Historical Resources and Tribal Cultural Resources* states that there would be no impacts to Copco No. 1 Dam, Copco No. 2 Dam, and Iron Gate Dam, their associated hydroelectric facilities, and the Klamath River Hydroelectric Project District (Potential Impact 3.12-11), because the Lower Klamath Project would remain in place. It is not necessary to repeat the tables presented in the Partial Removal Alternative in the analysis of the No Project Alternative, since both sets of tables would contain the same information regarding National Register eligibility. However, reference to Tables 4.3-1, 4.3-3, and 4.3-5 has been added to Section 4.2.12 *No Project Alternative – Historical Resources and Tribal Cultural Resources* to direct the reader to that information. Please refer to Volume III Attachment 1 Section 4.2.12 *No Project Alternative – Historical Resources and Tribal Cultural Resources* for the revisions. Reference to Tables 4.3-1, 4.3-3, and 4.3-5 also has been added to the Proposed Project impact analysis in Section 3.12.5 *Historical Resources and Tribal Cultural Resources – Potential Impacts and Mitigation*, Potential Impact 3.12-11, to direct the reader to the tabulated eligibility information. Please refer to Volume III Attachment 1 Section 3.12.5 *Historical Resources and Tribal Cultural Resources – Potential Impacts and Mitigation* for the revisions.

The comment's concern that the Proposed Project and the Continued Operations with Fish Passage Alternative use different flows is misplaced: both are analyzed in the Draft EIR using the 2013 BiOp Flows as the existing condition. Please refer to Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project* and Volume I Section 4.4.1.1 *Alternatives – Continued Operations with Fish Passage Alternative – Introduction – Alternative Description* (pages 4-99 to 4-101). Additionally, please note that the Final EIR has been updated to also include consideration of the 2019 BiOp Flows as a second baseline, which is summarized in Master Response HYD-1. Please also refer to Volume III Attachment 1 for the final Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project* and Section 4.4.1.1 *Alternatives – Continued Operations with Fish Passage Alternative – Introduction – Alternative Description* for the revisions associated with inclusion of the 2019 BiOp Flows.

Regarding the comment's concern that climate change effects are considered for the Continued Operations with Fish Passage Alternative but not for the Proposed Project and other alternatives, please note that, consistent with CEQA Guidelines section 15125(a), future climate changes are not part of the existing condition against which the EIR compares potential impacts. While climate change predictions are occasionally used in the Lower Klamath Project EIR to provide additional context for potential impact analyses related to the Proposed Project or the alternatives (e.g., Volume III Attachment 1 Section 3.2.5.1 *Water Quality – Potential Impacts and Mitigation – Water Temperature* Potential Impact 3.2-1, Volume III Attachment 1 Section 3.3.5.9 *Aquatic Resources – Potential Impacts*

and Mitigation – Aquatic Resource Impacts Potential Impact 3.3-8, Volume 1 Section 4.2.2 *No Project Alternative – Water Quality* Potential Impact 4.2.2-1 [pages 4-103 to 4-108]), the predictions are not relied upon for significance determinations associated with the Proposed Project or the alternatives. For reasons described in Volume I Section 4.2.1.1 *No Project Alternative – Introduction – Alternative Description* (pages 4-15 to 4-16), the No Project Alternative analysis focuses on the reasonably foreseeable period of 0−5 years, whereas climate change would be anticipated to only significantly influence environmental resources compared to existing conditions in the long term (5+ years). Thus, climate change is not discussed under the No Project Alternative, except to refer the reader to other relevant sections of the EIR where climate change is discussed.

For discussion of why spring-run Chinook are analyzed under the alternatives, please refer to responses to comments ORG46-251, ORG46-426, and ORG46-440.

Each of alternatives is evaluated for the set of potential impacts that would reasonably apply. If a potential impact would not apply to a particular alternative, then the alternative is not listed in association with that potential impact number in Table ES-1. For example, Potential Impact 3.3-17 *Effects on species interactions between introduced resident fish species and native aquatic species due to short- and long-term changes in habitat quality and quantity due to dam removal*, is not evaluated for the No Project Alternative or the Continued Operations with Fish Passage Alternative because neither of those alternatives involve dam removal. Similarly, Potential Impact 4.2.3-1 *Effects on coho salmon critical habitat quality and quantity due to continued operations of the Lower Klamath Project* is not evaluated for the Proposed Project, Partial Removal Alternative, Two Dam Removal Alternative, Three Dam Removal Alternative, or the No Hatchery Alternative because none of those alternatives or the Proposed Project involve leaving all of the Lower Klamath Project dams in place.

Comment ORG46-26

- *DEIR Reliance on Total Maximum Daily Load (TMDL) Modeling and Data Approaches Requires Additional Explanation. The DEIR relies on the flawed TMDLs from Oregon and California without providing a reasonable explanation supporting its TMDL analysis, nor does it adequately summarize the substantial body of technical information discrediting the TMDL modeling approach, nor does the DEIR provide any other substantial evidence supporting the use of the TMDL in the DEIR. As it relates to the TMDL, the DEIR does not fulfill CEQA's requirement that the EIR summarize the main points of disagreement when experts disagree about data or methodology (14 Cal. Code Regs. § 15151). A lead agency may choose among differing expert opinions as long as the EIR identifies arguments correctly and in a responsive manner (Browning-Ferris Indus. v. City Council 1986, 181 Cal. App. 3d 852) which the DEIR fails to do. An*

impact analysis that fails to explain major discrepancies in critical data may be legally inadequate in the absence of evidence supporting the EIR's discussion or resolution of the conflict (Preserve Wild Santee v. City of Santee (2012) 210 Cal. App. 4th 260).

For example, the DEIR relies extensively on the TMDLs for both Oregon and California reaches of the Klamath River. The State Water Board should be aware that the 2010 temperature TMDL in Oregon (ODEQ 2010) was withdrawn by Oregon Department of Environmental Quality (ODEQ 2015), does not represent the best available information upon which to base the DEIR analysis, and therefore should not be used to set conditions in the Klamath River at the state line. This 2010 temperature TMDL was withdrawn because it was based on modeling that contained substantial errors which, along with other technical deficiencies, overstated the Klamath Hydroelectric Project 's effects on water temperatures in the river, and did not accurately account for natural pollutant loadings and processes (Campbell 2011). An updated version of the nutrient Upper Klamath and Lost River Subbasin TMDL (ODEQ 2018) was released for public comment in mid-2018 and a final version in January 2019 (ODEQ 2019). PacifiCorp understands that a revised temperature TMDL for the Oregon portions of the Klamath River may be complete in Fall 2019.

The California TMDL modeling results are not an appropriate basis for comparing alternatives. PacifiCorp has previously documented substantial technical flaws with the assumptions, modeling, and analyses used in development of the California TMDLs. PacifiCorp's position that the compliance scenarios, technical analysis, and modeling supporting the California Klamath River TMDL are flawed was presented during the development of the TMDL and is contained in PacifiCorp ' s Petition for Writ of Mandate filed to challenge the same (PacifiCorp v State Water Resources Control Board, 2011, case 34-2011-80000769). PacifiCorp's legal challenge has not been resolved, and is currently stayed.[3]

Response to Comment ORG46-26

Regarding Total Maximum Daily Load (TMDL) modeling, please refer to Master Response WQ-5.

Comment ORG46-27

- *The DEIR Lacks Sufficient Analysis of Regional Power Supply in the Utilities Section. The DEIR fails to describe the baseline condition concerning electric utilities and power generation provided by the Klamath Hydroelectric Project, which violates CEQA's requirement that an EIR describe the existing environment in the vicinity of the project from both a local and regional perspective (14 Cal. Code Regs. § 1512S(a)). The DEIR does not describe the potentially significant impacts associated with*

removal of the dams and associated power transmission facilities on electricity service in the region, which violates CEQA's requirement that the EIR identify and describe a proposed project's significant environmental effects (Cal. Pub. Res. Code § 21100(b)(l); 14 Cal. Code Regs. § 15126.2(a)). The DEIR also fails to comply with CEQA's requirements by failing to evaluate potentially significant energy implications of a project (CEQA Guidelines Appendix F (II); Pub. Res. Code § 21100(b)(3)). The environmental impacts to be evaluated in an EIR include (but are not limited to): 1) the project's effects on local and regional energy supplies and on requirements for additional capacity; 2) the project's effects on peak- and base-period energy demands; and 3) the project' s effects on energy resources (CEQA Guidelines, Appendix F (II)).

The DEIR does not describe the baseline condition concerning electric utilities, the power generated by the Klamath Hydroelectric Project, or the impacts associated with removing those dams and associated power generation and transmission facilities on electricity service in the region. In the DEIR, Section 3.18 Public Services and Utilities, should contain a complete description about the ability to deliver utilities, including electricity. While the Proposed Project likely will not result in new need for local power generation, it will eliminate existing power sources at the hydroelectric dams, and remove local generation resources that provide power in an area without significant generation resources. The impact analysis should address the removal of these utilities, how those utilities will be replaced, and the impacts of that replacement. Because the DEIR fails to do so, it does not satisfy CEQA' s requirements.

Response to Comment ORG46-27

This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Greenhouse Gas Emissions and Energy*).

Comment ORG46-28

- *The Application of the DEIR's Significance Criteria Is Inconsistent. The DEIR attempts to define significance criteria for each resource area in the DEIR. While this is generally accomplished, the actual definitions are subject to reasonable differing interpretation and, in places, the definitions even contradict each other. CEQA requires that a threshold of significance be an identifiable quantitative, qualitative, or performance level of a particular environmental effect (14 Cal. Code Regs. § 15064.7(a); Protect the Historic Amador Waterways v. Amador Water Agency (2004) 116 Cal. App. 4th 1099, 1107). Inconsistent and insufficient definitions also creates the issue of misapplication of the thresholds of significance. CEQA requires that the EIR consider evidence of potential significant environmental effects, and therefore; a threshold of*

significance cannot be applied in a way that would foreclose the consideration of other substantial evidence tending to show the environmental effect to which the threshold relates might be significant (Comm unities for a Better Environment v. California Resources Agency (2002) 103 Cal. App. 4th 98, 114).

A non-exhaustive list of examples of this problem include:

- *The term "substantial" or "substantially" is not consistently defined. In Section 3.2 Water Quality, for example, the definition of "substantial" is meaningless (DEIR pg. 3-44) because according to the DEIR "...'substantial'...means the effect on water quality and the support of beneficial uses...is of considerable importance." The DEIR does not define "of considerable importance." This same "of considerable importance" phrase is used in the same manner in Section 3.11 Geology, Soils, and Mineral Resources and is not defined there either.*
- *As an example of an improperly applied threshold of significance, the threshold the DEIR identifies that a short-term impact to Coho Salmon is defined as significant if it would "substantially reduce the abundance (greater than 50 percent reduction) of a year class for aquatic species" (DEIR pg. 3-258). This definition ignores the fact that over 50 percent of the Coho Salmon population returns to the Trinity River (Naman and Perkins 2015; Kier et al. 2018) and would be substantially unaffected by the project. This significance definition also has the absurd result that even a complete extinction of the upper Klamath Coho population would not be considered significant. Under Communities for a Better Environment v. California Resources Agency, supra, 103 Cal. App. 4th 98, the small population of Coho in the mainstem Klamath River upstream of the Trinity River would be substantially impacted, and therefore this impact should be considered significant. This is just one example where the DEIR's significance criteria lack meaningful or adequate definition and application, in contravention of the requirements of CEQA.*
- *In Sections 3.5, 3.6, 3.7, 3.9, 3.15, 3.16, 3.17, 3.19, 3.20, 3.21, 3.22, the term "substantial" is used in the criteria, but is not defined.*
- *In Section 3.8 Water Supply/Water Rights the term "unreasonable injury" is not defined as it applies to water rights.*
- *The first criteria in Section 3.5.3 (DEIR pg. 3-514) says that impacts would be considered significant if they "[r]esult in population-level impacts on state species of special concern, USDA Forest Service sensitive wildlife species on USDA Forest Service lands, or BLM sensitive species on BLM lands." The next bullet (DEIR pg. 3-515) states that an impact would be significant if it would "[r]esult in any of the following to the other types of special-status species[112]:[sic] not listed above: direct mortality or physical harm to individuals...". Footnote 112 goes on to define a long list of sources of special status*

species leaving the reader to attempt to sort out what's to be analyzed at the population level per the first bullet and which could be analyzed at the individual level per the second bullet.

Response to Comment ORG46-28
As stated in Volume I Section 3.1.3 *Environmental Setting, Impacts, and Mitigation Measures – Introduction – Significance Criteria* (page 3-2), in setting criteria for evaluating significance, this EIR relies on scientific and factual data, analysis, consideration of relevant local, regional and state standards, and the questions presented in Appendix G of the CEQA Guidelines. These are then applied as appropriate in the various resource areas.

With respect to the comment's general assertion regarding the definition of "substantial", and the list of EIR sections in which the commenter indicates that "substantial" is not defined, please refer to Master Response CEQ-3.

For a discussion of the significance criterion for coho salmon please refer to response to comment ORG46-199 Item 4.

Regarding use of the term "unreasonable injury," an unreasonable injury to a water right is one that involves interference with the water right that would support a complaint made under Article 10 Section 2 of the California Constitution.

Please refer to Tables 3.5-4 (plants) and 3.5-5 (wildlife) for identification of special-status species, including the agency that lists each species. As described in the significance criterion in Volume I Section 3.5 *Terrestrial Resources – Significance Criteria* (page 3-514) that the comment cites, the population-level criterion applies to three groups of sensitive species: (1) state species of special concern, (2) United States Department of Agriculture (USDA) Forest Service sensitive wildlife species on USDA Forest Service lands, and (3) Bureau of Land Management (BLM) sensitive species on BLM lands. The second significance criterion cited in the comment (page 3-515) applies to all the remaining groups of special-status species. Footnote 112 on page 3-515 provides a listing of these remaining sources for special-status species, drawing together the information from both the plant and wildlife species tables.

Comment ORG46-29
The DEIR Should be Augmented. The DEIR omits inclusion and analysis of significant information critical to an appropriate analysis of the effects of the Proposed Project, much of which is in the existing public record (Pub. Res. Code § 21092.1; 14 Cal. Code Reg s. § 15088.5 [recirculation is generally required when the addition of new information deprives the public of meaningful opportunity to comment on substantial adverse project impacts or feasible mitigation measures or alternatives that are not adopted]; see Mountain Lion Coalition v. Fish & Game Comm'n (1989) 214 Cal. App. 3d 1043 [recirculation

required where draft EIR omitted any analysis of cumulative impacts, and a detailed analysis was first provided in the final EIR]; Vineyard Area Citizens for Responsible Growth v. City of Rancho Cordova (2007) 40 Cal. 4th 412, 447; see also Laurel Heights Improvement Ass'n v. Regents of Univ. of Cal. (1993) 6 Cal. 4th 1112, 1129).

The DEIR should analyze substantial information cited in these comments concerning significant effects on water quality, Coho Salmon, fill of Waters of the U.S., and loss of Copco and Iron Gate reservoirs as related to instream flows, substantial changes in periphyton communities, impacts associated with greenhouse gas emissions , and impacts from release of reservoir fish from the Proposed Project, which are not addressed in the DEIR but must be addressed in a recirculated DEIR (14 Cal. Code Regs. § 15088.5(a)(1)).

If new mitigation measures or alternatives are considered in response to comments, the DEIR should be augmented and provided for additional public review and comment (South County Citizens for Smart Growth v. County of Nevoda (2013) 221 Cal. App. 4th 316, 330); Laurel Heights Improvement Ass'n v. Regents of Univ. of Cal. (1993) 6 Cal. 4th 1112; CEQA Guidelines (14 Cal. Code Regs. § 15088.5(a)(3)); In Spring Volley Lake Ass' n v. City of Victorville (2016) 248 Cal. App. 4th 91, 108).

Response to Comment ORG46-29

The concerns raised by PacifiCorp in this overarching comment (i.e., concerns that the Draft EIR should analyze substantial information cited in the PacifiCorp comments about significant effects on water quality, coho salmon, fill of Waters of the U.S., loss of Copco and Iron Gate reservoirs as related to instream flows, periphyton communities, greenhouse gas emissions, and release of reservoir fish to the Middle and Lower Klamath River) are set forth in more detail throughout PacifiCorp's comment letter. They are accordingly addressed by the set of detailed responses to comments ORG46-2 through ORG46-516.

Comment ORG46-30

In the Draft Environmental Impact Report's (DEIR's) impacts and alternatives analyses, "short-term" is variably defined. For example, for analyses of water quality, dam-released sediment, and sediment resupply, short-term is generally defined as 2 years following dam removal (e.g., DEIR pgs. ES-6, 3-44, 3-760, 3-77S). For the aquatic resources impact analysis, short-term is defined as less than S years following dam removal (e.g., DEIR pg. 3-2S8). In the alternatives analysis, short-term is considered to be less than 5 years (e.g., DEIR pgs. 4-15, 4-24, 4-26). Correspondingly, long-term is defined as occurring greater than 2 years after dam removal for water quality and sediment resources (DEIR pg. 3-44) and greater than 5 years after dam removal for aquatic resources (DEIR pg. 3-258). These variable definitions pose a dilemma in that long-term water quality and sediment impacts overlap with short-term impacts to fish and other aquatic biota. In the case of water quality and sediment impacts on fish, this overlap underestimates the severity of short-term impacts, particularly as they pertain to

fish and other resources. The DEIR does not account for this when evaluating the severity and significance of short-term impacts. This discrepancy will mislead the public and decision-makers about the actual short- and long-term impacts of the Proposed Project across the various environmental resources and alternatives.

Response to Comment ORG46-30
The definition of short term is provided for each EIR environmental resource area analyzed under the Proposed Project and the alternatives, and each definition is selected for a period of time that is relevant to the resource and type of impacts being analyzed. For the Proposed Project and dam removal alternatives, short term is often defined as the two- to three-year dam removal construction period, but this time period is not the most appropriate period of analysis for all resource areas (e.g., fisheries uses a period of five years because for most aquatic resources this represents one to two generations [see Volume III Attachment 1 Section 3.3.3 *Aquatic Resources – Significance Criteria*]). The No Project Alternative does not involve construction and so a two- to three-year short-term construction period is not relevant to this alternative; instead, a five-year period is the most relevant short-term period based upon the anticipated duration of the FERC proceeding for relicensing of the hydroelectric facilities (see Volume I Section 4.2.1.1 *Alternatives – No Project Alternative – Introduction – Alternative Description* [page 4-15]).

The Draft EIR does not underestimate the severity of short-term water quality and sediment impacts to fish by having different definitions of short term for water quality-focused impact analyses versus fisheries-focused impact analyses. This is because the short-term fisheries impact determinations are not dependent on whether the short-term water quality impact determinations are significant; rather, the fisheries impacts analysis considers the potential effects of water quality parameters (e.g., water temperature, suspended sediment concentrations [SSCs], algal toxins) independently from the water quality impacts analysis and in combination with other aspects of the Proposed Project and alternatives that would affect fisheries (e.g., Aquatic Resource Measures).

Overall, presenting specific definitions of short term for each resource area and alternative better informs the public and decision-makers about the potential short- and long-term environmental impacts of the Proposed Project and the alternatives consistent with CEQA Guidelines section 15126.2 (a).

Comment ORG46-31
The DEIR states "approximately 36 to 57 percent of the total sediment stored in J.C. Boyle, Copco No. 1, and Iron Gate reservoirs by 2021 is expected to be eroded and transported downstream during the drawdown period and the year following dam removal (i.e., short-term), which is equivalent to 5.4 to 8.6 million cubic yards (1.2 to 2.3 million tons)."

These eroded volumes estimates are very large numbers that are difficult to put into perspective; it would be helpful for the DEIR to relate the eroded volume estimates to the average annual sediment load to provide context. These estimates also indicate that approximately 6.5 to 9.7 million cubic yards of sediments would be retained in the reservoirs after initial reservoir drawdown. The DEIR should address the longer-term effects caused by these retained sediments that could occur during future high flow events.

Response to Comment ORG46-31
Regarding the background annual sediment loads, please refer to Volume I Section 3.11.2.4 *Geology, Soils, and Mineral Resources, Environmental Setting – Sediment Load* Table 3.11-3 (pages 3-749 to 3-750). Please also refer to Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 and modifications in Volume III Attachment 1. Specifically, Volume I page 3-769 of this impact places the anticipated erosion volume due to dam removal into the context of annual basin-wide sediment discharge. For further explanation, please refer to Stillwater Sciences (2010, pages 27–29), which discusses the ratio of modeled sediment release from dam removal to cumulative average annual basin sediment delivery. Downstream of the Dillon Creek confluence (river mile [RM] 85.5), the lower estimate of sediment load release from dam removal is less than the average annual basin sediment delivery. Downstream of the Trinity River confluence (RM 43.5), the median estimate of sediment load release from dam removal is less than average annual basin sediment delivery.

Regarding background suspended sediment concentrations (1961−2008), please refer to USBR (2012a) Section 9.2.1.2 *Future Geomorphology and Sediment Transport Conditions, Dam Removal Alternative, One-Dimensional Simulation of Reservoir Drawdown and Erosion of Reservoir sediment – Background Sediment Loads*. Additionally, please refer to Volume II Appendix C Section C.2 *Suspended Sediments* (pages C-14 through C-23).

Regarding long-term effects relating to reservoir sediments, please refer to Potential Impact 3.11-5 (pages 3-768 to 3-769) in Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* and modifications to this impact in Volume III Attachment 1, and to ORG46-8 for information on erosion and stabilization of reservoir sediment deposits.

Comment ORG46-32
The DEIR contains the repeated conclusion that the fine sediment predicted to be released during drawdown will be efficiently and shortly locations transported all the way to the Pacific Ocean. For example, on page ES-6, the DEIR states: "Most of the fine sediment is expected to be transported the report in suspension to the ocean shortly after being eroded. Fine sediment erosion would result in elevated suspended sediment concentrations downstream of Iron Gate Dam in the short term (Stillwater Sciences 2010, USBR 2012)."

For example, on page 2-60, the DEIR states: "Over 80 percent of the reservoir sediments are fine sediment (organics, silts, and clays), which are expected to remain suspended in the Klamath River flow as it moves downstream and out into the Pacific Ocean."

For example, on page 2-68, the DEIR states: "Based on estimated annual sediment deposition rates, an approximately 15.13 million cubic yards (4.16 million tons [dry weight]11) of sediment would be present behind the dams by 2020 (USBR 2012c) (Table 2.7-10). Because the trapped sediments consist primarily of organic material (e.g., dead algae), silts, and clays, they would be easily eroded and flushed out of the reservoirs into the Klamath River, and would continue to be suspended in the river downstream to the Pacific Ocean."

The notion implied in these statements is highly simplified. Some deposition of fine sediment would occur downstream during high discharges when flows go over-bank and inundate the floodplain - a scenario that could occur during drawdown. In addition, at lower discharges when flows remain in-channel, fine sediment likely would deposit in backwaters, alcoves, side-channel inlets and outlets, and areas along the channel margins. Fine sediment that deposits in backwater areas such as alcoves and side-channels could adversely affect aquatic and riparian biota and habitats and could become remobilized in subsequent high flow events, extending the duration of sediment impacts on aquatic biota. For example, fine sediment can infiltrate spawning gravels and significantly impact spawning success. The DEIR should be revised and recirculated to include this analysis.

The transport and deposition of the fine sediment predicted to be released under the Proposed Project is fundamentally important to understanding a wide-range of environmental impacts, both short-term and long-term. Therefore, the DEIR should include a more detailed discussion and supporting numerical or quantitative analysis to document the expected impacts from fine sediment transport and deposition.

Analysis of fine sediment transport and deposition downstream of Iron Gate is not included in either of the DEIR's cited references (i.e., Stillwater Sciences 2010 and USBR 2012c). In general terms, the 1-D modeling used in the DEIR's cited references (i.e., Stillwater Sciences 2010 and USBR 2012c) is a computationally efficient means to assess overall sediment loads for many miles of river, over several years, and for multiple scenarios. However, the 1-D modeling has germane limitations in that it cannot simulate the distribution of sediment erosion and deposition in the river, particularly across the channel or in split or side channels. The modeling also assumes that fine sediment would behave as wash load, which by definition is sediment that remains in suspension and does not deposit. However, while the DEIR's cited references (i.e., Stillwater Sciences 2010 and USBR 2012c) intend this as only a simplifying assumption of

the 1-D modeling, the DEIR appears to couch this basic modelling assumption as a finding from the model.

This is a global comment that applies to all statements which conclude that the fine sediment predicted to be released during the drawdown will be transported to the Pacific Ocean without any discernible deposition in the river reaches downstream of Iron Gate Dam.

Response to Comment ORG46-32
Please refer to Master Response GEO-1 and ORG46-8.

Comment ORG46-33
Regarding the Phytoplankton and Periphyton section, there is no discussion of periphyton benefits expected to occur as a result of the Proposed Project such as those to seasonal nutrient uptake and sequestration, photosynthesis, habitat, and food web. Such benefits should be acknowledged (see detailed comments on Section 3.4).

Response to Comment ORG46-33
Please refer to Volume III Attachment 1 Potential Impact 3.2-8, Volume I Potential Impact 3.4-4 (pages 3-435 to 3-437), and Volume I Potential Impact 3.4-5 (pages 3-437 to 3-440) for discussion of the potential impacts to nutrients and periphyton under the Proposed Project, including the influence of periphyton on nutrient uptake and sequestration along with the general importance of periphyton in aquatic food webs. Please refer to Volume III Attachment 1 Potential Impact 3.2-10 and Potential Impact 3.2-11 for discussion of the potential impacts of periphyton to dissolved oxygen and pH from photosynthesis and growth, respectively, under the Proposed Project. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Periphyton growth in the Klamath River under the Proposed Project would potentially create habitat, contribute to the food web, uptake, sequester, or contribute nutrients on a seasonal basis, and contribute to daily variations in pH and dissolved oxygen due to photosynthesis and respiration, but the magnitude of these potential effects would depend on the extent of periphyton growth that would occur. The response of periphyton in the Klamath River under the Proposed Project is subject to many competing processes that could either accelerate or hinder periphyton growth. While the Proposed Project would likely result in periphyton growth in the newly created low gradient river channel within the Copco No. 1 and Iron Gate reservoir footprints, there is considerable uncertainty about the exact extent and types of periphyton that would occur. As a result of this uncertainty, the EIR avoids overstating the potential for benefits related to periphyton under the Proposed Project.

Comment ORG46-34

Regarding the Water Quality section, adverse impacts associated with increased turbidity include burying and scour of aquatic vegetation (e.g., periphyton, macrophytes), which could limit or preclude growth. The resultant effects would include: lack of photosynthesis (oxygen production), lack of nutrient uptake, lack of cover and food for macroinvertebrates, and lack of cover and food for juvenile fish rearing. Such effects should be acknowledged in the DEIR. Additionally, TMDLs have been established for the Klamath River to address nutrient impairment. The removal of Copco and Iron Gate reservoirs, which retain 18 to 21 percent of total nitrogen and 12 to 16 percent of annual phosphorus loading from the Klamath River (PacifiCorp 2006; Kann and Asarian 2005, 2007; Asarian et al. 2009), should be acknowledged in the DEIR as potentially having adverse impacts on Klamath River water quality. The long-term impacts of increased nutrient delivery to the Klamath River downstream of Iron Gate on water quality has not been evaluated in the DEIR. See comments 3.2-53 to 3.2-55 and 3.4-5 below.

Response to Comment ORG46-34

Please refer to Volume I Section 3.5.5 *Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities* Potential Impact 3.5-3 (pages 3-521 to 3-522) for a discussion of the short-term and long-term impacts of dam removal on wetland habitat, including aquatic macrophytes such as cattails (*Typha spp.*), bulrushes, pondweeds (*Potamogeton spp*.) and coontail (*Ceratophyllum demersum*), downstream of the Lower Klamath Project dams due to erosion or sediment deposition. As stated in Volume I Section 3.4.2 *Phytoplankton and Periphyton – Environmental Setting* (page 3-392), since no surveys have been conducted to determine the relative distribution or biomass of large aquatic plants (i.e., macrophytes) in the Klamath River, they were not discussed further in Volume I Section 3.4 *Phytoplankton and Periphyton*. However, to address the concerns raised in the comment, the following provides additional consideration of potential impacts to large aquatic plants (i.e., macrophytes), referencing the EIR impact analyses for periphyton where the discussions overlap.

With respect to the comment regarding scour of aquatic vegetation due to increased turbidity, please refer to Volume I Section 3.4.5.2 *Phytoplankton and Periphyton – Potential Impacts and Mitigation – Periphyton* Potential Impact 3.4-3 (pages 3-433 to 3-435) for an analysis of the short-term potential impacts of dam removal on periphyton abundance in the Klamath River, including scour of periphyton during drawdown of the reservoirs. Under existing conditions, periphyton abundance in the Klamath River naturally decreases after high flows associated with storm events as the periphyton communities in the river reduce to a thin layer of scour-resistant diatoms (Asarian et al. 2015). The magnitude of drawdown flows in the Klamath River downstream of Iron Gate Dam would not exceed the range of flows occurring under existing conditions (see Volume I Section 3.6.2.2 *Flood Hydrology – Environmental Setting – Basin Hydrology* [pages 3-590 to 3-621] for additional details) and the drawdown flows would

occur between November 1 and March 15 when high flows would naturally occur in the Klamath River due to winter storms, so periphyton scour during drawdown and dam removal is anticipated to be within the range occurring under existing conditions. As such, variations in water quality due to reductions in periphyton abundance during dam removal would be within the range occurring under existing conditions and there would be no significant impact. While larger aquatic plants (i.e., macrophytes) may also be present in quiet backwater areas in the Klamath River in addition to periphyton, no known quantitative or species-specific information about these aquatic plants has been collected in the phytoplankton and periphyton Area of Analysis, as noted in the introduction of Volume I Section 3.4.2 *Phytoplankton and Periphyton – Environmental Setting* (page 3-392). The potential impacts of erosion and deposition associated with dam removal on macrophytes within wetland habitats downstream of Iron Gate Dam are addressed in Volume I Section 3.4.5.2 *Phytoplankton and Periphyton – Potential Impacts and Mitigation – Periphyton* Potential Impacts 3.4-3, 3.4-4, and 3.4-5 (pages 3-433 to 3-440) and Section 3.5.5.1 *Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities* Potential Impact 3.5-3, as revised in Volume III Attachment 1. The potential impact of dam removal on larger aquatic plants within the main river channel (i.e., not wetlands or riparian habitats) is expected to be similar to the potential impact of dam removal on periphyton (see Volume I Potential Impact 3.4-3 [pages 3-433 to 3-435]) since the larger aquatic plants in the main river channel grow in similar habitats as periphyton. Thus, scour of larger aquatic plants and variations in the abundance of larger aquatic plants in the Klamath River is anticipated to be within the range occurring under existing conditions and would not result in a significant impact under the Proposed Project.

With respect to the comment regarding burying of aquatic vegetation due to increased turbidity, the abundance of periphyton and larger aquatic plants (i.e., macrophytes) would potentially be altered by coarse reservoir sediment deposition in the Klamath River from Iron Gate Dam to approximately Cottonwood Creek (river mile [RM] 185.1) (USBR 2012a) since sediment transport modeling of dam removal indicates coarse reservoir sediments would deposit in this reach, with reach-averaged deposition of gravel and sediment estimated to be from 0.9 feet to 1.7 feet between Bogus Creek (RM 192.68) and Willow Creek (RM 187.8) (see Volume III Attachment 1 Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5). As previously stated in Volume I Section 3.4.5 *Phytoplankton and Periphyton – Potential Impacts and Mitigation – Periphyton* Potential Impact 3.4-3 (pages 3-433 to 3-435) and Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5, there would be minimal deposition of fine sediments in the Klamath River due to reservoir drawdown and high winter flows (note that revisions in Potential Impact 3.11-5 in Volume III Attachment 1 do not change this conclusion). If rain and snowmelt levels are high during drawdown, relatively less deposition of coarse reservoir sediments would occur in downstream reaches, as there would be

higher flows in the system to flush out reservoir sediments (Stillwater Sciences 2008). Please refer to Volume III Attachment 1 for Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5.

In the short term, reach-averaged sedimentation levels of 0.9 to 1.7 feet are not expected to substantially negatively impact periphyton or larger aquatic plants downstream of Iron Gate Dam since periphyton and larger aquatic plants are generally adapted to this scale of perturbation due to seasonal and inter-annual sedimentation dynamics typical of dynamic river systems. Burial of existing periphyton and larger aquatic plants with coarse reservoir sediment would reduce the abundance of periphyton and larger aquatic plants in localized areas immediately following sediment deposition, but periphyton and larger aquatic plants would be expected to re-colonize these sediment deposits within the short term (i.e., three years after dam removal begins or sooner), similar to the way scoured streambeds and new sediment deposits on the streambed are recolonized after naturally occurring high winter flows. Thus, there would be a less than significant effect on periphyton and larger aquatic plant abundance downstream of Iron Gate Dam due to localized short-term sediment deposition caused by dam removal.

Overall, short term scour and burial of existing periphyton and larger aquatic plants would potentially reduce the abundance of periphyton and larger aquatic plants in localized areas in the Klamath River under the Proposed Project, but this decrease in periphyton and larger aquatic plant abundance would be within the range occurring under existing conditions and periphyton and larger aquatic plants would recolonize and regrow. In the long term, scour and deposition associated with dam removal, drawdown flows, and reservoir sediment transport under the Proposed Project would return to background rates (see Volume III Attachment 1 Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 for more details). Thus the identified processes would not significantly change the existing range of periphyton and larger aquatic plant abundance in the Klamath River.

With respect to the comment regarding the potential for reduced rates of photosynthesis and oxygen production from aquatic vegetation due to increased turbidity, modeled suspended sediment concentrations (SSCs) in the Klamath River under the Proposed Project during the two primary periphyton and larger aquatic plant growth seasons (i.e., May to October[9]) that would occur in dam removal year 2 and post-dam removal year 1 are within the estimated range of background SSC concentrations (e.g., 1 to 100 milligrams per liter [mg/L] at Orleans between May and October depending of water year type [USBR 2012a]), and they are typically on the low end of that range (i.e., less than 50 mg/L).

[9] Periphyton and aquatic macrophytes are generally dormant during November through April and/or river flows are too high to conduct surveys.

While SSCs would potentially increase above 50 mg/L for approximately 2 weeks or less during the primary periphyton and larger aquatic plant growth season in some water year types during dam removal year 2 and post-dam removal year 1, because the modeled concentrations are within the estimated range of background SSC concentrations, they would not be anticipated to significantly alter periphyton and/or larger aquatic plant growth, including associated rates of photosynthesis and oxygen production, due to reduced light availability under the Proposed Project. Because there are no quantitative data on variations in periphyton and larger aquatic plant growth, rates of photosynthesis, or the amount of associated oxygen production, due to changes in SSC (or turbidity) in the Klamath River or other comparable rivers, the magnitude of changes in periphyton and larger aquatic plant growth, photosynthesis, and oxygen production due to increased SSCs cannot be explicitly quantified. Further, the comment does not provide additional evidence or data that turbidity (or SSCs) in the Klamath River following dam removal would limit or preclude growth of periphyton and/or larger aquatic plants. Overall, increases in SSCs in the Klamath River under the Proposed Project would not significantly inhibit periphyton or larger aquatic plant (i.e., macrophyte) growth compared to the baseline condition. As such, it would not cause significant effects through the various pathways the comment posits.

With respect to the comment regarding nutrient retention in Copco No. 1 and Iron Gate reservoirs, please refer to Volume III Attachment 1 Section 3.2.5.3 *Water Quality – Potential Impacts and Mitigation – Nutrients* Potential Impact 3.2-8 for a discussion of the long-term alterations in nutrients to the Klamath River downstream of Iron Gate Dam from lack of interception and retention by the dams and conversion of the reservoir areas to a free-flowing river. Volume III Attachment 1 presents the final Section 3.2 *Water Quality*. Please also refer to response to comment ORG46-88 for a discussion of how Section 3.2.2.1 *Water Quality – Environmental Setting –Overview of Water Quality Processes in the Klamath Basin – Nutrient cycling in reservoirs and internal loading* has been clarified to specify the most recent calculated annual nutrient retention amounts for the Lower Klamath Project dams (Asarian et al. 2009).

Additionally, Appendix C, Section C.3.1.1 *Hydroelectric Reach* (pages C-24 to C-33) has been revised to clarify the amount of variability in seasonal nutrient retention/release from the reservoirs by adding a discussion of the May 2005 to December 2007 (i.e., the time that nutrient data were measured by Asarian et al. [2009]) time series for Copco No. 1 and Iron Gate reservoirs. Please refer to Volume III Attachment 1 Appendix C, Section C.3.1.1 *Hydroelectric Reach* for the revisions.

Please also refer to responses to comments ORG46-122, ORG46-123, ORG46-139 and ORG46-140 for further discussion of the analysis of nutrient retention in the Copco No. 1 and Iron Gate reservoirs.

Please also refer to Volume I Section 3.4.5.1 *Phytoplankton and Periphyton – Potential Impacts and Mitigation – Phytoplankton* Potential Impact 3.4-2 (pages 3-426 to 3-433) and Volume I Section 3.4.5.2 *Phytoplankton and Periphyton – Potential Impacts and Mitigation – Periphyton* Potential Impact 3.4-4 (pages 3-435 to 3-437) and Potential Impact 3.4-5 (pages 3-437 to 3-440) for analysis of the alterations in the phytoplankton and periphyton growth due to increased nutrients under the Proposed Project.

Comment ORG46-35

The loss of production from Iron Gate Hatchery, which contributes a substantial portion of the Tribal, commercial, and sport fishing Chinook salmon harvest, would seem to be an unavoidable adverse impact of the Proposed Project, but this impact is not discussed in the Executive Summary. The contribution of Iron Gate Hatchery to Chinook harvest has averaged about 28,000 per year (California HSRG 2012).

Response to Comment ORG46-35

Section 3.3.5.6 *Aquatic Resources – Potential Impacts and Mitigation – Fish Hatcheries* discusses the likely effects of eight years of hatchery production following dam removal, including an analysis of the sources of hatchery and natural production likely to occur each year of dam removal and following dam removal through post-dam removal year 10. The potential for natural production of salmon smolts upstream of the current location of Iron Gate Dam is discussed for each species in Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* and is based on extensive review of scientific literature, and in the case of fall-run Chinook salmon Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-7, a quantitative life-cycle model (Hendrix 2011). This analysis concludes a likelihood of successful recolonization and robust fall-run Chinook salmon production following dam removal and eight years of hatchery operation. Please also refer to Master Response AQF-2.

Please refer to Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-7 for an analysis of the effects of a reduction in hatchery production on the escapement of fall-fun Chinook salmon, and Section 3.12.5.1 *Historical Resources and Tribal Cultural Resources – Potential Impacts to Tribal Cultural Resources* Potential Impact 3.12-9 for a discussion of the potential impacts of reduced hatchery production on tribal fisheries. Please also refer to Master Response AQF-3.

Comment ORG46-36

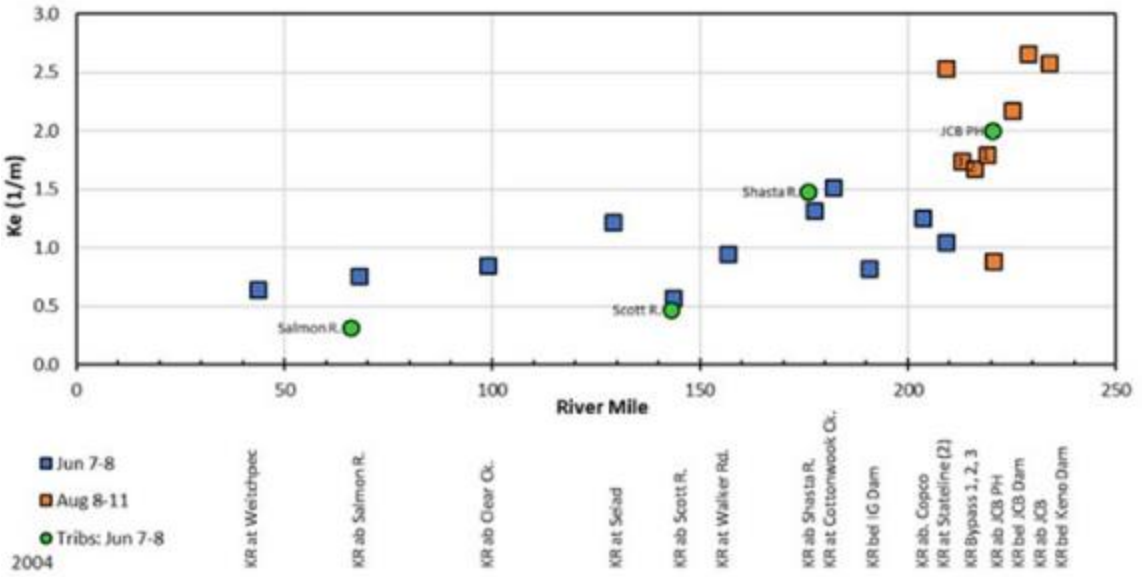
Regarding the Phytoplankton and Periphyton section, there is no reason on and why growth of periphyton would be restricted to the margins of the stream. Light limitation, which would be the element restricting periphyton growth, is not a restricting factor for much of the growing season in the Klamath River

downstream of Iron Gate Dam but can be a factor in the river upstream of Copco Reservoir.

Light conditions in aquatic systems are typically characterized based on irradiance values for photosynthetically available radiation (PAR). Light limitation is assumed to occur beneath water depths associated with "onset saturation" values of PAR, which are values that occur when photosynthesis for typical macrophytes and diatoms produces excess oxygen. Onset saturation values in aquatic systems are typically less than about SO µmol PAR m·2 s·1 (Kirk 1994). Previous PAR measurements in the Klamath River have been used to calculate light extinction coefficients (PacifiCorp 2004a, 2014), which can then be used to calculate the depth of water where onset saturation occurs.

The approximate range of light extinction (Ke) measurements are O.S/m to 1/m in the Klamath River downstream of Iron Gate (see graph below). Based on this Ke range and a maximum PAR intensity of 1800 µmol PAR m· 2 s·1 (measured) at the water surface, the saturation compensation value of SO µmol PAR m·2 s·1 (per Kirk 1994) is reached at depths of about 11 to 20 feet. The vast majority of the Klamath River downstream of Iron Gate Dam is less than 11 feet in depth during the growing season. This indicates that light is generally not limiting periphyton growth in the Klamath River downstream of Iron Gate Dam.

By comparison, the approximate range of Ke measurements are 1.0 / m to 2.5/ m in the Klamath River upstream of Copco Reservoir (see graph below). This higher range of Ke measurements is atributable to the large organic loads contributed to the upper river by Upper Klamath Lake (PacifiCorp 2004a, 2014). Based on this Ke range, the saturation compensation value is reached at depths of about 5 to 11 feet. The depth of the Klamath River upstream of Copco Reservoir is more variable, with an appreciable portion is 5 to 11 feet or more in depth during the growing season. This indicates that light is likely limiting periphyton growth in many areas of the Klamath River upstream of Copco Reservoir.



Response to Comment ORG46-36

The EIR analysis for Volume I Potential Impact 3.4-4 (pages 3-435 to 3-437) determined that potential periphyton growth within the Hydroelectric Reach would be most likely to occur along the channel margins since potential disruption of periphyton growth by increased flow variability during storm flow (see also Volume I Potential Impact 3.6-3) and more frequent river bed sediment movement (see also Volume I Potential Impact 3.11-5) under the Proposed Project would be more likely to limit periphyton growth in the middle of the river channel than along the channel margins. As acknowledged in Volume I Potential Impact 3.4-4 (pages 3-435 to 3-437), there are multiple processes that influence periphyton establishment and growth (e.g., light availability, nutrient availability, water temperature, seasonal flow variations, sediment transport), so light availability alone would not determine the extent of growth within the channel.

Additionally, variations in the light extinction measurements upstream and downstream of the Oregon-California state line presented in the comment cannot be conclusively attributed to longitudinal differences in the Klamath River since the measurements upstream and downstream of the Oregon-California state line were collected at different times of the year when algal-derived (organic) suspended sediments in the Klamath River that would potentially influence light extinction measurements likely would be different. Light extinction measurements upstream of the Oregon-California state line were primarily conducted during August 8 to 11 (year not specified in the graph) when algal growth would likely be peaking, but light extinction measurements downstream of the Oregon-California state line were primarily conducted during June 7 to 8 (year not specified in the graph) when algal growth may be less. Light extinction (Ke) measurements varied abruptly near the same location (i.e., Oregon-California state line) between June (Ke approximately 1.0/m) and August (Ke approximately 2.5/m), suggesting the variations between the upstream and

downstream light extinction measurements is potentially due to seasonal rather than longitudinal differences. As such, the longitudinal variations in light extinction should be considered for each period separately only. While there are likely variations in the light extinction between the upstream and downstream reaches of the Klamath River, additional data would be needed to determine that variation throughout the Klamath River.

While Volume I Potential Impact 3.4-4 explained why increased flow variability and sediment transport under the Proposed Project would likely limit periphyton growth to the channel margins, Potential Impact 3.4-4 has been revised to clarify that there is potential for periphyton growth in the Hydroelectric Reach wherever suitable habitat conditions occur in the river channel. Please refer to Volume III Attachment 1 Section 3.4.5.2 *Phytoplankton and Periphyton – Potential Impacts and Mitigation – Periphyton* for the revisions.

However, the overall effect of the Proposed Project would likely increase periphyton in the portions of Copco No. 1 and Iron Gate reservoir footprints with suitable habitat for periphyton growth due to the creation of new, previously uncolonized low gradient river channels. Periphyton growth would be most likely to occur along the channel margins with shallower water depths, more light availability, warmer water temperatures, and lower probability of seasonal sediment transport and scour, but periphyton growth could also occur elsewhere in the channel where ever suitable habitat conditions exist. While there is considerable uncertainty, there is the potential under the Proposed Project that nuisance periphyton species could be part of the periphyton assemblages that grow in the new low gradient river channels. The nuisance periphyton species would potentially provide habitat for the polychaete worm (*Manayunkia speciosa*) that is the intermediate host of the fish parasites *Ceratomyxa shasta* and *Parvicapsula minibicornis*. Thus, if there were a short-term or long-term increase in growth of nuisance periphyton species due to increases in available habitat, especially along channel margin areas within the Copco No. 1 and Iron Gate reservoir footprints of the Hydroelectric Reach, potentially result in a new or further impairment of designated beneficial uses. It would therefore be a significant impact.

Comment ORG46-37

The DEIR states "efforts aimed at meeting Klamath River total maximum to the daily loads (TMDLs) are not analyzed for the short term under No Project Proposed Alternative because the basin response to the restoration measures to Project meet the TMDLs during the short term is too speculative." The DEIR is not clear in this section or elsewhere in the document whether and how the TMDLs are relied upon for analysis of short-term impacts for other alternatives. The DEIR also does not include a specific single location in the document where the rationale, assumptions, and approach for long-term impacts using the TMDLs are described.

Response to Comment ORG46-37
The EIR discusses the Total Maximum Daily Loads (TMDLs) where it is appropriate to do so (i.e., analyses about or related to water temperature, dissolved oxygen, pH, and nutrients). *Executive Summary* has been revised to clarify that the 'various efforts' and the 'restoration measures' cited in the text are referring to the same thing. The same statement in Section 4.2.1.1 *Alternatives – No Project Alternative – Introduction – Alternative Description* has also been revised. Please refer to Volume III Attachment 1 *Executive Summary* and Volume III Attachment 1 Section 4.2.1.1 *Alternatives – No Project Alternative – Introduction – Alternative Description* for the revisions.

Regrading TMDLs please also refer to Master Response WQ-5.

Comment ORG46-38
If the impacts are increasing in severity toward the right of the table, Significant and Unavoidable should be the final column. Switch the final two columns and indicate when there is no feasible mitigation for a specific impact.

Response to Comment ORG46-38
A significant and unavoidable impact is not necessarily more severe than a significant and unavoidable impact with mitigation. The impact severity depends on the resource in question, the details of the analysis, and the details of feasible mitigation. If there is no feasible mitigation for a particular impact, then there is no mitigation provided in the mitigation column. The footnote to Table ES-1 shown below has been repeated at the front of the table to be more easily seen by the reader.

"* Indicates a Significant and Unavoidable Impact that would be reduced to No Significant Impact with Mitigation if one or more Recommended Measures were to be implemented. Due to federal preemption, the State Water Board cannot guarantee the implementation of Recommended Measures."

For additional information regarding federal preemption and the Lower Klamath Project, please refer to Master Response CEQ-2.

Comment ORG46-39
The coding of long-term Potential Impacts 3.17-2 (Public Services) as significant and unavoidable with mitigation does not match the significance statement on page 3-919 (significant and unavoidable). The coding in Table ES-1 appears correct because the text on page 3-919 indicates that even with mitigation response time would increase, and any additional response time is defined as significant on p 3-916.

Response to Comment ORG46-39
The *Executive Summary – Summary of Proposed Project Effects, Potential Impacts, and Potential Cumulative Impacts* Table ES-1 has been revised to state

that in the long-term (L) for Potential Impact 3.17-2, impacts under the Proposed Project (PP), Partial Removal Alternative (PR), Two Dam Removal Alternative (2R), Three Dam Removal Alternative (3R),and No Hatchery Alternative (NH) would be significant and unavoidable. Likewise, the No Project (NP) has been corrected to be 'No Significant Impact'. These minor modifications to Table ES-1 are consistent with the analysis presented in EIR Section 4 *Alternatives*. Please refer to Volume III Attachment 1 *Executive Summary of Proposed Project Effects, Potential Impacts, and Potential Cumulative Impacts* for the revisions.

Comment ORG46-40

The potential impacts 3.10-1 and 3.10-2 contained in Table ES-1 related to Greenhouse Gas Emissions do not acknowledge the emissions impacts of removing hydroelectric generating resources that are qualified renewable resources under the California Renewal Portfolio Standard. Previous environmental analysis of potential removal of the Klamath Hydroelectric Project dams have evaluated a range of emissions impacts. FERC (2007) estimated an increase in carbon emissions impacts of removing the four Klamath dams to range between 68,600 and of 106,330 metric tons of carbon per year (FERC 2007, Table 4-8) while the Department of the Interior (DOI) and California Department of Fish and Wildlife (CDFW) (2012) estimated that removal of the hydroelectric facilities would result in an increase in regional emissions impacts from potential dam removal ranging between 341,S39 to 396,575 metric tons of carbon dioxide equivalent (MTC02e; see Tables 3.10-6 and 3.10-7 in DOI and CDFW 2012) assuming PacifiCorp attains the California Renewable Portfolio Standard of 33 percent renewable energy in 2020. The DEIR fails acknowledge the emissions impacts related to dam removal and only evaluates the increased emissions impacts related to dam deconstruction activities. However, the DEIR does state that removing the reservoirs would reduce methane emissions from the reservoirs. It is inconsistent for the DEIR to describe the potential for reduced methane emissions from Klamath Hydroelectric Project reservoirs - emissions which have never been documented and that FERC (2007) described as "speculative" - while failing to acknowledge or even attempt to quantify the emissions increase that will result from dam removal. The Klamath Hydroelectric Project generates carbon-free energy that can power the equivalent of approximately 70,000 homes. The Klamath Hydroelectric Project also provides voltage support, dependable capacity necessary to meet planning reserve and reliability standards mandated by the North American Energy Reliability Corporation. The Klamath Hydroelectric Project also provides ancillary services such as spinning reserve and voltage support that contribute to the reliability of the transmission system that cannot be entirely replaced through renewable energy resources. PacifiCorp will need to rely on the remainder of its generation fleet and market purchases to make up power lost from the Klamath Hydroelectric Project, and those sources, while increasingly renewable, have higher emissions than the Klamath Hydroelectric Project. The DEIR should be revised and recirculated to evaluate these impacts.

Response to Comment ORG46-40
This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Greenhouse Gas Emissions and Energy*).

Comment ORG46-41
Potential impacts 3.22-1 through 3.22-6 (Transportation and Traffic) should be coded as Significant and Unavoidable because the State Water Resources Control Board (State Water Board) cannot ensure implementation of that mitigation.

Response to Comment ORG46-41
The EIR's analysis of traffic and transportation impacts has been revised for the Proposed Project (PP) and for the Partial Removal Alternative (PR), Two Dam Removal Alternative (2R), Three Dam Removal Alternative (3R), and No Hatchery Alternative (NH) to reflect that traffic impacts referenced in the comment now are identified as less than significant with the implementation of Mitigation Measure TR-1. Table ES-1 has been revised accordingly. It is not clear whether the hydroelectric project owner or operator would implement traffic measures, including Implementation of Mitigation Measure TR-1, through 'good citizen' agreements under the Continued Operations with Fish Passage Alternative (CO) and it is unclear how these measures would be enforced. Thus, the significance determination has not been changed for the Continued Operations with Fish Passage Alternative. Please refer to Master Response CEQ-2. Please refer to Volume III Attachment 1 Table ES-1, Section 3.22 *Transportation and Traffic* and Section 4 *Alternatives* for the revisions.

Comment ORG46-42
This table of potential impacts shows no quantified data associated with each alternative, study area, or resource type (e.g., tribal, historic period archaeological, historic built environment) that allow for an effective comparison between alternatives and the Proposed Project. The numerous cultural resources studies previously conducted for the Klamath Hydroelectric Project identified tribal cultural resources, historic-period Resources) archaeological resources, and historic built environment resources using records searches, surveys, and consultation with tribes and local agencies. As-yet identified resources certainly will be found during future phases of the Proposed Project; however, known quantifiable data should be shared in the DEIR as a way to effectively compare alternatives and the Proposed Project while preserving the confidential nature of that data.

Response to Comment ORG46-42
As the title indicates, Table ES-1 is a summary of impacts and mitigation measures identified for the Proposed Project and six alternatives, across all resource areas, at specific geographic locations (where appropriate), and for the short term and long term timeframes analyzed in the EIR. It would not be

appropriate for Table ES-1 to also present detailed quantified data for tribal, historic period archaeological, and/or historic built environment resources, as suggested by the comment. Greater detail, including known non-confidential resource data, can be found in Volume III Attachment 1 Section 3.12 *Historical Resources and Tribal Cultural Resources* and in the corresponding alternative subsections in Volume I Section 4 *Alternatives*.

Comment ORG46-43

We recommend referencing the USBR hydrology, hydraulic, and sediment transport study as 2011 even though an errata was issued in 2012.

U.S. Bureau of Reclamation (USBR). 2011. Hydrology, Hydraulics and Sediment Transport Studies for the Secretary's Determination on Klamath River Dam Removal and Basin Restoration, Technical Report No. SRH-201102, including Jan 2012 errata. Prepared for Mid-Pacific Region, Bureau of Reclamation, Technical Service Center, Denver, Colorado.

Response to Comment ORG46-43

The citation provided on the title page of United States Bureau of Reclamation's (USBR's) report is "Reclamation (2012). Hydrology, Hydraulics and Sediment Transport Studies for the Secretary's Determination on Klamath River Dam Removal and Basin Restoration, Technical Report No. SRH-2011-02. Prepared for Mid-Pacific Region, US Bureau of Reclamation, Technical Service Center, Denver, CO." The EIR Volume I correctly cites this report as a 2012 publication.

Comment ORG46-44

Neither J.C. Boyle or Copco No. 1 have functional low-level outlets as indicated on the table.

Response to Comment ORG46-44

Section 2.3 *Proposed Project – Existing Lower Klamath Project Features,* row six of Table 2.3-1, has been revised to clarify the type of feature that allows water to flow past the dams under existing conditions. References to diversion culverts/tunnels are no longer associated with J.C. Boyle and Copco No. 1 dams in Table 2.3-1, since these features are not functional under existing conditions. Please refer to Volume III Attachment 1 Section 2.3 *Proposed Project – Existing Lower Klamath Project Features* for the revisions.

Comment ORG46-45

Lost River and Shortnose suckers were listed in 1988 (53 FR 27130) not 1998 as listed in the text.

Response to Comment ORG46-45

Volume I Section 2.6.1 *Proposed Project – Project Background – Water Conflicts in the Klamath River Basin* has been clarified as requested. Please also note that the title for Section 2.6.1 of the EIR has been revised for clarity in Volume III.

Please refer to Volume III Attachment 1 Section 2.6.1 *Proposed Project – Project Background – Water History in the Klamath River Basin* for the revision.

Comment ORG46-46
The DEIR states that the Klamath Tribes have experienced their 92nd year without access to salmon yet provides no supporting evidence for this point. This year count does not correspond to the completion date for Copco No. 1 in 1918 which did block fish passage.

Response to Comment ORG46-46
The timeline in Volume I Section 2.6.1 *Proposed Project – Project Background – Water Conflicts in the Klamath River Basin* has been modified to correct the year count to be 93 years. Please also note that the title for Section 2.6.1 of the EIR has been revised for clarity in Volume III. Please refer to Volume III Attachment 1 Section 2.6.1 *Project Background – Water History in the Klamath River Basin* for the revisions.

Comment ORG46-47
The timeline (in Section 2.6.1) is incomplete in terms of it missing any PacifiCorp actions (like the issuance of the original Project license in 1954, relicensing application in 2004, implementation of a Habitat Conservation Plan (HCP) for Coho salmon in 2014, the use of reservoir storage to benefit USBR irrigators and river flows in 2014 and 2018}, and so on. There is also no mention of water quality issues and cyanobacterial blooms in Upper Klamath Lake that will persist following potential dam removal.

Response to Comment ORG46-47
This section focuses on major events associated with water-related disputes in the Klamath Basin and is not intended to be a comprehensive history of water use and/or management in the basin.

Comment ORG46-48
The second half of this paragraph has no bearing on the content of the DEIR and should be removed.

Response to Comment ORG46-48
As described in Volume I Section 2.6.1 *Proposed Project – Project Background – Water Conflicts in the Klamath River Basin* (page 2-22), the second half of the paragraph referenced by the commenter is included in the EIR to acknowledge the broader context within which the issue of dam removal currently exists in the Klamath Basin.

Comment ORG46-49
While basically accurate, this discussion omits mention of the current FERC status. The text should clarify that at this time, PacifiCorp is still the sole owner of the entire Klamath Hydroelectric Project and that FERC has not acted on the

transfer request let alone the surrender request. Significantly, FERC has not yet evaluated the Definite Plan (presented in DEIR Appendix B) or conducted analysis in accordance with the National Environmental Policy Act (NEPA) to determine if the Definite Plan should be modified to reflect dam safety concerns or mitigate potential environmental impacts.

Response to Comment ORG46-49
The EIR states that PacifiCorp currently owns and operates the Lower Klamath Project, and that, among other authorities, Federal Energy Regulatory Commission (FERC) must approve and set conditions for transfer of ownership and decommissioning (please refer to Volume I Section 2.4 *Surrounding Land Ownership and Land Use* [page 2-16] and Section 2.6.2 *Relationship with Klamath Hydroelectric Project* [pages 2-22 to 2-23]).

Comment ORG46-50
Using the term 'Dam Removal Year 1' to refer to Proposed Project actions that occur before dams are actually removed is confusing to the reader.

Response to Comment ORG46-50
As shown in Volume I Table 2.7-1, Dam Removal Year 1 is the year that drawdown and dam removal begins (i.e., Copco No. 1 Dam drawdown and dam removal begin in November and December). Drawdown and dam removal are the primary actions in the Proposed Project, and these actions involve impacts that are distinct from other types of actions in this multi-year project. Therefore, it is helpful to the reader to designate a timeframe based on the start of these actions.

Comment ORG46-51
This figure oversimplifies the relationship between reservoir drawdown and the fish life cycles on the Klamath River. Based on the other information in the DEIR, suspended sediment loads could extend well through the spring following drawdown yet the figure limits this to early March for Copco No. 1 and Iron Gate reservoirs. This is misleading. Also, this figure is missing Eulachon, an anadromous and ESA-listed species found in the lower Klamath River. Coho adult migration may end in December at Iron Gate Dam, but in the tributaries downstream of Iron Gate Dam it can extend into early January (MKWC 2015, 2016, 2017).

*Why is there a * for Copco 1 which according to the footnote means "No significant release of sediment expected" yet there is no information presented to support this assertion?*

Response to Comment ORG46-51
Section 2.7 *Proposed Project – Proposed Project* has been revised to clarify that based on the distribution and life-history timing of aquatic species in the Klamath Basin, only a portion of fish populations are likely to be present in the mainstem

Klamath River during the reservoir drawdown period, which is also the period of greatest sediment transport, and to refer the reader to Section 3.2.5 *Water Quality – Potential Impacts and Mitigation* Potential Impact 3.2-3 for additional information. Figure 2.7-1 has been revised to include eulachon and to make associated updates to the figure legend associated with this species and reservoir drawdown timing. Coho salmon spawning timing is shown for mainstem Klamath River, and not the tributaries, since it is the life history timing within the mainstem that is relevant for assessing impact of sediment release illustrated by the figure. Please refer to Volume III Attachment 1 Section 2.7 *Proposed Project – Proposed Project* for the revisions.

Comment ORG46-52

The Proposed Project includes the cessation of power generation at Copco No. 1 in fall 2020. As per Section 7.3.3 of the Klamath Hydropower Settlement Agreement (KHSA), cessation of generation before December 31, 2020, requires that additional value to customers be identified. Unless that is included, the Proposed Project should be revised to accurately reflect the requirements of the KHSA.

Operations of Copco No. 2 following drawdown of Copco No. 1 are unclear from the Proposed Project discussion in the DEIR. PacifiCorp would not continue to attempt to operate Copco No. 2 after drawdown of Copco No. 1. Once the sediment from Copco Reservoir begins to mobilize, operations of Copco No. 2 would not be feasible.

Response to Comment ORG46-52

The Klamath River Renewal Corporation's (KRRC's) Definite Plan (2017) proposed that generation of power at Copco No. 2 Dam (with sediment-laden flow) would continue for up to four months after January 1, 2021 (or until May 1, 2021) to offset lost revenue from shutting Copco No. 1 down prior to January 1, assuming that the Copco No. 2 generating equipment will be capable of operating under such conditions. As noted in Section 3.2.5.2 *Water Quality – Potential Impacts and Mitigation – Suspended Sediments* Potential Impact 3.2-3, the shift in the Proposed Project Copco No. 2 drawdown timing from January 1 (Appendix B: *Detailed Plan*) to May 1 (Appendix B: *Definite Plan*) would not change the anticipated magnitude or timing of significant impacts due to elevated suspended sediment concentrations (SSCs) in the Hydroelectric Reach during dam removal year 2. The State Water Board notes that the KRRC has now proposed that dam removal year 1 – which includes the cessation of power production at Copco No. 1 – would be 2021. This is after the December 2020 date in the Klamath Hydropower Settlement Agreement (KHSA).

While in general, comments on the Definite Plan should be submitted to the KRRC, the State Water Board notes PacifiCorp's statement that the company would not continue to operate Copco No. 2 Powerplant once the sediment from Copco No. 1 Reservoir begins to mobilize and after drawdown of Copco No. 1

Reservoir. The EIR indicates that Copco No. 2 Reservoir drawdown would occur in May of dam removal year 2, as proposed by KRRC (see Volume I Section 2.7 *Proposed Project – Proposed Project* Table 2.7-1 and Figure 2.7-1 [as modified in Volume III Attachment 1]), and the analyses assume continued production at Copco No. 2 Powerhouse because the need to halt production is speculative. The EIR also acknowledges the uncertainty related to continuing Copco No. 2 Powerplant operation by stating that if Copco No. 2 Powerhouse is not capable of operating under sediment-laden conditions, then drawdown of this reservoir would still use the penstock (Volume I Section 2.7.2 *Proposed Project – Proposed Project – Reservoir Drawdown* [specifically page 2-57]).

Please note that the State Water Board issued a draft water quality certification which sets forth Condition 3 requiring that Copco No. 2 Reservoir drawdown conclude no later than March 15 of the year following initiation of Copco No. 1 Reservoir drawdown.

Comment ORG46-53

The discussion of operations of the low-level outlets seems to have gotten confused with the spillways. Presumably once reservoirs are drawn down, there would be no complete refill such that the spillways at Iron Gate or Copco dams could be activated.

Response to Comment ORG46-53

Section 2.7.2 *Proposed Project – Proposed Project – Reservoir Drawdown* has been revised to clarify the reference to the diversion control tunnels and structures, rather than the spillways. Please refer to Volume III Attachment 1 Section 2.7.2 *Proposed Project – Proposed Project – Reservoir Drawdown* for the revisions.

Comment ORG46-54

Once Iron Gate Reservoir is below the spillway elevation, the only way to pass water out of the reservoir is through the turbine, bypass valve at the turbine, or the low-level outlet. The powerhouse will be offline and unavailable and the spillway will be well above the water surface elevation. It is unclear from this paragraph what the intent is, but the facilities would not be able to spill this water and so inflow greater than the capacity of the low-level outlet would accumulate in the reservoir. The list of flood capacities seems inappropriate and does not include March-May which includes the peak snowmelt period.

Response to Comment ORG46-54

Volume I Section 2.7.2 *Proposed Project – Reservoir Drawdown* has been revised to clarify that the spillway at Iron Gate Dam would not be used unless Iron Gate Reservoir were to fully refill, and the diversion control gates would be used for passing water through the dams. Additionally, the flood capacities have been corrected and text regarding dam removal timing has been included to indicate that during dam removal of all four dams, the drawdown of Iron Gate

Reservoir would maintain enough capacity to pass a 1 percent probable flood for that time of year, in order to reduce the potential for flow to overtop the Iron Gate Dam embankment (Volume II Appendix B: *Definite Plan*). This statement includes the spring runoff period. Further, removal of Copco No. 1 Dam sections and Copco No. 2 Dam would begin after May 15 of dam removal year 2, and removal of Iron Gate would occur between June 1 and September 30 of dam removal year 2, the dams would retain their existing flood capacity during the peak snowmelt period. Please refer to Volume III Attachment 1 Section 2.7.2 *Proposed Project – Reservoir Drawdown* for the revisions.

Comment ORG46-55

This paragraph has the same flow control issues as the one on the previous page (see comment 2.12). With J.C. Boyle Powerhouse offline, use of the power intake and the power canal to move water would require use of the emergency spillway which seems unlikely. The DEIR also fails to consider the possibility of flood flows during spring when snowmelt is most likely. J.C. Boyle Reservoir would be drawn down by mid-March like the rest of the reservoirs.

Response to Comment ORG46-55

Section 2.7.2 *Proposed Project – Reservoir Drawdown* has been revised to clarify that because removal of J.C. Boyle Dam would occur beginning in mid-June of dam removal year 2, the dam would retain its existing flood capacity during the peak snowmelt period. Please refer to Volume III Attachment 1 Section 2.7.2 *Proposed Project – Reservoir Drawdown* for the revisions.

Comment ORG46-56

The DEIR states that "Release flows would add water to the otherwise existing flows in the river (i.e., Keno Reservoir releases and tributary inflows)." This is true, but if the Klamath River Renewal Corporation (KRRC) is releasing water from Copco and Iron Gate reservoirs as part of drawdown, PacifiCorp expects that USBR will release the minimum necessary to achieve biological opinion (BiOp) target flows at the Iron Gate U.S. Geological Survey (USGS) gage and not release anything above the absolute minimum from Keno Dam to J.C. Boyle Dam. All that extra water would be retained in Upper Klamath Lake by USBR for other uses.

Response to Comment ORG46-56

The paragraph referenced in the comment discusses the range of release flows that would occur in the Klamath River due to drawdown of the three larger reservoirs, and contextualizes these flows by providing the 2-year and 10-year peak flows in the Klamath River at the three reservoir locations. It does not rely on any assumptions regarding United States Bureau of Reclamation's (USBR's) operations during drawdown. As noted in the reference paragraph, more detail regarding release flows and associated assumptions is in Volume I Section 3.6.5.1 *Flood Hydrology – Potential Impacts and Mitigation – River Floodplain*.

Comment ORG46-57
The DEIR does not include any of the 2017 reservoir sediment boring data to collected by the KRRC.

Response to Comment ORG46-57
To the State Water Board's knowledge, there were no sediment cores collected from the Lower Klamath Project in 2017. In February 2018, Klamath River Renewal Corporation (KRRC) collected eleven sediment cores at Copco No. 1 Reservoir to characterize and analyze the stability of the sediment deposits present around much of the rim of the reservoir and within the reservoir bed, and three sediment cores at Iron Gate Reservoir to characterize past landslides and to inform design of the replacement water supply pipeline for the City of Yreka (Volume II Appendix B: *Definite Plan – Appendix E*). No sediment cores were collected at J.C. Boyle Reservoir.

The 2018 sediment core data were not collected to further characterize the composition or thickness of the sediment deposits for the purpose of informing estimates of the total amount of sediment present in the reservoir footprints or how much sediment would erode during reservoir drawdown, which are the focus of the discussion in Volume I Section 2.7.3 *Proposed Project – Reservoir Sediment Deposits and Erosion During Drawdown*.

The sediment core data referenced in Section 2.7.3 are spatially distributed across the reservoirs and the depth of the cores (i.e., record length) is sufficiently long that pre-reservoir sediment could be distinguished, thus the data are considered technically sound for providing an estimate of the volume of reservoir sediment deposits (see Section 3.2.2.8 *Water Quality – Environmental Setting – Inorganic and Organic Contaminants – Sediment Contaminants*). Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*. Using more recent sediment core data would not be expected to change the range of stored sediment estimates presented in Volume 1 Section 2.7.3 *Proposed Project – Reservoir Sediment Deposits and Erosion During Drawdown* Table 2.7-10 (page 2-67) and Volume I Section 3.11.2.5 *Geology, Soils, and Mineral Resources – Environmental Setting – Reservoir Sediment Storage and Composition* Table 3.11-4 (page 3-754). The uncertainty of the reservoir sediment volume estimates is reasonable for sediment yield analyses, which generally use modeling to estimate the order of magnitude of annual sediment yield.

Section 2.7.3 *Proposed Project – Proposed Project – Reservoir Sediment Deposits and Erosion During Drawdown* has been revised according to the above discussion. Please refer to Volume III Attachment 1 Section 2.7.3 *Proposed Project – Proposed Project – Reservoir Sediment Deposits and Erosion During Drawdown* for the revisions.

Please also note that the February 2018 sediment cores do provide additional information useful for the assessment of potential sediment instability along the reservoir rims and within the deposits on the reservoir beds during and

immediately following reservoir drawdown, and as such are discussed in Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-3 (pages 3-761 to 3-765).

Comment ORG46-58

The DEIR states that 80 percent of the reservoir sediment is composed of fine sediment but other references in the DEIR (e.g., Stillwater Sciences 2010, USBR 2012c) say the value is 85 percent.

Response to Comment ORG46-58

Silt and clay comprise 84.8 percent of reservoir sediments, averaged across J.C. Boyle, Copco No. 1, and Iron Gate reservoirs (see Volume I Table 2.7-10 in Section 2.7.3 *Proposed Project – Proposed Project – Reservoir Sediment Deposits and Erosion During Drawdown* (page 2-67) and Table 3.11-4 in Section 3.11.2.5 *Geology, Soils, and Mineral Resources – Environmental Setting – Reservoir Sediment Storage and Composition* (page 3-754). Therefore, stating "over 80 percent of the reservoir sediments are fine sediment" and "more than 80 percent fine sediment" is accurate.

Comment ORG46-59

This section of the DEIR should include a discussion of how the sediment size classes are distributed spatially within the reservoir and what impact that spatial variability has on the mobilization of the respective sediment classes during drawdown. For example, larger particles are often preferentially located at the head of the impoundment and these head areas will be the first areas exposed to steeper water surface slopes and increased bed shear stress during the drawdown.

Response to Comment ORG46-59

Section 2.7.3 *Proposed Project – Proposed Project – Reservoir Sediment Deposits and Erosion During Drawdown* (pages 2-60 to 2-69) Section 2.73 *[Proposed Project] Reservoir Sediment Deposits and Erosion During Drawdown* (pages 2-60 to 2-69) of the EIR has been clarified revised in Volume III to include information on the spatial patterns of sediment accumulation in the reservoirs. Please refer to Volume III Attachment 1 Section 2.7.3 *Proposed Project – Proposed Project – Reservoir Sediment Deposits and Erosion During Drawdown* for the revisions. Coarse-grained sediments are concentrated near the primary inlets of the J.C. Boyle, Copco No. 1, and Iron Gate reservoirs, and in the Copco No. 2 Reservoir where minimal reservoir sediment accumulation has occurred (USBR 2010; USBR 2012a). These coarser particles may be mobilized during drawdown but are unlikely to be transported substantial distances downstream because total water discharge during drawdown would be similar to, or less than, the historical seasonal 10-year flood. The coarser particles may be mobilized in later flood events but are not modeled to be transported past Cottonwood Creek (USBR 2012a). Although, Section 2.7.3 *[Proposed Project] Reservoir Sediment Deposits and Erosion During Drawdown* (pages 2-60 to 2-69) discusses

sediment erosion during drawdown, please note that this subject is more comprehensively addressed in Potential Impact 3.11-5 in Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* (pages 3-765 to 3-775), which is modified in Volume III Attachment 1.

Comment ORG46-60

The figures in the DEIR showing sediment depths should be updated to reflect data collected by the KRRC during studies to support removal, including detailed bathymetric mapping and additional geotechnical investigations. This would help address the "uncertainty in sediment volume estimates" (DEIR pg. 2-65).

Response to Comment ORG46-60

The primary technical reports relating to in-reservoir sedimentation are USBR (2010) and USBR (2012a). Volume I Section 2.7.3 *Proposed Project – Proposed Project – Reservoir Sediment Deposits and Erosion During Drawdown* has been clarified by adding information characterizing in-reservoir sediment deposition. Please refer to Volume III Attachment 1 Section 2.7.3 *Proposed Project – Proposed Project – Reservoir Sediment Deposits and Erosion During Drawdown* for the revisions. Bathymetric figures for Copco No. 1 and Iron Gate reservoirs are already included in Volume I Section 2.7.2 *Proposed Project – Reservoir Drawdown,* Figure 2.7-5 and Figure 2.7-6 (pages 2-55 and 2-56). These figures represent the most recent data, the Klamath River Renewal Corporation (KRRC) and their consultants have not provided the State Water Board with any new information.

Regarding the uncertainty of sediment deposit volumetric estimates, please refer to comment response ORG46-8.

Comment ORG46-61

The DEIR states that "Whether the actual reservoir sediment volumes are on the higher end or the lower end of the uncertainty estimate, the dam removal approach and the significance of potential impacts due to sediment transport during reservoir drawdown would remain the same." The DEIR should explain why the significance of potential impacts associated with downstream sediment transport during the drawdown is unrelated to the total volume predicted to be transported. This conclusion appears tied to the DEIR's incorrect assumption that fine sediment released during the drawdown would remain in suspension in the 190-mile-long reach downstream of Iron Gate Dam to the Pacific Ocean (see Major Issue 2.4 and comment 3.5-8). However, some fraction of the total fine sediment load will settle out in the riverine system, such as on the channel margins, back waters, pools, or point bars. Therefore, it follows that the magnitude of the impact would be directly related to the volume of sediment estimated to transported downstream.

Response to Comment ORG46-61
The statement quoted by the commenter explains that the EIR has considered the potential lower and upper estimates of sediment deposits that would mobilize during drawdown, and that deposited sediment volumes within this range do not result in a change to the breadth or severity of potential impacts analyzed in the EIR. This is because: a) for water quality, exceedances of 100 mg/L suspended sediment concentrations (SSCs) over a continuous two-week exposure period would occur for a similar number of months during and following drawdown for the range (lower and upper estimates) of sediment volume expected to mobilize (see Volume III Attachment 1 Section 3.2.5.2 *Water Quality – Potential Impacts and Mitigation – Suspended Sediments* Potential Impact 3.2-3). Additionally, please refer to Volume II, Appendix D, Section D.2 for a discussion of how and why the State Water Board chose the significance criteria for potential water quality effects; b) for geomorphology, the anticipated morphological responses are not expected to differ substantially while sediment volumes are within an order of magnitude (see Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 [pages 3-765 to 3-775] and modifications to this impact in Volume III Attachment 1); and c) the potential impacts to aquatic organisms are related to both SSCs and morphological change (see Volume III Attachment 1 *Aquatic Resources*).

Please also refer to Master Response GEO-1, relating to fine sediment erosion, transport, and deposition, and morphological responses.

Comment ORG46-62
The DEIR states "Sediment jetting would be focused in the six areas where restoration actions are proposed within the Copco No. 1 Reservoir footprint (Figure 2.7-11) and the three areas where restoration actions are proposed within the Iron Gate Reservoir footprint (Figure 2.7-12)." It is not clear from the referenced figures where sediment jetting will occur as these areas are not called out in the figures.

Response to Comment ORG46-62
Section 2.7.3 *Proposed Project – Proposed Project – Reservoir Sediment Deposits and Erosion During Drawdown*, Section 2.7.4.2 *Proposed Project – Proposed Project – Restoration Within the Reservoir Footprint – Reservoir Restoration Features,* Section 3.2.5.2 *Water Quality – Potential Impacts and Mitigation – Suspended Sediments* Potential Impact 3.2-3, and Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 have been clarified to indicate the location of sediment jetting. Please refer to Volume III Attachment 1 Section 2.7.3 *Proposed Project – Proposed Project – Reservoir Sediment Deposits and Erosion During Drawdown*, Volume III Attachment 1 Section 2.7.4.2 *Proposed Project – Proposed Project – Restoration Within the Reservoir Footprint – Reservoir Restoration Features,* Volume III Attachment 1 Section 3.2.5.2 *Water Quality – Potential Impacts and Mitigation – Suspended Sediments* Potential Impact 3.2-3, and Volume III

Attachment 1 Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 for the revisions.

Comment ORG46-63

Sediment jetting was not included in the modeling conducted by USBR (2012). The DEIR needs to explain how this activity would affect suspended sediment concentrations and should be discussed to determine if sediment jetting will increase the amount of sediment mobilized from the reservoirs, which could presumably increase the magnitude and/or duration of sediment impacts downstream.

Response to Comment ORG46-63

With respect to the potential for additional inputs of sediment due to the proposed sediment jetting during reservoir drawdown, Table 3.2-12 (page 3-86) presented in Potential Impact 3.2-3 in Volume I Section 3.2.5.2 *Water Quality – Potential Impacts and Mitigation – Suspended Sediments,* includes explicit consideration of the volume and percentage of sediment that would be eroded by sediment jetting, separate from sediment transport analyzed by the U.S. Bureau of Reclamation (USBR) 2012 model. The column in Table 3.2-12 entitled "2020 Sediment Volume Erosion[3,4] (cubic yards)" includes the volume of sediment that would be eroded by drawdown plus sediment jetting, and the "Percentage of 2020 Sediment Volume Transported by Sediment Jetting (%)" presents the amount of sediment that would be mobilized via sediment jetting as a fraction of the total reservoir sediment deposits to be eroded. Sediment jetting would be conducted in a limited number of locations within the reservoir footprints and in a manner that would not erode significant additional masses of surficial sediment compared with the original USBR (2012a) estimates of sediment mobilization, which did not include sediment jetting. As such, the assessment in Potential Impact 3.11-5 in Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* (pages 3-765 to 3-775), is accurate. The analysis in Potential Impact 3.11-5 is consistent with both USBR (2012a) and Section 3.2 *Water Quality* of the EIR. Please also refer to Master Response WQ-3.

Comment ORG46-64

The DEIR states "A faster drawdown rate would reduce the time of interaction between the flow and reservoir sediment deposits, thus reducing the overall amount of sediment erosion, whereas a slower drawdown rate would increase the time of interaction between the flow and reservoir sediment deposits, thus increasing the overall amount of sediment erosion. It is expected that increasing the previously modeled maximum drawdown rate of 2.25 to 3 feet per day (USBR 2012c) to the Proposed Project maximum drawdown rate of 5 feet per day (Appendix B: Definite Plan - Appendix P) would slightly decrease the total amount of sediment erosion that occurs during drawdown."

The DEIR needs to clarify the basis for this stated conclusion. As written, this statement is an oversimplification of a complex set of interrelated forces. A faster drawdown rate might reduce the duration of direct erosion, but it might increase the rate of erosion resulting from the steeper water gradient (higher velocities) and increase the probability of slump failures due to increased pore-pressure. In addition, the numeric model used in the DEIR does not account for erosion from slump failures. Therefore, the conclusion in the DEIR that a faster drawdown rate would result in lower total mass erosion is not accurate. Rather, it is possible that a faster drawdown rate would produce higher volumes of eroded sediment.

Response to Comment ORG46-64
Please refer to response to comment ORG46-8.

Comment ORG46-65
The DEIR states "The previously modeled maximum drawdown rate would result in 36 to 57 percent of erosion of the sediment deposit from the reservoirs (Table 2.7-11) and increasing the drawdown rate to 5 feet per day would most likely result in an amount of erosion toward the lower end of the estimated range or slightly lower." See the comment 2.22 above regarding effects of drawdown rates on potential erosion.

These eroded volume estimates are very large numbers that are difficult to put into perspective; it would be helpful for the DEIR to relate the eroded volume estimates to the average annual sediment load to provide context. These estimates also indicate that approximately 6.5 to 9.7 million cubic yards of sediments would be retained in the reservoirs after initial reservoir drawdown. The DEIR should address the longer-term effects caused by these retained sediments that could occur during future high flow events.

Response to Comment ORG46-65
Regarding sediment erosion during drawdown, please see ORG46-8.

In terms of relating the potential mass of sediment erosion to the average annual sediment load, please refer to response to comment ORG46-31.

Regarding the potential long-term effects related to the sediment retained within the reservoirs after drawdown, please refer to Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 (pages 3-768 to 3-769) and modifications to this impact in Volume III Attachment 1, and to ORG46-8.

Comment ORG46-66
According to the KHSA, PacifiCorp is to provide funding for up to 8 years of operations of Iron Gate Hatchery following decommissioning. What happens to

the hatchery after that period of time is unclear, but it is speculative to assume that it would cease to function entirely.

Response to Comment ORG46-66
The EIR acknowledges that there is uncertainty as to whether the Iron Gate Hatchery facility would be decommissioned in place, demolished, or partly or fully repurposed after the eight-year operational period (Volume I Section 2.7.6.1 *Proposed Project – Proposed Project – Hatchery Operations – Iron Gate Hatchery*, page 2-77). In light of the lack of identified funds for operation, a scenario involving continuing operation is speculative. Please also refer to Master Response AQF-2.

Comment ORG46-67
The auxiliary trap at the Iron Gate Hatchery already exists. While there is other construction work proposed to occur at the hatchery, there is no new construction for this item.

Response to Comment ORG46-67
Section 2.7.6.1 *Proposed Project – Proposed Project – Hatchery Operations – Iron Gate Hatchery* has been clarified as requested. Please refer to Volume III Attachment 1 Section 2.7.6.1 *Proposed Project – Proposed Project – Hatchery Operations – Iron Gate Hatchery* for the revision.

Comment ORG46-68
It would appear that there is not enough water to operate Iron Gate Hatchery during certain months of the year (in both spring and fall) and the DEIR does not propose a viable alternative. The DEIR says that recirculation and early release 'would be studied' to see if they meet the goals. Early smolt releases would have an effect on overall returns of adult Chinook salmon and should be evaluated as an alternative hatchery operations in the effects analysis. These fish would be smaller than target sizes and may not survive as well as those released later in the season.

Response to Comment ORG46-68
Based on available flow data for Bogus Creek (Volume I Figure 2.7-14), the Iron Gate Hatchery water supply may not be sufficient to provide for all of the three hatchery raceways for short periods of time during fall and winter months under dry conditions; however, since the hatchery raceways would not be used for rearing Chinook salmon smolts during the fall and winter, this would not present a concern. It is also possible that during some years Iron Gate Hatchery could experience a deficit of up to 4 cubic feet per second (cfs) to operate the hatchery for several consecutive days in the mid- to late spring, when Chinook salmon smolts would be rearing in the raceways. Each of the three rearing ponds at Iron Gate Hatchery requires 2.25 cfs to operate, for a total 6.75 cfs requirement for the raceways. A temporary deficit of 4 cfs could result in one to two rearing ponds experiencing insufficient flows to operate, requiring an “early” release of

one- to two-thirds of Iron Gate Hatchery rearing smolts to the Klamath River. As the intended release period for Chinook salmon at Iron Gate Hatchery is April through May (mid- to late spring), smolts released in mid-April of some years would not necessarily be released earlier than would otherwise occur, or they may only experience release a few weeks earlier than would otherwise occur. Smolts released early in the season may be slightly smaller than smolts released later in the season, and therefore they could experience somewhat lower riverine and marine survival than their larger counterparts (Scheuerell et al. 2009, Feldhaus et al. 2016). Chinook salmon yearlings (which have higher survival) would be raised at Fall Creek Hatchery (FCH) and would not be affected by reduced instream flows in Bogus Creek.

In sum, there is potential that in some years, one- to two- thirds of Chinook smolts rearing at Iron Gate Hatchery may be released slightly earlier than would occur if more water were available in Bogus Creek. Overall, the infrequent occurrence of the potential for early smolt release for a proportion of Chinook smolts from Iron Gate Hatchery, and the small difference in timing (and therefore smolt size and survival) is unlikely to result in a significant reduction in returns of adult fall-run Chinook salmon to the Klamath River.

Comment ORG46-69

The DEIR states that "As Fall Creek Hatchery is part of PacifiCorp's Klamath project...facilities are subject to the terms of any new FERC action for 2082." While the Fall Creek Development (diversions, penstock, powerhouse, tailrace, etc.) are in the FERC license, the Fall Creek Hatchery is not in the current license for the Klamath Hydroelectric Project (P-2082). Reference to any terms and conditions for Fall Creek Development (including the hatchery facilities) is speculative and should be removed from the DEIR.

Response to Comment ORG46-69

Section 2.7.6.2 *Proposed Project – Proposed Project – Hatchery Operations – Fall Creek Hatchery* and Section 4.7.1 *Alternatives – No Hatchery Alternative – Introduction* have been clarified as requested. Please refer to Volume III Attachment 1 Section 2.7.6.2 *Proposed Project – Proposed Project – Hatchery Operations – Fall Creek Hatchery* and Section 4.7.1 *Alternatives – No Hatchery Alternative – Introduction* for the revisions.

Comment ORG46-70

This figure is out of date and does not represent the current proposed improvements at the Fall Creek Hatchery. PacifiCorp's understanding is that the two settling pond locations shown in the inset on this figure were removed from consideration because of cultural resource concerns and that the settling pond is currently planned to go where the figure shows the lower rearing tanks. The DEIR needs to be updated to reflect the actual proposal.

Response to Comment ORG46-70
The Proposed Project description is based on the information provided in Volume II Appendix B: *Definite Plan – Appendix H* and acknowledges that selection of the settling pond site is pending cultural resources investigations and consultation with tribes with historical and cultural connection to the area (see Volume I Section 2.7.6.2 *Proposed Project – Hatchery Operations – Fall Creek Hatchery*, page 2-81). Additionally, Volume I Section 2.7.6.2 *Proposed Project – Hatchery Operations – Fall Creek Hatchery* Figure 2.7-15 (page 2-83) states in the legend that the location of the Fall Creek powerhouse and hatchery infrastructure is approximate.

Additionally, as listed in Section 3.12.5.1 *Historical Resources and Tribal Cultural Resources –Potential Impacts and Mitigation – Potential Impacts to Tribal Cultural Resources* Tribal Cultural Resources Mitigation Measure TCR-1, the KRRC shall develop, in consultation with Affected Tribes, a Historic Properties Management Plan. In part, the Tribal Cultural Resources Management Program (TCRMP) shall include site-specific mitigation measures for potentially affected TCRs [Tribal Cultural Resource]. The TCRMP shall provide for ongoing consultation or site-specific mitigation refinement with the relevant Affected Tribe(s) with a traditional and cultural affiliation to an impacted TCR, as appropriate and feasible consistent with the schedule for Project implementation.

Mitigation Measure TCR-1 further states, “Consistent with KHSA [Klamath Hydroelectric Settlement Agreement] Section 7.6.6, the TCRMP shall also include recommended measures to identify, avoid, minimize, or mitigate adverse impacts to TCRs during rehabilitation and expansion of Fall Creek Hatchery (FCH), consistent with California Public Resources Code section 21084.3(a) and (b). Please refer to Volume III Attachment 1 for the final Section 3.12 *Historical Resources and Tribal Cultural Resources.*

The EIR thus discloses the potential for changes to the Fall Creek Hatchery plans based on cultural resources.

Comment ORG46-71
Similar to the comment on the Fall Creek Hatchery, the DEIR does not accurately represent the Proposed Project, which would limit the upstream distribution of anadromous fish in Fall Creek such that they would not be provided access to either of the areas where the City of Yreka diverts water thereby eliminating the need for updated fish screens.

Response to Comment ORG46-71
Section 2.7.7 *Proposed Project – City of Yreka Water Supply Pipeline Relocation* has been revised to include the Klamath River Renewal Corporation’s (KRRC’s) updated proposal to include a permanent fish passage barrier at the Fall Creek Hatchery (FCH), located approximately 200 to 300 feet downstream of both Dams A and B (KRRC 2019a), such that there would be no need for updates to

the City of Yreka's Dam A or B existing diversion intake structures. This would reduce by 200 to 300 feet the approximately one mile of increased habitat for anadromous salmonids upstream of Iron Gate Dam that would occur under the Proposed Project; however, as discussed in Potential Impact 3.3-24, the proportion of anadromous salmonids anticipated to use the habitat in Fall Creek is relatively minor in comparison with the totality of newly accessible habitat upstream of Iron Gate Dam under the Proposed Project and there would be no change in significance determinations in the EIR. Please refer to Volume III Attachment 1 Section 2.7.7 *Proposed Project – Proposed Project – City of Yreka Water Supply Pipeline Relocation* for the revisions.

Comment ORG46-72

Daggett Road bridge gets completely replaced under the Proposed Project. The DEIR references the "...existing timber traffic bridge along Daggett Road..."

Response to Comment ORG46-72

Section 2.7.7 *Proposed Project – Proposed Project – City of Yreka Water Supply Pipeline Relocation* has been clarified as requested. Please refer to Volume III Attachment 1 Section 2.7.7 *Proposed Project – Proposed Project – City of Yreka Water Supply Pipeline Relocation* for the revisions.

Comment ORG46-73

Except for the salvaging of overwintering fish from the mainstem Klamath River, AR-2 does nothing to minimize the impacts of high loads of suspended sediments juvenile salmonids migrating from the tributaries. This means that AR-2 is not a true mitigation measure for many of the impacts associated with the Proposed Project.

Response to Comment ORG46-73

As described in Volume I Section 2.7.8.1 *Proposed Project – Other Project Components – Aquatic Resource Measures*, Aquatic Resource Measure AR-2 proposes three primary actions to reduce short-term suspended sediment impacts to outmigrating juvenile fish: (1) salvaging mainstem overwintering juvenile salmonids prior to reservoir drawdown; (2) maintaining tributary-mainstem connectivity to ensure volitional fish passage between tributaries and the Klamath River (in conjunction with AR-1 efforts); and (3) developing a water quality monitoring network, trigger thresholds, and plan for salvaging and relocating juvenile fish from tributary confluence areas to cool water tributaries or nearby off-channel ponds. These actions are included in the Proposed Project and are not subject to CEQA Guidelines section 15126.4. As proposed by Klamath River Renewal Corporation (KRRC), these actions are appropriate in scale and type to offset anticipated impacts to juvenile salmonids from release of sediment under the Proposed Project. However, as discussed in Volume III Attachment 1 Potential Impact 3.3-1, mitigation measures AQR-1 and AQR-2 would be required to increase certainty of the effectiveness of the aquatic resource measures AR-1 and AR-2 and to reduce the short-term significant

adverse impacts of the Proposed Project on coho salmon critical habitat. Mitigation measures AQR-1 and AQR-2 are consistent with CEQA requirements for feasible, enforceable, and proportional mitigation, as detailed in CEQA Guidelines section 15126.4.

Comment ORG46-74

The DEIR indicates that the KRRC recreation plan is proposing a trail from J.C. Boyle to Iron Gate even though this crosses property that would be retained by PacifiCorp. No easement or easement-related discussions have occurred that would make this a reasonably foreseeable action. PacifiCorp recognizes that the DEIR says that the KRRC "may" provide these recreational opportunities, but inclusion of them in the DEIR misleads the reader into thinking that these are actually proposed. If they are truly proposed, then the DEIR needs to evaluate the impact of constructing, operating, and maintaining these elements of the Proposed Project.

Response to Comment ORG46-74

The Klamath River Renewal Corporation's (KRRC's) Definite Plan (2017) proposes that new river-based opportunities may include a new trail between J.C. Boyle Dam and the Iron Gate Fish Hatchery. Additional detail about land ownership is provided in Volume II Appendix B: *Definite Plan – Appendix Q*, where KRRC recognizes that the new trail would need to cross PacifiCorp Parcel A lands, Bureau of Land Management (BLM) lands, private lands, and potentially United States Forest Service (USFS) lands. For discussion of how the EIR considers the level of detail in KRRC's Recreation Plan, please refer to Master Response REC-2. This discussion notes that recreation plans are still under development. The EIR thus describes the proposed action, but also notes that the recreation components of the action are subject to change. Please also refer to Volume III Attachment 1 for the final Section 3.20 *Recreation*.

Comment ORG46-75

The DEIR says the Proposed Project would alter the 100-year floodplain immediately downstream of Iron Gate Dam but does not explain the cause or the nature of the alteration.

Response to Comment ORG46-75

As described in Volume I Section 2.7.8.4, *Proposed Project – Other Project Components Downstream Flood Control* (page 2-95) is part of the description of the applicant's Proposed Project. Volume I Section 3.6 *Flood Hydrology* describes the environmental resources that may be affected by the Proposed Project and is the more appropriate location for a detailed discussion of the causes and nature of expected floodplain alteration under the Proposed Project. More specifically, Potential Impact 3.6-3 (pages 3-630 to 3-633) presents the analysis of the causes and nature of the expected floodplain alteration under the Proposed Project.

Comment ORG46-76

There are two concerns with this discussion. First, given that more sediment has accumulated behind the dams since USBR completed their floodplain modeling in 2012 and that material would be moved downstream under the Proposed Project, the DEIR needs to explain why the modeling from 2012 is still accurate. Second, what happens if, after dam removal, FEMA decides that the 100-year floodplain is substantially higher than that generated by USBR in 2012 and there are MORE structures in this zone that should have been protected? Who is responsible for providing flood protection for those additionally at-risk structures? The DEIR also needs to state how was the 0.5 foot (ft) threshold chosen as the level at which flood mitigation was required.

Response to Comment ORG46-76

As discussed in Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 (pages 3-765 to 3-775), United States Bureau of Reclamation's (USBR's) hydraulic modeling approach used estimated sediment volumes that would be deposited behind the dams by 2020 (USBR 2012). The primary reservoir drawdown period for the Proposed Project would occur in early 2022. The increase in sediment volume between 2020 and 2022 would be an order of magnitude less than the uncertainty of the 2020 total sediment volume estimates, such that model results using the anticipated 2020 sediment volumes would still be applicable to the Proposed Project.

Hydraulic and sediment transport modeling conducted by USBR (2012) used methods consistent with accepted standards detailed by Federal Emergency Management Agency (FEMA) (2018). While the commenter speculates that FEMA could determine that the 100-year floodplain following dam removal is substantially greater (i.e., higher) from that modeled by USBR (2012) and that therefore, more structures could be at risk under a FEMA determination, the comment provides no particular reason why the USBR's (2012) floodplain delineation is incorrect or any reason to conclude that FEMA intends to re-delineate the floodplain. The comment does not explain why the USBR's modeling is an inaccurate assessment of the changed floodplain inundation, or that a different assessment would be either much larger, or a more accurate description of flood risk. Given the consistency of modeling approaches used by USBR with FEMA standards, it would be speculative to anticipate that FEMA would expand the 100-year floodplain such that the number of structures located in the altered 100-year floodplain would change materially from those identified by Klamath River Renewal Corporation (KRRC) in the Definite Plan, regardless of whether the altered floodplain boundary is provided by USBR (2012) or by FEMA as part of a future map update.

Regarding the use of a 0.5 foot threshold used in determining the area of potential significant impacts to the Klamath River floodplain, Section 3.6.5.2 *Flood Hydrology – Potential Impacts and Mitigation – River Floodplain* and

Volume II Appendix B: *Definite Plan* (page 270), explain that USBR (2012b) and KRRC have estimated that below Humbug Creek any change to the floodplain will be less than 0.5 feet, and that changes of less than 0.5 feet would not result in a significant effect. As FEMA does not recognize changes in flood elevations less than 1 foot, the application of a 0.5-foot change in flood elevation to rule out areas that could be significantly affected is a conservative approach to determining the potential effects of the Proposed Project on the Klamath River floodplain. Please refer to Volume III Attachment 1 for the revised Section 3.6.5.2 *Flood Hydrology – Potential Impacts and Mitigation – River Floodplain*.

Comment ORG46-77

The DEIR states that "The Draft Cultural Resources Plan, submitted with the Definite Plan CITE [sic], describes consultation completed by the date of submission by KRRC and PacifiCorp, acting as FERC's non-federal representatives..."

- *CITE appears to be a missing citation*
- *PacifiCorp is only involved tangentially in the consultation process*
- *The KRRC has been leading this effort and is responsible for all of the material in the Definite Plan including the Cultural Resources Plan.*

Response to Comment ORG46-77

Section 2.7.8.5 *Proposed Project – Proposed Project – Other Project Components – Cultural Resources* has been amended from the description in the Definite Plan and clarified to emphasize that Klamath River Renewal Corporation (KRRC) is leading the consultation process. The reference to "CITE" has been removed, as the citation was already in the text. Please refer to Volume III Attachment 1 Section 2.7.8.5 *Proposed Project – Proposed Project – Other Project Components – Cultural Resources* for the revisions.

Comment ORG46-78

The Traffic Management Plan represents coordination with the Oregon Department of Transportation, Caltrans, Klamath and Siskiyou counties, and the Oregon State Police/California Highway Patrol. However, the DEIR does not mention whether the Traffic Management Plan represents coordination with local towns, communities, and neighborhoods. These communities will be directly impacted by the Proposed Project and the DEIR should expand the discussion of outreach to include local towns, communities, neighborhoods, citizen's groups, and businesses.

Response to Comment ORG46-78

Please refer to Volume I Section 3.22.5 *Transportation and Traffic – Potential Impacts and Mitigation* (starting on page 3-1069) for a discussion of transportation-related impacts. As specifically noted in Volume I Section 3.22.5 *Transportation and Traffic – Potential Impacts and Mitigation* (page 3-1072), "The Proposed Project includes a draft Traffic Management Plan (Traffic Management

Plan) that identifies the key requirements that would be incorporated by the construction contractor into a final Traffic Management Plan. According to Appendix B: *Definite Plan – Appendix O2*, the Traffic Management Plan is a specialized program tailored to minimize impacts by applying a variety of techniques such as *Public Information, Motorist Information, Incident Management and Construction Strategies*. The major objectives of the Traffic Management Plan are to maintain efficient and safe movement of vehicles through the construction zone covered by activities in the Definite Plan and to provide public awareness of potential impacts to traffic on both haul routes and access roads to the four dam complexes". Definite Plan Appendix O-2 Traffic Management Plan, Section 1.2 further describes these 'Management Strategies' proposed to minimize construction-related traffic delays and maintain safe movement of vehicles during implementation of the Definite Plan".

As noted in their Draft EIR comments (ORG56), Klamath River Renewal Corporation (KRRC) has committed to addressing all potential traffic conflicts as part of their Final Traffic Management Plan (TMP). KRRC states that they are committed to ensuring that the TMP *"will maintain efficient and safe movement of the vehicles through the construction zone covered by activities in the Definite Plan".* The KRRC's comment also states that the *"Final TMP would be informed by KRRC's contractor's specific measures and methods for construction and input received from relevant local jurisdictions."* The TMP specifically describes a public outreach process.

Comment ORG46-79

In the first line of this table and footnote #2, the DEIR indicates that the Interim Measures Implementation Committee (IMIC) would continue to function following implementation of the Proposed Project. This is not the case; the IMIC would cease to exist when the KHSA is fully implemented. Additionally, footnote #2 references the Priority List of Projects and funds to be provided by PacifiCorp for water quality projects. Although this is accurate, it should only be attached the table entry for Interim Measure 11; as is noted in PacifiCorp (2018c) this water quality fund would be overseen by a steering committee and while member organizations may be similar to the IMIC, it would not be the IMIC.

PacifiCorp has no responsibility to continue any of the interim measures except Interim Measures 19 and 20 past decommissioning.

Response to Comment ORG46-79

References to Interim Measures Implementation Committee (IMIC) continuation following implementation of the Proposed Project have been corrected throughout the EIR to acknowledge that the IMIC would cease to exist when the Klamath Hydropower Settlement Agreement (KHSA) is fully implemented. Table 2.7-19 and reference to footnote number 2, within Section 2.7.9 *Proposed Project – Proposed Project – KHSA Interim Measures* have been revised according to the above discussion. For consistency, Table 3.24-1 in Section 3.24.1

Cumulative Effects – Introduction – Analysis Approach and Table 4.2-1 in Section 4.2.1.1 *Alternatives – No Project Alternative – Introduction – Alternative Description – KHSA Interim Measures* have also been revised per the above discussion. Please refer to Volume III Attachment 1 Section 2.7.9 *Proposed Project – Proposed Project – KHSA Interim Measures*, Section 3.24.1 *Cumulative Effects – Introduction – Analysis Approach*, and Section 4.2.1.1 *Alternatives – No Project Alternative – Introduction – Alternative Description – KHSA Interim Measures* for the revisions.

Comment ORG46-80

The transfer of lands from PacifiCorp's ownership to the KRRC is included in the transfer application for the lower Klamath Project that is pending before FERC.

Response to Comment ORG46-80

Section 2.7.10 *Proposed Project – Proposed Project – Land Disposition and Transfer* has been revised to clarify that this transfer is the subject of the KRRC's *Joint Application for Approval of License Amendment and License Transfer* submitted to Federal Energy Regulatory Commission (FERC) on September 23, 2016. Please refer to Volume III Attachment 1 Section 2.7.10 *Proposed Project – Proposed Project – Land Disposition and Transfer* for the revisions.

Comment ORG46-81

The inclusion of the statement "Because CEQA requires analysis of potential impacts and mitigation measures that are outside the State Water Board's regulatory purview for the Proposed Project, this EIR discusses and analyzes the effects of some mitigation measures that would not be enforceable by the State Water Board. It is the State Water Board's understanding that the KRRC may agree to implement certain mitigation measures through good neighbor agreements or other legally enforceable mechanisms (Appendix B: Definite Plan -Section 1)" leads to confusion in the document about which of these measures are enforceable by the CEQA lead agency, despite the footnotes, and it would be inappropriate to rely on any speculative agreements as the basis for the DEIR to reduce an impact to less than significant [Pub. Res. Code§ 21002.l (b); CEQA Guidelines§ 15126.4(a)].

Response to Comment ORG46-81

Please refer to Master Response CEQ-2.

Comment ORG46-82

In addition to the topics raised in Major Issue 2.2, the following specific changes should be made to Section 3.1.6:

- *A description of differences in assumptions and analytical methods used to derive the model results.*
- *Figures and charts should include clear definition of the parameter and time periods presented, including the hydrologic period used.*

- *A complete discussion of why it is sufficient to "bracket the range of 2013 BiOp flows" rather than maintain more comparable and updated probability distributions of flow duration and magnitude.*
- *Specific examples that demonstrate the robustness of the DEIR's assumption that merely bracketing the range of flows is sufficient to assess impacts.*

Response to Comment ORG46-82
Please refer to response to comment ORG46-6, which provides a response to the comment letter's identified Major Issue "2.2 Klamath River Flow Modeling". Additionally, Section 3.1.6 *Introduction – Summary of Available Hydrology Information for the Proposed Project* has been revised to clarify assumptions and analytical methods used to derive the hydrologic model results by explicitly stating how the Biological Opinion (BiOp) flows during fall/winter and spring/summer periods are calculated, to provide updated figures that include the most extended hydrologic period available for each flow comparison, and to provide additional discussion of how the range of 2013 BiOp Flows is within the range of modeled KBRA Flows approximately 99.9 percent of the time at Keno and Iron Gate dams. As discussed in response to comment ORG46-6 and revisions to Section 3.1.6, while the specific timing of flows and the likelihood of exceeding a specific flow during individual months changes between the 2013 BiOp and KBRA flows, modeled 2013 BiOp Flows less than or greater than modeled KBRA Flows would occur too infrequently (i.e., 0.01 percent of the time or less) to substantially alter the range of flow conditions in the Klamath River or previous model results using KBRA Flows. Please also refer to Master Response HYD-1 and Volume III Attachment 1 Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*.

Comment ORG46-83
The DEIR states "cold air temperatures and precipitation generally occur from November to March, corresponding to periods of higher flows and paragraph on colder water temperatures. Warmer air temperatures and drier conditions occur from April to October, corresponding to periods of lower flows and warmer water temperatures." These statements erroneously attribute water temperature conditions solely to air temperature changes. Water temperature responds in a more complex manner to heat exchange associated with meteorological parameters that include solar radiation, relative humidity (or wet bulb or dew point temperatures), wind speed, barometric pressure, as well as air temperature.

Response to Comment ORG46-83
Section 3.2.2.1 *Water Quality – Environmental Setting – Overview of Water Quality Processes in the Klamath Basin* provides a summary of general water temperature trends within the Klamath Basin. The following statement in this EIR section notes general seasonal trends in air temperature and precipitation and the *corresponding* general seasonal trends in water temperature and Klamath

River flows, and does not imply or assert that water temperature conditions are caused solely by air temperature changes: “Cold air temperatures and precipitation generally occur from November to March, corresponding to period of higher flows and colder water temperatures. Warmer air temperatures and drier conditions occur from April to October, corresponding to period of lower flows and warmer water temperatures.” As set forth in Section 3.2.2.2 *Water Quality – Environmental Setting – Water Temperature* water temperatures in the Klamath River are the result of multiple heat exchange processes, including short wave radiation (i.e., solar radiation), long wave radiation, sensible heat transfer, latent heat transfer (i.e., evaporation), heat transfer across the streambed, and advective and diffusive/dispersive heat transfer (i.e., flow and mixing) in the river, as well as groundwater interactions. Please see Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Comment ORG46-84

Regarding "River and reservoir water temperatures," the DEIR's general description that cooler water is released from reservoirs in spring and warmer water is released in early fall is not a universal tenet. This description is overly simplistic and does not account for reservoir residence time, stratification, outlet works, operations, and other factors.

Regarding Figure 3.2-2, algal toxins should probably not be on this graphic; recommend that the figure use the term “Algae" instead.

Response to Comment ORG46-84

Section 3.2.2.1 *Water Quality – Environmental Setting – Overview of Water Quality Processes in the Klamath Basin – River and Reservoir Water Temperatures* provides a summary of the general water temperature trends within the Klamath Basin. While there are occasional exceptions to the general water temperature trends that cooler water is released from the reservoirs in spring and warmer water is released in early fall, historical data from 2010 to 2017 downstream of Iron Gate Dam support the accuracy of the stated general trends as discussed in Section 3.2.2.2 *Water Quality – Environmental Setting – Water Temperature* and Appendix C, Section C.1 *Water Temperature*. The specific water temperature conditions in the Hydroelectric Reach, Middle and Lower Klamath River, Klamath River Estuary, and Pacific Ocean Nearshore Environment are analyzed in Potential Impacts 3.2-1 and 3.2-2, so variations between the measured and modeled water temperature conditions downstream of Lower Klamath Project reservoirs and the general water temperature trends presented in Section 3.2.2.1 *Water Quality – Environmental Setting – Overview of Water Quality Processes in the Klamath Basin – River and reservoir water temperatures* would not alter the analysis of potential impacts in the EIR. Additional factors that can influence the water temperature trends in rivers within and downstream of reservoirs, including installation of a powerhouse intake barrier/thermal curtain, are discussed further in the aforementioned EIR sections.

Figure 3.2-2 represents the intensity of algae growth with darker green shading in surface waters, as noted in the figure caption. Algal toxins are specified on the figure because they are released when algae (i.e., phytoplankton) blooms die, as noted in the text accompanying Figure 3.2-2.

Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality* and the final Appendix C *Water Quality Supporting Technical Information*.

Comment ORG46-85

The DEIR states "Releases or this deeper, oxygen depleted water from the bottom of the reservoir can cause serious problems for downstream fish and other aquatic biota." This statement should include: "...if release waters are not oxygenated through the outlet facilities and/or powerhouse, or through other means." While this statement can be true in general, it does not necessarily apply to the existing Klamath Hydroelectric Project where intakes for the powerhouses are not at the bottom or the reservoir. There is also no evidence that dissolved oxygen has ever been a problem downstream or Iron Gate Dam as is implied in the DEIR. The discussion should more accurately reflect existing conditions.

Response to Comment ORG46-85

Section 3.2.2.1 *Water Quality – Environmental Setting – Overview of Water Quality Processes in the Klamath Basin* has been clarified as requested. Please refer to Volume III Attachment 1 Section 3.2.2.1 *Water Quality – Environmental Setting – Overview of Water Quality Processes in the Klamath Basin* for the revision.

Appendix C, Section C.4.2.1 *Iron Gate Dam to Salmon River* provides a discussion of dissolved oxygen data from 2001 to 2016 in the Klamath River from Iron Gate Dam to its confluence with the Salmon River. Data show dissolved oxygen conditions immediately downstream of Iron Gate Dam regularly falling below 8.0 milligrams per liter (mg/L) and the current Basin Plan minimum dissolved oxygen criteria based on percent saturation. Dissolved oxygen data (in mg/L and in percent saturation) in the Klamath River immediately downstream of Iron Gate Dam (river mile [RM] 193.1) measured by PacifiCorp using a multi-parameter sonde are summarized from June 2008 to December 2016 in Appendix C, Section C.4.2.1 *Iron Gate Dam to Salmon River* Table C-4. The summary specifically highlights the average monthly dissolved oxygen percent saturation has continued to exhibit in recent years dissolved oxygen percent saturation values below the Basin Plan minimum dissolved oxygen criteria during portions of the year, with the majority of measured low dissolved oxygen saturation values occurring from August through November. Please refer to Volume III Attachment 1 for the final Appendix C *Water Quality Supporting Technical Information*.

Comment ORG46-86

In the discussion or "Reservoir mixing and dissolved oxygen," the DEIR states "In late fall, thermal stratification typically breaks down as the surface water layer cools and wind mixing or the water column occurs. This process is called reservoir turnover (Figure 3.2-2)." This discussion belongs in Section 3.2.2.2 Water Temperature.

Response to Comment ORG46-86

Section 3.2.2.1 *Water Quality – Environmental Setting – Overview of Water Quality Processes in the Klamath Basin* has been slightly modified to move the sentence below from the end of the *Reservoir mixing and dissolved oxygen* sub-section to the end of the preceding *River and reservoir water temperature* sub-section. Please refer to Volume III Attachment 1 Section 3.2.2.1 *Water Quality – Environmental Setting – Overview of Water Quality Processes in the Klamath Basin* for the revision.

Comment ORG46-87

In the discussion of "Phytoplankton in reservoirs," the DEIR states "This can result in wide daily swings in dissolved oxygen and pH, which is stressful to aquatic biota." The Klamath River is naturally weakly buffered and within both reservoir surface waters and in river waters the pH can vary considerably over a day during summer periods (PacifiCorp 2004a, 2014). These pH swings will occur in this weakly buffered aquatic system with or without reservoirs (PacifiCorp 2004a, 2014).

The remainder of paragraph 2 (pg. 3-20) focuses on toxin producing algae and toxins. The DEIR should clarify that there are always times or locations where the reservoirs do not have toxin producing algae present. In addition, PacifiCorp has installed and maintained a barrier curtain in Iron Gate Reservoir to segregate surface waters and limit release of phytoplankton to downstream reaches. Although operational refinements and investigations are still going on, work to date indicates that the barrier curtain successfully segregates the surface waters and reduces release of surface waters were most of the cyanotoxins are found (Watercourse 2016; PacifiCorp 2017b).

Response to Comment ORG46-87

Section 3.2.2.1 *Water Quality – Environmental Setting – Overview of Water Quality Processes in the Klamath Basin* discusses the general effects of hydroelectric project operations on water quality. Please see Section 3.2.2.6 *Water Quality – Environmental Setting – pH* and Appendix C, Section C.5 *pH* for a more specific discussion of pH existing conditions in the Klamath River, including the weakly buffered nature of the Klamath River. Please see Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* and Appendix C, Section C.6 *Algal Toxins and Chlorophyll-a* for a more specific discussion of the algal toxins under existing conditions in the Klamath River.

Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality* and the final Appendix C *Water Quality Supporting Technical Information*.

The discussion in Section 3.2.2.1 *Water Quality – Environmental Setting – Overview of Water Quality Processes in the Klamath Basin – Phytoplankton in reservoirs* regarding algal toxins indicate that blue-green algae blooms and algal toxins can occur seasonally, not that they are always present throughout the reservoirs during any time of the year. Whether or not there are always times when or locations where the reservoirs do not have toxin-producing algae present has no bearing on overall compliance with water quality standards for these algae or algal toxins.

Please refer to Volume I Section 4.2.2 *Alternatives – No Project Alternative – Water Quality – Suspended Sediments* Potential Impact 4.2.2-2 (pages 4-109 to 4-111) for a discussion of the effects to date of the intake barrier/thermal curtain on releases of blue-green algae [cyanobacteria] downstream of Iron Gate Dam.

The text has been revised to amplify other statements in the EIR indicating that the Klamath River is a weakly buffered system. Please refer to Volume III Attachment 1 Section 3.2.2.1 *Water Quality – Environmental Setting –Overview of Water Quality Processes in the Klamath Basin* for the revisions.

Comment ORG46-88

In the discussion of "Nutrient cycling in reservoirs and internal loading," the DEIR states "On an annual basis, the majority of nutrients entering a reservoir from a watershed are eventually discharged downstream, with only a small fraction being retained in the reservoir sediments." The "only a small" modifier is biased and should be replaced with the actual quantity of retention in percent and mass (in tons). The magnitude of nutrient retention has been calculated for Copco and Iron Gate reservoirs combined at 12 to 16 percent of the total phosphorus inflow and about 18 to 21 percent of the total nitrogen inflow (PacifiCorp 2006; Kann and Asarian 2007; Asarian and Kann 2005; Asarian et al. 2009).

The DEIR states "During reservoir turnover when the stratification breaks down, these nutrient rich waters are mixed throughout the reservoir water column and the nutrients can be released downstream, resulting in a secondary (fall) phytoplankton bloom (which includes blue-green algae)." However, the DEIR does not describe or address the dynamics of destratification in the reservoir, including the fact that Copco 1 and Iron Gate reservoirs are two large reservoirs in series which can affect the turnover of Iron Gate Reservoir depending on conditions in Copco Reservoir.

The DEIR suggests that downstream releases of nutrients can lead to phytoplankton blooms in the river. This is undocumented, and late in the year has a low chance of occurring. Complete destratification and a return to isothermal conditions typically occurs in Iron Gate during November or

December, which is after the growth season for phytoplankton is over (see PacifiCorp 2014).

Response to Comment ORG46-88
Section 3.2.2.4 *Water Quality – Environmental Setting – Nutrients* has been clarified to specify the most recent calculated annual nutrient retention amounts for the Lower Klamath Project dams (Asarian et al. 2009). While these annual nutrient retention amounts are cited in PacifiCorp (2014), the magnitudes of the most recent annual nutrient retention for Copco No. 1 and Iron Gate reservoirs in Asarian et al. (2009) differ from previous studies due to earlier studies either analyzing nutrient data from only part of a year or improving the methods for estimating nutrient retention in the reservoirs.

Kann and Asarian (2005) and PacifiCorp (2006) analyze nutrient data from March/April to November 2002, so the nutrient retention estimates in those citations do not represent *annual* nutrient retention. Asarian et al. (2009) analyzes nutrient data from May 2005 to December 2007, while Asarian and Kann (2007) analyzes nutrient data from May 2005 to May 2006, but the estimates of nutrient retention in Copco No. 1 and Iron Gate reservoirs for May 2005 to May 2006 changed between Asarian and Kann (2007) and Asarian et al. (2009) because Asarian et al. (2009) had more accurate accounting of the effects of hydropower peaking, incorporated ungaged flows, and used multiple regression models to estimate nutrient load. Please see Asarian et al. (2009) for more details on the methodological improvements and resulting differences in nutrient retention estimates in Copco No. 1 and Iron Gate reservoirs between Asarian and Kann (2007) and Asarian et al. (2009). Please refer to Volume III Attachment 1 Section 3.2.2.1 *Water Quality – Environmental Setting – Overview of Water Quality Processes in the Klamath Basin – Nutrient cycling in reservoirs and internal loading* for the revisions.

Comment ORG46-89
The DEIR states "Slow transport of water downstream and modified timing and magnitude of river flows can affect the growth of periphyton downstream of hydroelectric dams." Although this statement can be true in the larger-scale and the Klamath Hydroelectric Project reservoirs do impound water, the overall flow rates in the Klamath River are largely unaffected by the hydroelectric dams due to their lack of active storage capacity, with the exception of the peaking reach between J.C. Boyle Powerhouse and Copco Reservoir. Downstream of Iron Gate Dam, flow rates under current operations, particularly during summer periods when periphyton growth occurs, will be similar to those under the Proposed Project because they would continue to be managed by USBR with essentially the same target flow rates (USBR 2018b). Under current operations, periphyton is limited to the river margins, and growth in the inundated river channel is absent due to depth and light limitation.

The DEIR states "Natural scouring of periphyton populations can be diminished downstream of large dams due to altered flows and interception of coarse sediment movement by the dam, leading to seasonal occurrence of large periphyton mats that can cause water quality problems and provide abundant habitat for fish parasites." However, the flow rates downstream of Iron Gate Dam under current operations during summer (when much of the periphyton growth occurs) will be similar to those under the Proposed Project. Periphyton colonizes the channel bed after winter flows abate and will extend continuously throughout the river reaches from J.C. Boyle Reservoir to the Iron Gate Dam site following potential dam removal.

The DEIR needs to further update this discussion with recent observations from the Klamath Fish Disease Workgroup that the polychaete worms that are the intermediate host for fish parasites are also found in high densities in sand/silt habitat and on boulders (see True et al. 2016). The DEIR should also acknowledge that the Klamath Hydroelectric Project does not meaningfully reduce the magnitude of river flows downstream of Iron Gate Dam that would be necessary to result in periphyton scouring. Prior analysis conducted by USBR shown that river flows will not appreciably change as a result of potential dam removal (USBR 2011) due to the small amount of active storage in the reservoirs. Dam operations can achieve flow variability downstream of Iron Gate Dam to provide biological benefits that can mitigate for potential impacts related to flow modifications. Reservoir storage can also be activated to provide for special flow releases downstream of Iron Gate Dam to mitigate fish disease in the Klamath River as has occurred in recent years (PacifiCorp 2018b).

The DEIR states "Periphyton can influence riverine water quality by affecting nutrient cycling and diel (i.e., 24-hour cycle) fluctuations in dissolved oxygen and pH." However, the impact of an additional 30 miles of periphyton and macrophytes on water quality has not been addressed in the DEIR.

Response to Comment ORG46-89

Section 3.2.2.1 *Water Quality – Environmental Setting – Overview of Water Quality Processes in the Klamath Basin* summarizes the ***general*** influence of hydroelectric project operations on water quality. The discussion of the general influence of hydroelectric project operations on periphyton growth downstream of reservoirs such as the Lower Klamath Project reservoirs is meant to provide background context for the potential physical, chemical, and biological effects of dams, rather than the details of the specific effects that have been documented the Klamath River due to the presence of the Lower Klamath Project dams. The specific details about water quality existing conditions in the Klamath River are discussed in Section 3.2.2.2 *Water Quality – Environmental Setting – Water Temperature* through Section 3.2.2.8 *Water Quality – Environmental Setting – Inorganic and Organic Contaminants*. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

The specific details about periphyton growth downstream of Iron Gate Dam are discussed in Volume I Section 3.4.2.4 *Phytoplankton and Periphyton – Environmental Setting – Middle and Lower Klamath River – Periphyton* (pages 3-418 to 3-420).

Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project* summarizes the influence of the Lower Klamath Project dams on habitat for aquatic resources in the Klamath River, including a summary of the influence of the Lower Klamath Project dams on diseases and parasites. Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Disease and Parasites* specifically states that polychaete worms are present in a variety of habitat types, including runs, pools, riffles, edge-water, and reservoir inflow zones, as well as sand, gravel, boulders, bedrock, aquatic vegetation, and they are frequently found among mats of filamentous periphytic algal species (e.g., *Cladophora sp.*) that traps fine sediment and detritus (Bartholomew and Foott 2010). As such, an additional citation about the habitats of polychaete worms is unnecessary. Additionally, the comment citation to True et al. (2016) does not support the comment's assertion that polychaete worms are found in high densities in sand/silt habitat and on boulders because True et al. (2016) did not collect or report any data on the habitats where polychaete worms are found. True et al. (2016) collected fish samples from five reaches in the Klamath River and analyzed the prevalence of *Ceratonova shasta* and *Parvicapsula minibicornis* parasite infections with variations in water temperature and flow. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Potential Impact 3.2-8, Potential Impact 3.2-10, and Potential Impact 3.2-11 provide a discussion of the potential impacts of periphyton growth on nutrients, dissolved oxygen, and pH. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Please refer to response to comment ORG46-34, ORG46-136, ORG46-137, ORG46-146, ORG46-149, ORG46-266, ORG46-451 for additional discussion of the influence of periphyton and macrophytes on water quality conditions in the Klamath River. Please refer to response to comment ORG46-267 for additional information regarding the potential impacts of the Proposed Project on the distribution of periphyton and macrophyte communities in the Klamath River.

Comment ORG46-90

The DEIR states "While natural diel (24-hour) water temperature variations occur in the river, daily peaking operations at J.C. Boyle Powerhouse (river mile [RM) 225.2) result in an increase in the daily water temperature range in the Bypass Reach because warmer reservoir discharges are diverted around this reach (see also Section 2.3.1 J.C. Boyle Dam Development) and cold groundwater springs enter the river and dominate remaining flows." The DEIR should clarify that

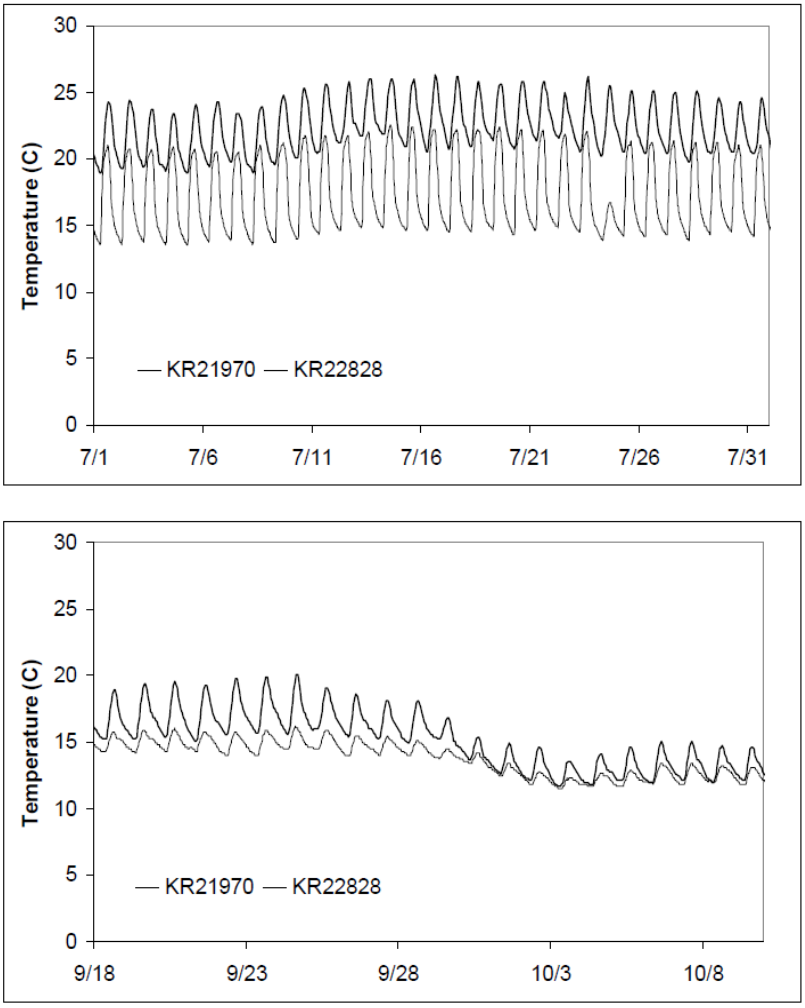
bypassing waters around this reach result in a notably cooler river and reduced diurnal range (not increased) because of the dominance of spring inflows in the bypass reach.

The DEIR incorrectly states that "At the upstream end of the Peaking Reach, the natural, cold groundwater input into the Bypass Reach, combined with fluctuations in river flow due to hydroelectric power operations in the Peaking Reach also produces an observed increase in daily water temperature range above the natural diel water temperature fluctuations (Kirk et al. 2010)." Peaking flows are derived from water stored in J.C. Boyle Reservoir and are large relative to those likely to exist if the J.C. Boyle Development were not in place and USBR was managing flow releases for salmonids out of Keno Dam. Both factors lead to a diel range that is more attenuated under existing conditions than would occur under a no dams scenario such as the Proposed Project.

Response to Comment ORG46-90

J.C. Boyle Bypass Reach water temperatures are typically cooler from May to September and warmer from November to March than ambient river temperatures upstream or downstream and daily variations in water temperatures are reduced due to spring inflows to the J.C. Boyle Bypass Reach with a relatively constant water temperature (approximately 11 to 12°C) throughout the year (PacifiCorp 2004a-1; Kirk et al. 2010).

Section 3.2.2.2 *Water Quality – Environmental Setting – Water Temperature* correctly states J.C. Boyle hydroelectric power operations produce an increase in the daily water temperature range above the natural diel water temperature fluctuations in the J.C. Boyle Peaking Reach. As detailed in PacifiCorp (2004a-1) Figures 3.7-7a and 3.7-7b (reproduced below), the Klamath River water temperature and daily water temperature variations are greater during peaking operations than non-peaking flows. PacifiCorp (2004a-1) Section 3.7.1 *Water Temperature* (page 3-13) specifically states that the diurnal range of water temperature variation is larger in the peaking reach downstream of the J.C. Boyle Powerhouse during peaking operations and the range of daily water temperature variation downstream of the powerhouse is greatly reduced when no peaking operations occur (i.e., constant daily discharge). The water temperature data under non-peaking flows from 2002 (Figures 3.7-7a and 3.7-7b from PacifiCorp [2004a]) indicate that the water temperature and daily water temperature variations would decrease under the Proposed Project after J.C. Boyle Dam is removed and peaking operations cease.



Figures 3.7-7a and 3.7-7b from PacifiCorp (2004a-1). Klamath River water temperature measured in 2002 at KR22828 (approximately river mile [RM] 233.3) (upper curve in both plots) upstream of the J.C. Boyle Reservoir and at KR21970 (approximately RM 224.45) (lower curve in both plots) downstream of the J.C. Boyle Powerhouse during peaking operations (top plot) and during non-peaking flows (bottom plot).

Section 3.2.2.2 *Water Quality – Environmental Setting – Water Temperature* has been revised to clarify the water temperature conditions in the J.C. Boyle Bypass Reach and the Peaking Reach. Please refer to Volume III Attachment 1 Section 3.2.2.2 *Water Quality – Environmental Setting – Water Temperature* for the revisions.

Comment ORG46-91

The DEIR mentions the powerhouse intake barrier curtain in Iron Gate Reservoir installed by PacifiCorp under Interim Measure 11. The principal purpose of the barrier curtain is to segregate surface waters in Iron Gate Reservoir and thereby reduce concentrations of blue-green algae releases to the Klamath River. A

byproduct of the curtain is slightly cooler release temperatures (Watercourse 2016; PacifiCorp 2017b).

The DEIR concludes that "modest" water quality improvement is possible with the curtain but suggests such improvement would not be adequate to achieve compliance with the Water Quality Plan or Klamath River TMDLs. Aside from PacifiCorp's position that the Klamath River TMDLs are technically flawed (as explained in TMDL-specific comment 3.2-34), the DEIR does not accurately point out that the powerhouse intake barrier curtain in Iron Gate Reservoir installed by PacifiCorp under Interim Measure 11 is a prototype for testing and design refinement. The curtain is not designed and installed, nor is it operated to achieve compliance with the thermal plan included in the TMDL.

The DEIR also does not adequately explain or assess the results of the studies conducted on the prototype intake barrier curtain in Iron Gate Reservoir. These studies indicate that the curtain is effective at isolating near-surface waters of Iron Gate Reservoir upstream of the curtain (e.g., Watercourse 2016; PacifiCorp 2017b). Water quality samples, physical measurements, velocity profiles, and field observations of conditions consistently identified that waters of the photic zone, where the majority of blue-green algae occur, were largely isolated to the upstream side of the curtain. Water that ultimately passed under the curtain was drawn from deeper, cooler depths in regions of Iron Gate Reservoir upstream of the curtain. Regarding blue-green algae concentrations, monitoring results indicated reductions in Aphanizomenon (97 percent), Microcystis (82 percent), microcystin (70 percent), and chlorophyll-a (61 percent) occurred downstream of Iron Gate Dam when compared to surface samples collected at a depth of O .S meter upstream of the barrier curtain (Watercourse 2016; PacifiCorp 2017b).

Response to Comment ORG46-91

Section 3.2.2.2 *Water Quality – Environmental Setting – Water Temperature* explains and assesses the results of the intake barrier/thermal curtain studies with respect to its influence on water temperature. In addition, Section 3.2.2.2 *Water Quality – Environmental Setting – Water Temperature* notes that a purpose of the powerhouse intake barrier/thermal curtain was to isolate surface waters in Iron Gate Dam to reduce downstream releases of blue-green algae in the reservoir. Section 3.2.2.2 *Water Quality – Environmental Setting – Water Temperature* has been revised to clarify that the primary purpose of the intake barrier/thermal curtain is to manage blue-green algae releases to the Klamath River. The intake barrier/thermal curtain tested in 2014 was referred to as a prototype and the current intake barrier/thermal curtain installed in 2015 has not been described as a prototype in published, publicly available PacifiCorp reports on its operation and performance since then (PacifiCorp 2016a, 2017a, 2018a). Water temperature improvements from operation of the intake barrier/thermal curtain would be potentially limited by the need to access water with higher dissolved oxygen concentrations to comply with dissolved oxygen standards, with the curtain completely rolled up during portions of 2017 to maximize

dissolved oxygen concentrations for aquatic life (PacifiCorp 2018a). Please refer to Volume III Attachment 1 Section 3.2.2.2 *Water Quality – Environmental Setting – Water Temperature* for the revisions. Section 3.2.2.2 *Water Quality – Environmental Setting – Water Temperature* is focused on the water temperature under existing conditions, so it does not summarize the influence of the intake barrier/thermal curtain on blue-green algae, chlorophyll-*a*, or microcystin.

The potential water temperature improvement from the intake barrier/thermal curtain is considered modest relative to the magnitude of the thermal lag caused by Iron Gate Reservoir during summer through fall (i.e., mid-June to early-November). Monitoring results indicate that the curtain reduces the entrainment of *Aphanizomenon flos-aquae*, *Microcystis aeruginosa*, microcystin, and chlorophyll-*a* into the Iron Gate Powerhouse intake and subsequent release downstream into the Klamath River during the period the intake barrier/thermal curtain was in use (PacifiCorp 2016a, 2017a), but the magnitude of the reduction varies widely over time for some parameters such that the 72- to 96-hour average percent reduction reported in the comment would not fully characterize the intake barrier/thermal curtain performance. While 72-hour average percent reduction of *Aphanizomenon flos-aquae* (i.e., 97 percent) reasonably represents the 24-hour percent reduction of *Aphanizomenon flos-aquae* range (i.e., 93 to 99 percent), the *Aphanizomenon flos-aquae* cell count still exceeded the California Cyanobacteria Harmful Algal Bloom (CCHAB) Human Health Secondary Trigger Level for Total Potentially Toxigenic Cyanobacteria [blue-green algae] Species of 4,000 cells/mL in two measurements (i.e., 9/2/2015 18:00 and 9/3/2015 2:00). The 72-hour average percent reduction of *Microcystis aeruginosa* from the intake barrier/thermal curtain is 82 percent, but the 24-hour percent reduction of *Microcystis aeruginosa* ranges from 74 to 92 percent. Additionally, the ranges in the 24-hour percent reduction of microcystin (i.e., 25 to 84 percent) and chlorophyll-a (i.e., 1 to 89 percent) are significantly different from the 72- or 96-hour average percent reduction (70 percent for microcystin; 61 percent for chlorophyll-a) (PacifiCorp 2016a). It is also worth noting that monitoring results from 2016 show a relatively large percent reduction in the total cyanobacteria and total *Microcystis aeruginosa* from upstream of the curtain to downstream of Iron Gate Dam, but the total cyanobacteria and total *Microcystis aeruginosa* downstream of Iron Gate Dam exceeded the CCHAB Human Health Secondary Trigger Level for Total Potentially Toxigenic Cyanobacteria [blue-green algae] Species during multiple sampling events. Water quality monitoring data from 2017 and 2018 downstream of Iron Gate Dam also show multiple exceedances of the Klamath Total Maximum Daily Loads (TMDLs) phytoplankton chlorophyll-a target (i.e., 10 ug/L) and multiple microcystin posting limits (e.g., 6 ug/L for CCHAB Warning TEIR I; Table 3.2-10) (Watercourse Engineering, Inc. 2018, 2019). An analysis of the intake barrier/thermal curtain performance during 2017 or 2018 has not been published and PacifiCorp continues to test and refine the intake barrier/thermal curtain design and operations.

Overall, the available data show the intake barrier/thermal curtain would potentially reduce transport of *Aphanizomenon flos-aquae*, *Microcystis aeruginosa*, microcystin, and chlorophyll-*a* from Iron Gate Reservoir into the Klamath River downstream of Iron Gate Dam*,* but the data do not indicate that this measure would consistently reduce *Aphanizomenon flos-aquae*, *Microcystis aeruginosa*, microcystin, and chlorophyll-*a* such that they would no longer cause an exceedance of water quality standards, cause an exceedance of CCHAB trigger levels, or achieve the Klamath TMDLs phytoplankton chlorophyll-a target of 10 ug/L for Copco No. 1 and Iron Gate reservoirs during the May to October growth season.

Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* has been revised to clarify the influence of the powerhouse intake barrier/thermal curtain on chlorophyll-a and microcystin concentrations in the Klamath River downstream of Iron Gate Dam. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

As discussed in ORG46-384, Section 4.2.2 *No Project Alternative – Water Quality – Chlorophyll-a and Algal Toxins* Potential Impact 4.2.2-*7* has been revised to clarify the influence of the powerhouse intake barrier/thermal curtain on chlorophyll-a and microcystin concentrations in the Klamath River downstream of Iron Gate Dam under the No Project Alternative. Please refer to Volume III Attachment 1 Section 4.2.2 *No Project Alternative – Water Quality – Chlorophyll-a and Algal Toxins* Potential Impact 4.2.2-*7* for these revisions.

Volume I Section 4.4.2.2 *Continued Operations with Fish Passage Alternative – Water Quality – Suspended Sediments* Potential Impact 4.2.2-2 (pages 4-109 to 4-111) provides a discussion of the results of the intake barrier/thermal curtain studies with respect to its influence on blue-green algae and organic suspended material under the Continued Operations with Fish Passage Alternative. As explained above, available data indicate the intake barrier/thermal curtain would reduce *Aphanizomenon flos-aquae*, *Microcystis aeruginosa*, microcystin, and chlorophyll-*a* downstream of Iron Gate Dam when it is deployed, but the available data do not indicate that this measure would improve algal-derived (organic) suspended material such that that there would no longer be an exceedance of water quality standards, CCHAB trigger levels, or the Klamath TMDLs phytoplankton chlorophyll-a target of 10 ug/L for Copco No. 1 and Iron Gate reservoirs during the May to October growth season.

Section 4.4.2.6 *Continued Operations with Fish Passage Alternative – Water Quality – Chlorophyll-a and Algal Toxins* Potential Impact 4.2.2.7 also has been revised to clarify the influence of the powerhouse intake barrier/thermal curtain on chlorophyll-a and microcystin concentrations in the Klamath River downstream of Iron Gate Dam under the Continued Operations with Fish Passage Alternative. Please refer to Volume III Attachment 1 Section 4.4.2.6

Continued Operations with Fish Passage Alternative – Water Quality – Chlorophyll-a and Algal Toxins Potential Impact 4.2.2.7 for these revisions.

Comment ORG46-92
The DEIR should include a discussion of the magnitude of "relatively low" diurnal temperature range downstream of Iron Gate Dam, and how that range is associated with intake depth in Iron Gate Reservoir.

Response to Comment ORG46-92
Please refer to Appendix C, Section C.1.2.1 *Water Temperature – Mid- and Lower Klamath Basin – Iron Gate Dam to Salmon River* (pages C-4 to C-10), especially Figures C-3 to C-6 (pages C-6 to C-8), for details on the relatively low variability in water temperature immediately downstream of Iron Gate Dam compared to Klamath River locations farther downstream.

Section 3.2.2.2 *Water Quality – Environmental Setting – Water Temperature* has been revised to clarify the influence of the Iron Gate Dam intake structure on water temperature downstream of Iron Gate Dam. The intake barrier/thermal curtain tested in 2014 was referred to as a prototype and the current intake barrier/thermal curtain installed in 2015 has not been described as a prototype in published, publicly available PacifiCorp reports on its operation and performance since then (PacifiCorp 2016a, 2017a, 2018a). Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*, including the revisions to Section 3.2.2.2 *Water Quality – Environmental Setting – Water Temperature*.

Comment ORG46-93
The DEIR states "Water temperatures in the Klamath River Estuary are linked to temperatures and flows entering the estuary, salinity of the estuary and resulting density stratification, and the timing and duration of sand berm formation across the estuary mouth." The DEIR should state that meteorological conditions are a large factor as well. While coastal "fog" and ocean-water input minimizes extreme water temperature much of the time, short duration heat spells (e.g., clear weather in the late summer and early fall) can quickly lead to elevated Estuary temperatures.

Response to Comment ORG46-93
Section 3.2.2.2 *Water Quality – Environmental Setting – Water Temperature* has been revised to clarify the influence of meteorological conditions on water temperature in the Klamath River Estuary. Please refer to Volume III Attachment 1 Section 3.2.2.2 *Water Quality – Environmental Setting – Water Temperature* for the revisions.

Comment ORG46-94
The DEIR states that the trapping of fine sediments does not appear to be a critical function of the Lower Klamath Project reservoirs with respect to the overall system, citing that only 3.4 percent of the annual sediment load originates

from the upper and middle Klamath River. This statement appears intended to demonstrate that the fine sediment load flowing into the reservoirs is nominal relative to the overall basin and thus has little impact to the river system. However, adopting a basin-scale perspective neglects to acknowledge the relative importance of the upstream sediment load at the reach-scale, for example, for the reaches immediately downstream of Iron Gate Dam where the relative proportion of the sediment load that comes from upstream of the reservoirs is nearly 100 percent. The relative proportion of sediment originating from upstream of the reservoir system may only be 3.4 percent for the basin as a whole but may be close to 100 percent of the annual load for the reach immediately downstream of the reservoirs. Therefore, from the reach-scale perspective, the local impact may be more significant.

Response to Comment ORG46-94
Appendix C, Section C.2.1.1 *Hydroelectric Reach*, especially Figure C-13, provides a discussion of the trapping of suspended materials within individual reservoirs. Please refer to Volume III Attachment 1 for the final Appendix C *Water Quality Supporting Technical Information.* Please refer to Volume I Section 3.11.2.4 *Geology, Soils, and Mineral Resources – Environmental Setting –Sediment Load* (pages 3-748 to 3-753) for a discussion of trapping of bedload materials.

Section 3.2.2.3 *Water Quality – Environmental Setting – Suspended Sediments* has been updated to clarify the Lower Klamath Project dams' influence on suspended material in the reaches immediately downstream of the dams. Please refer to Volume III Attachment 1 Section 3.2.2.3 *Water Quality – Environmental Setting – Suspended Sediments* for the revisions.

Comment ORG46-95
The DEIR does not explain the seasonal periphyton and macrophyte growth on the bed of the Klamath River downstream of Iron Gate Dam, and how that extensive growth contributes to the Klamath River organic matter load. Periphyton and macrophyte growth in the Klamath River is extensive, particularly upstream of the Scott River, where sediment transport frequency is lower. Growth is made possible by nutrients transported downstream from upstream sources including natural geologic nutrients (Shasta River springs, springs downstream of J.C. Boyle Dam, and sources from Upper Klamath Lake and in the Upper Klamath Basin), inputs at Upper Klamath Lake via nitrogen-fixing blue-green algae Aphonizomenon flos oquoe, and anthropogenic activities along the mainstem (including Upper Klamath Lake and upstream sources) and in tributaries. Periphyton and macrophytes convert bioavailable nutrients to plant biomass, and subsequent senescence yields particulate organic matter to the Klamath River. With removal of the dams under the Proposed Project, the spatial extent of periphyton and macrophytes would increase by approximately 30 miles (from Iron Gate Dam through what is now J.C. Boyle Reservoir). The

impacts of this substantial spatial increase in periphyton and macrophytes on water quality are not addressed in the DEIR.

Response to Comment ORG46-95
Section 3.2.2.3 *Water Quality – Environmental Setting – Suspended Sediments* summarizes the ***existing suspended sediment*** conditions in the Klamath River. Please refer to Volume I Section 3.4.2.4 *Phytoplankton and Periphyton – Environmental Setting – Middle and Lower Klamath River – Periphyton* (pages 3-418 to 3-420) for discussion of the seasonal periphyton (including macrophytes) abundance in the Klamath River downstream of Iron Gate Dam. Section 3.2.2.3 *Water Quality – Environmental Setting – Suspended Sediments* provides a summary of organic suspended material in the Klamath River and Appendix C, Section C.2 *Suspended Sediments* provides additional discussion of organic suspended material in the Klamath River based on measurements of total organic suspended material in the Klamath River, so periphyton (including macrophyte) contributions to the organic suspended material is inherently included in this discussion. However, the relative magnitudes of the phytoplankton and periphyton contributions to organic (algal-derived) suspended material in the Klamath River have not been and cannot be quantified from the available data since measurements of organic (algal-derived) suspended material in the Klamath River do not distinguish between the potential sources of the organic suspended material. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality* and the final Appendix C *Water Quality Supporting Technical Information.*

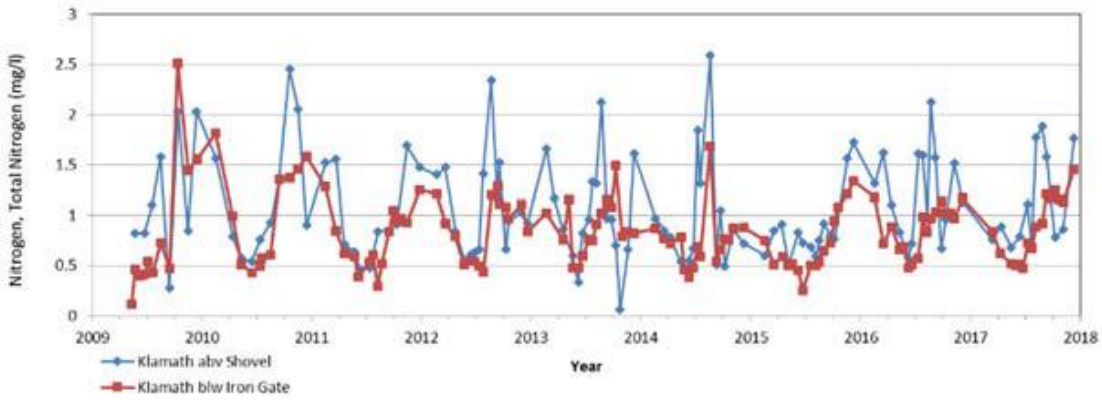
Potential Impact 3.2-6 provides a discussion of the potential changes in organic (algal-derived) suspended material in the Klamath River under the Proposed Project. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*, including Potential Impact 3.2-6.

Volume I Potential Impact 3.4-4 (pages 3-435 to 3-437) provides a discussion of the potential changes in periphyton growth in the Hydroelectric Reach under the Proposed Project. However, Potential Impact 3.4-4 has been revised to address other comments (e.g., ORG46-36), so please also refer to Volume III Attachment 1 Section 3.4.5.2 *Phytoplankton and Periphyton – Potential Impacts and Mitigation – Periphyton* Potential Impact 3.4-4 for the revisions. Please refer to response to comment ORG46-267 for additional information regarding the potential impacts of the Proposed Project on the distribution of periphyton and macrophyte communities in the Klamath River.

Section 3.2.2.3 *Water Quality – Environmental Setting – Suspended Sediments* has been revised to clarify that the discussion of existing organic suspended material conditions in the Klamath River includes the contribution of periphyton. Please refer to Volume III Attachment 1 Section 3.2.2.3 *Water Quality – Environmental Setting – Suspended Sediments* for the revisions.

Comment ORG46-96

The DEIR states "On an annual basis, nutrients typically decrease slightly through the Hydroelectric Reach due to settling of particulate matter and associated nutrients in Copco No. 1 and Iron Gate reservoirs..." However, the critical aspect of the residence time through the reservoirs is absent from this discussion. Using data from KHSA Interim Measure 15 monitoring, the attenuation and lag through Project reservoirs (for example from upstream of Copco Reservoir at the Klamath above Shove l Creek site to downstream of Iron Gate Dam) is apparent. In the data presented below, the annual outflow in total nitrogen was notably less than the annual inflow in total nitrogen. This nutrient loading lag effect is also assessed in PacifiCorp (2006).



Response to Comment ORG46-96

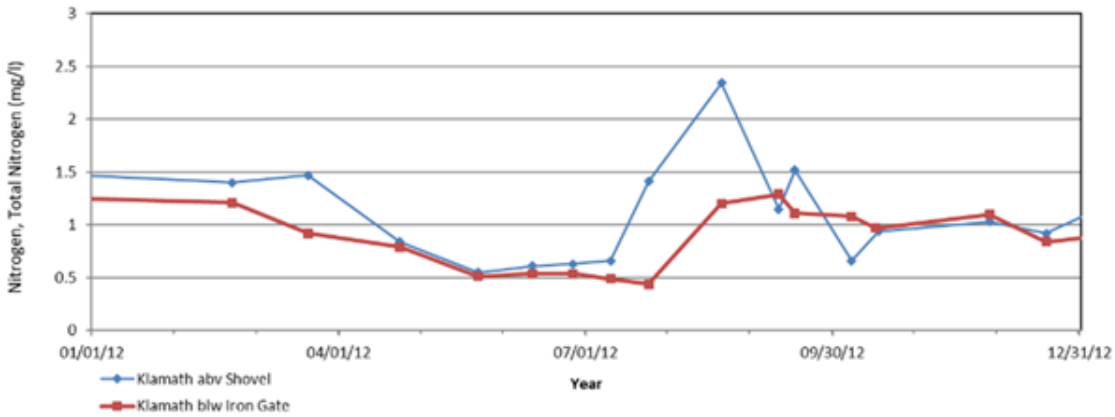
Contrary to the assertion in the comment, Section 3.2.2.4 *Water Quality – Environmental Setting – Nutrients* does acknowledge that seasonal nutrient variations are a combination of processes, including reservoir residence times. Please refer to the beginning of the next paragraph for the following statement: "Seasonal variations in concentrations of Total Nitrogen (TN) and Total Phosphorus (TP) occur in the Klamath River downstream of Iron Gate Dam, due to a combination of nutrient storage and release from the water column and reservoir sediments, varying water concentrations at the elevation of the penstock intakes, residence times, and possible atmospheric losses through denitrification (for TN only) (Asarian and Kann 2011)." Thus, the Interim Measure 15 (IM15) nutrient data presented in this comment do not conflict with the EIR discussion of annual and seasonal nutrient cycling in the reservoirs.

Appendix C, Section C.3.1.1 *Hydroelectric Reach* provides further discussion of the temporal lag in nutrients due to the hydraulic retention time of the Lower Klamath Project reservoirs. Please refer to Volume III Attachment 1 for the final Appendix C *Water Quality Supporting Technical Information*.

Section 3.2.2.4 *Water Quality – Environmental Setting – Nutrients* has been clarified with further discussion of seasonal nutrient dynamics in the Lower Klamath Project reservoirs from Appendix C, Section C.3.1.1 *Hydroelectric*

Reach. Please refer to Volume III Attachment 1 Section 3.2.2.4 *Water Quality – Environmental Setting – Nutrients* for the revisions.

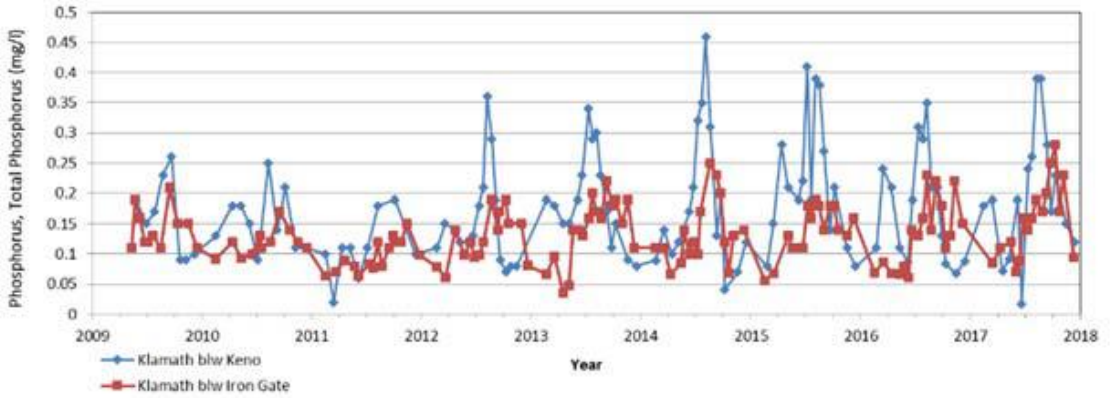
Comment ORG46-97



The DEIR states "Seasonal nutrient releases occur during periods of in-reservoir phytoplankton growth, and, in the case of TP [total phosphorus), can also result in downstream transport of bioavailable nutrients to the Lower Klamath River where they can stimulate excessive growth of periphyton (aquatic freshwater organisms attached to river bottom surfaces)." While nutrients sourced from the sediments do occur, the overall concentrations (or loads) are minor compared to the loads conveyed into the reservoirs via the Klamath River. Production occurs year-round, albeit seasonal maxima occurs in the late spring through early fall. While seasonal nutrient release occurs during periods of peak in-reservoir production, this nutrient release coincides with periods of thermal stratification and hypolimnetic anoxia - a necessary condition. However, thermal stratification also impedes mixing of hypolimnetic waters with surface waters (i.e., epilimnion) where the vast majority of primary production occurs. Thus, while nutrient release occurs during the peak primary production period, these nutrients are trapped in the hypolimnion and unavailable to promote surface water productivity. Further, the thermoclines in both Copco and Iron Gate reservoirs associated with seasonal stratification are located downstream of the invert of the intake works at both dams. Thus, little hypolimnetic water is entrained in the outlet works, and little nutrient enriched water is released to downstream river reaches.

The DEIR overstates this contribution and attributes seasonal variations downstream of the reservoir, in part, to this internal loading of the reservoirs. However, the inflowing Klamath River is by far the dominant source of nutrients into these reservoirs. Typical summer flows into (and through) Copco and Iron Gate reservoirs are on the order of 900 to 1,000 cubic feet per second (cfs). Given that Copco and Iron Gate reservoir storages are approximately 40,000 acre-feet and 50,000 acre-feet, respectively, and both stratify seasonally, these flow rates result in residences times of several weeks. Large upstream organic matter and nutrient loads are thus conveyed continuously throughout summer into these reservoir s and having a dominant impact on reservoir water quality

{PacifiCorp 2006, 2014). This can be clearly seen in the KHSA Interim Measure 15 data for total phosphorus concentrations at the Klamath River at Keno Dam as compared to the Klamath River downstream of Iron Gate Dam (see below).



Response to Comment ORG46-97

Appendix C, Section C.3.1.1 *Hydroelectric Reach* provides further information about the seasonal release of nutrients from in-reservoir production, including a discussion that total phosphorus (TP) released from sediments in Copco No. 1 and Iron Gate reservoirs during summertime anoxia remains in the hypolimnion until the reservoirs begin to turn over in the fall, rather than being released to downstream river reaches during the summer period of peak periphyton growth. Data from the reservoirs and downstream of Iron Gate Dam also indicate that some release of TP may occur between August and November, which could stimulate downstream periphyton growth during the late summer and fall. Please refer to Volume III Attachment 1 for the final Appendix C *Water Quality Supporting Technical Information*.

Section 3.2.2.4 *Water Quality – Environmental Setting – Nutrients* focuses its summary of existing nutrient conditions on increasing or decreasing nutrient trends through the Hydroelectric Reach and the Lower Klamath Project reservoirs rather than presenting a comparison of the magnitude of nutrients being transported by the Klamath River or exported from the Lower Klamath Project reservoirs. Section 3.2.2.4 *Water Quality – Environmental Setting – Nutrients* does not overstate the contribution of the nutrient releases from reservoir sediments because it only discusses the total magnitude of the nutrients in the Klamath River downstream of Iron Gate Dam. As discussed in Asarian et al. (2009) and cited in Appendix C, Section C.3.1.1 *Hydroelectric Reach*, nutrients being transported by the Klamath River into the Hydroelectric Reach and the Lower Klamath Project reservoirs are the dominant source of nutrients into these reservoirs and comprise the majority of nutrients being transported downstream of the reservoirs. While nutrient releases from reservoir sediments are typically a small percentage of the incoming nutrients to reservoirs, these sediment releases can result in nutrients downstream of one or more of the reservoirs being greater than nutrients upstream of the

corresponding reservoir (Asarian et al. 2009). As noted in response to comment ORG46-96, the discussion of nutrient loading accounts for the effect of residence time in the Lower Klamath Project reservoirs.

Section 3.2.2.4 *Water Quality – Environmental Setting – Nutrients* has been revised to clarify that nutrients being transported into the Hydroelectric Reach and the Lower Klamath Project reservoirs from upstream sources are the dominant source of nutrients into these reservoirs and comprise the majority of nutrients being transported downstream of the reservoirs. Please refer to Volume III Attachment 1 Section 3.2.2.4 *Water Quality – Environmental Setting – Nutrients* for the revision. The clarification does not change the results of the impact analysis.

Comment ORG46-98

The DEIR recognizes that the Copco No. 1 and Iron Gate reservoirs act to retain particulate matter and nutrients on an annual basis but characterizes the resulting decrease in particulate matter and nutrients as "slight." What this modifying adverb actually means in this instance is clearly debatable. A similar use of "slight" or "very small" is used throughout the DEIR when discussing nutrient retention effects of the reservoir s (e.g., DEIR pgs. 3-114, 3-115, 3-117, 3-118, 3-137, 3-431, 3-846). For example, on page 3-117, even after making the unrealistic assumption of full compliance with TMDL load allocations, the DEIR characterizes annual increases in total phosphorus of 10 to 15 micrograms per liter (µg/L) as "very small," when in fact such increases are arguably substantive. Furthermore, on page 3-116, the DEIR states "...TP [total phosphorus] concentrations in the Middle and Lower Klamath River would increase by approximately 2 to 12 percent for the June–October period if the dams were to be removed, while increases in TN [total nitrogen] concentrations would be relatively larger, at an estimated 37 to 42 percent for June through October and 48 to 55 percent for July through September (see Figure 3.2-18)." It is inaccurate to characterize changes in nutrient loading of up to 55 percent as either "slight," "very small," or "relatively larger." In fact, given the large inflowing nutrient loads to Copco Reservoir, particularly the large loads emanating to the Klamath River from Upper Klamath Lake, the substantial net retention provided by Copco and Iron Gate reservoirs (618 and 38 metric tons of nitrogen and phosphorus annually, respectively; Asarian and Kann 2007) is an important process for reducing nutrient loads to the Klamath River downstream of Iron Gate Dam.

The DEIR goes on to conclude that the loss of this long-term nutrient retention following reservoir elimination is "No Significant Impact" for the Proposed Project and the other partial dam-removal alternatives (e.g., see Table ES-1). On the other hand, the DEIR describes in several places that Copco No. 1 and Iron Gate reservoirs do not retain but rather release nutrients on a seasonal basis and the DEIR concludes that elimination of this seasonal release would be a "Beneficial Effect" of the Proposed Project and the other partial dam-removal alternatives (e.g., see Table ES-1). This differing characterization of annual versus seasonal

nutrient retention in Copco No. 1 and Iron Gate reservoirs is not supported with any analysis and instead represents a bias in which the significance of long-term nutrient retention in the reservoirs is downplayed and the significance of seasonal effects is elevated.

Regarding the seasonal effects related to reservoir nutrient retention or release, the DEIR does not adequately explain or account for the substantial variability in these assumed seasonal effects as evident in the calculated input and output nutrient loading values. Moreover, the DEIR' s analysis of the reservoirs' seasonal nutrient loading and retention does not adequately explain or account for the hydraulic residence time of water in the reservoirs. The reservoir residence times are considerable, allowing for processes such as decay and settling to occur. These processes are important to recognize and consider when assessing the roles of nutrient retention in the system. If inflow and outflow nutrient conditions are compared for a time interval that is less than water residence and travel time through the reservoirs, it is easy to mistakenly identify the reservoirs as sources of nutrients. For example, as discussed in PacifiCorp (2006), Copco Reservoir inflows may indicate higher levels of total nutrients than Iron Gate Reservoir outflows. However, Iron Gate is actually further reducing the input from Copco Reservoir because of the considerable residence time in Iron Gate Reservoir; that is, total nutrients in Copco Reservoir inflows has been reduced as the "peak" passes through the reservoirs.

Response to Comment ORG46-98
Section 3.2.2.4 *Water Quality – Environmental Setting – Nutrients* has been revised to clarify the most recent calculated annual nutrient retention amounts for the Lower Klamath Project reservoirs (Asarian et al. 2009) and what is meant by the use of "slight" when describing nutrient retention. Please refer to Volume III Attachment 1 Section 3.2.2.4 *Water Quality – Environmental Setting – Nutrients* for the revisions according to the following discussion. The magnitudes of the most recent annual nutrient retention for Copco No. 1 and Iron Gate reservoirs in Asarian et al. (2009) differ from previous studies cited by PacifiCorp (2014) and the comment (i.e., Asarian and Kann [2007]) due to earlier studies either analyzing nutrient data from only part of a year or improvements in the methods for estimating nutrient retention in the reservoir, as discussed in detail below.

Kann and Asarian (2005) and PacifiCorp (2006) analyze nutrient data from March/April to November 2002, so the nutrient retention estimates in those citations do not represent *annual* nutrient retention. Asarian et al. (2009) analyzes nutrient data from May 2005 to December 2007, while Asarian and Kann (2007) analyzes nutrient data from May 2005 to May 2006. The estimates of nutrient retention in Copco No. 1 and Iron Gate reservoirs for May 2005 to May 2006 changed between Asarian and Kann (2007) and Asarian et al. (2009) because Asarian et al. (2009) had more accurate accounting of the effects of hydropower peaking, incorporated un-gaged river flows, and used multiple regression models to estimate nutrient load. Please see Asarian et al. (2009) for

more details on the methodological improvements and resulting differences in nutrient retention estimates in Copco No. 1 and Iron Gate reservoirs between Asarian and Kann (2007) and Asarian et al. (2009).

Section 3.2.2.4 *Water Quality – Environmental Setting – Nutrients* has been revised to clarify the analysis of seasonal nutrient retention or release with the most recent calculated seasonal nutrient retention or release amounts for the Lower Klamath Project reservoirs (Asarian et al. 2009). Please refer to Volume III Attachment 1 Section 3.2.2.4 *Water Quality – Environmental Setting – Nutrients* for the revisions.

Appendix C, Section C.3.1.1 *Hydroelectric Reach* also has been revised to clarify the variability in the seasonal nutrient retention/release from the reservoirs considered in the impact analyses using the May 2005 to December 2007 time series of Copco No. 1 and Iron Gate reservoir nutrient retention/release estimates, including adding Asarian et al. (2009) Figures 23 through 26 (see below) showing this nutrient retention/release variability for Copco No. 1 and Iron Gate reservoir. Please refer to Volume III Attachment 1 Appendix C, Section C.3.1.1 *Hydroelectric Reach* for the revisions.

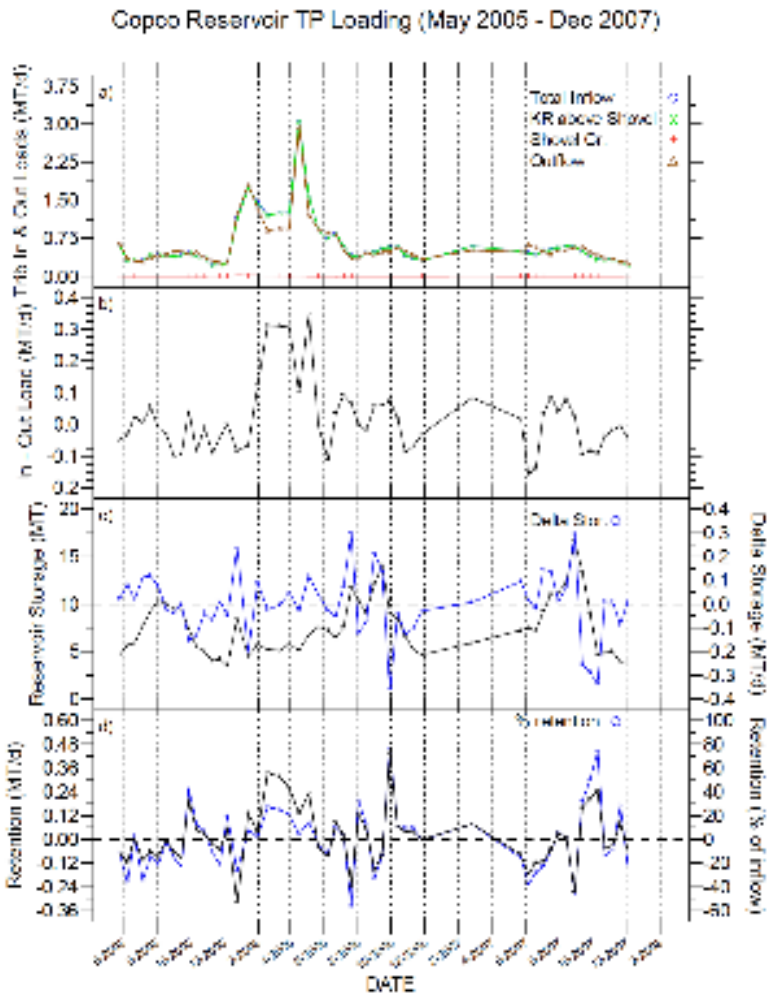


Figure 23 from Asarian et al. (2009). Time Series of Copco No. 1 Reservoir Total Phosphorus Loading, May 2005 to Dec 2007. Each Point Represents Data from an Entire Sampling Interval (Approximately Biweekly) and is Placed at the Midpoint of the Two Adjacent Sampling Dates. Horizontal Dashed Lines are Placed at Zero for Delta Storage and Retention.

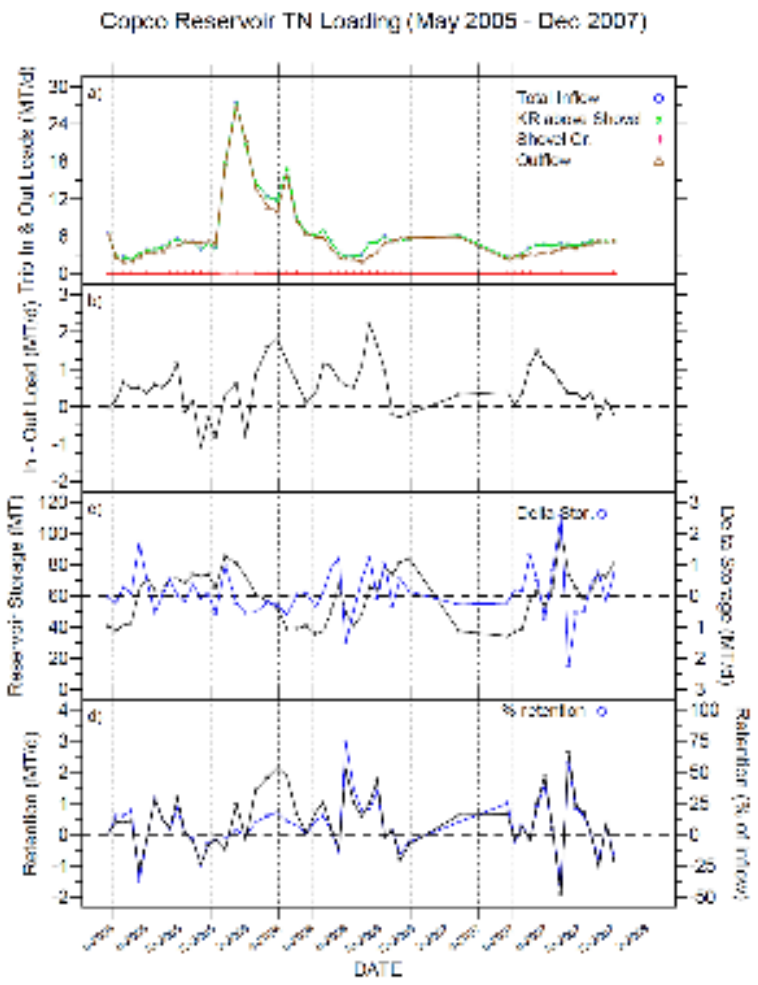


Figure 24 from Asarian et al. (2009). Time Series of Copco No. 1 Reservoir Total Nitrogen Loading, May 2005 to Dec 2007. Each Point Represents Data from an Entire Sampling Interval (Approximately Biweekly) and is Placed at the Midpoint of the Two Adjacent Sampling Dates. Horizontal Dashed Lines are Placed at Zero for Delta Storage and Retention.

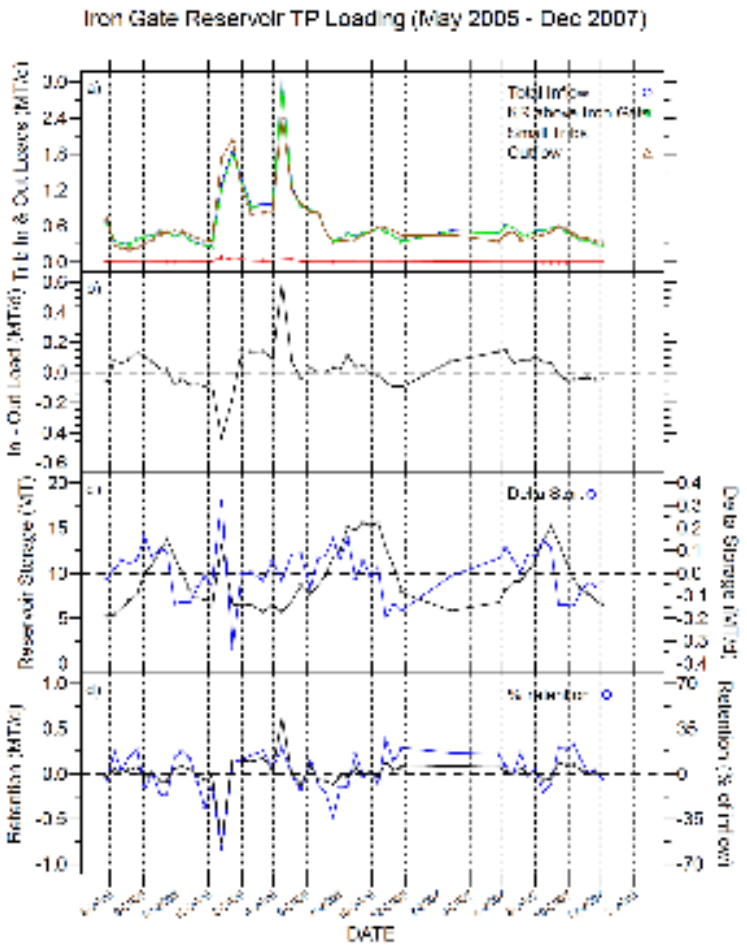


Figure 25 from Asarian et al. (2009). Time Series of Iron Gate Reservoir Total Phosphorus Loading, May 2005 to Dec 2007. Each Point Represents Data from an Entire Sampling Interval (Approximately Biweekly) and is Placed at the Midpoint of the Two Adjacent Sampling Dates. Horizontal Dashed Lines are Placed at Zero for Delta Storage and Retention.

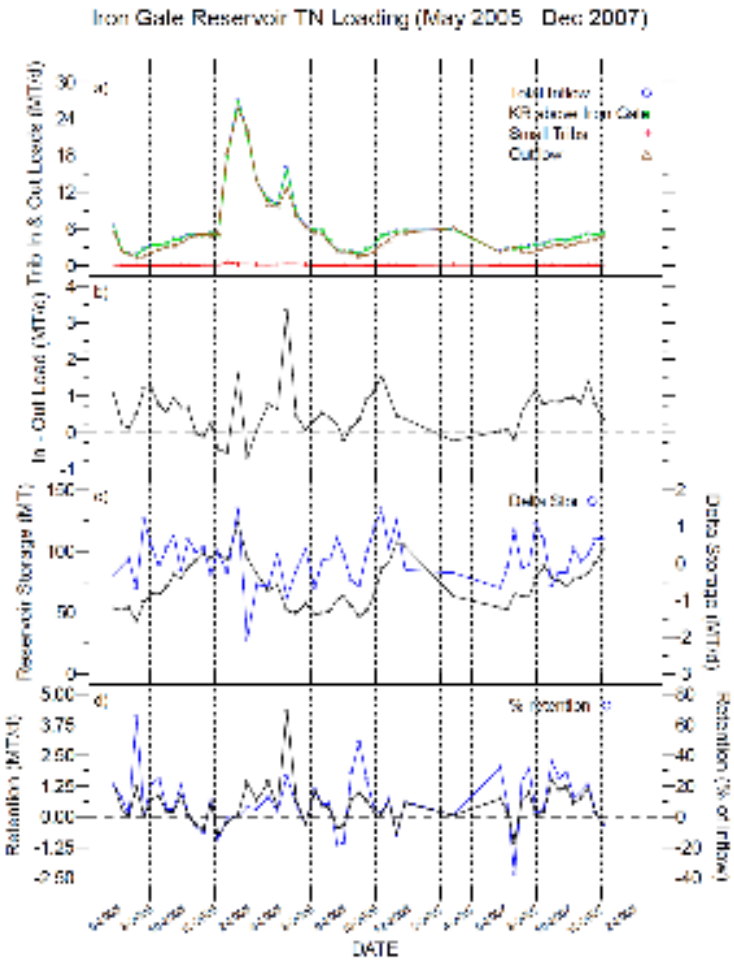


Figure 26 from Asarian et al. (2009). Time Series of Iron Gate Reservoir Total Nitrogen Loading, May 2005 to Dec 2007. Each Point Represents Data from an Entire Sampling Interval (Approximately Biweekly) and is Placed at the Midpoint of the Two Adjacent Sampling Dates. Horizontal Dashed Lines are Placed at Zero for Delta Storage and Retention.

As necessary, estimates of nutrient retention or release in Asarian et al. (2009) account for the hydraulic residence time of water in the reservoirs and its influence on nutrient retention and release, so the comment's assertion that the EIR nutrient retention or release discussion does not adequately account for the reservoir residence time is incorrect. Asarian et al. (2009) calculated the hydraulic residence time for Copco No. 1 and Iron Gate reservoirs from May 2005 to December 2007. As explained by the comment, the hydraulic residence time of water is important to consider when evaluating upstream and downstream nutrient trends over a time scale similar to the inflows/outflows since the effect of the hydraulic residence time on nutrients would have a similar magnitude as the effect of inflows/outflows on nutrients. However, the hydraulic residence time becomes less important to consider as the time scale increases since the magnitude of the inflows/outflows would become much larger than the magnitude

of the hydraulic residence time. The hydraulic residence time does not need to be explicitly considered in the seasonal (e.g., 3 month) or annual estimates of nutrient retention because these time scales are approximately three times or greater than the average hydraulic residence time calculated for Copco No. 1 and Iron Gate reservoirs from May 2005 to December 2007 (i.e., approximately 5 days during high winter and spring flows and approximately 15 to 25 days during summer low flows for Copco No. 1 Reservoir and approximately 3 to 10 days during winter/spring and approximately 25 to 30 days during summer for Iron Gate Reservoir). Seasonal and annual estimates of nutrient retention or release in Asarian et al. (2009) would accurately quantify the nutrient dynamics in Copco No. 1 and Iron Gate reservoirs.

Additional comments about the use of adverbs like "slight" or "very small" describing the magnitude of nutrient changes appear to be unrelated to Section 3.2.2.4 *Water Quality – Environmental Setting – Nutrients*; rather they appear to be related to Potential Impact 3.2-8 and several other locations in the EIR. While the comment's overall point about the potentially subjective meaning of adverbs is noted and clarifications to the magnitude of "slight" or other adverbs are incorporated in the relevant sections of the EIR, the specific example presented in the comment is an incorrect interpretation of the discussion in Potential Impact 3.2-8 since "very small" was used to describe the 0.01 to 0.015 mg/L annual increase in Total Phosphorus (TP) and "relatively larger" 0.1 to 0.125 mg/L annual increase in Total Nitrogen (TN) estimated by the *Klamath River Total Maximum Daily Load (TMDL) model,* but the previous discussion of percentage increases in nutrients after dam removal (i.e., approximately 2 to 12 percent increase in TP during June to October or a 27 to 42 percent increase in TN during June to October and a 48 to 55 percent increase in TN during July through September) is related to a *different* model: the Yurok Tribe analysis. Potential Impact 3.2-8 clearly explains that these results are from different models because after the sentence stating the "very small" increase in TP and "relatively larger" increase in TN, the EIR specifies: "It should be noted that while following the same relative trend as the Yurok Tribe analysis, the absolute increases predicted by the Klamath River TMDL model for the "TMDL dams-out" California scenario (TCD2RN) are much lower (e.g., 0.1–0.125 mg/L TN increase for the TMDL model vs. 0.1 to 0.5 mg/L TN increase for the Yurok Tribe analysis)."

Comparing the Klamath River TMDL model results of a "very small" 0.01 to 0.015 mg/L annual increase in TP and "relatively larger" 0.1 to 0.125 mg/L annual increase in TN with the measured nutrient concentrations listed in Figure 3.2-18 (i.e., existing [with dams]), the "very small" annual increase in TP is 6 to 9 percent and the "relatively larger" annual increase in TN is 9 to 14 percent. Thus, Potential Impact 3.2-8 does not characterize a change in nutrient loading of up to 55 percent as "slight", "very small", or "relatively larger." Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*, including Section 3.2.2.4 *Water Quality – Environmental Setting – Nutrients* and Potential Impact 3.2-8.

Comment ORG46-99

These paragraphs do not adequately address the role of primary production and associated impacts on water quality in the Klamath River. The Klamath River is weakly buffered and existing seasonal primary production can readily produce pH in excess of 9 coincident with elevated water temperatures, particularly between Iron Gate Dam and the Scott River. Further, review of periphyton data indicates that the lower Klamath River is nitrogen-limited in late summer, as evidenced by the dominance of Epithemia sorex. Epithemia sorex contains endosymbiotic cyanobacteria in many of the cells, which fix atmospheric nitrogen for use by the cells. The seasonal dominance by Epithemia sorex (as well as other nitrogen-fixing periphyton) are a source of nitrogen to the Klamath River that are not discussed in the DEIR. Also, there is minimal light limitation in much of the Klamath River from Iron Gate Dam to the Trinity River creating good growing conditions for periphyton.

The DEIR states "Measured levels of TP [total phosphorus] in the estuary are typically below 0.1 mg/L during summer and fall (June–October) and TN [total nitrogen] levels are consistently below 0.7 mg/L (June–October)." These total nutrient values mean little without some context that establishes the bioavailable, inorganic forms of nutrients, such as ammonia, nitrate, and orthophosphate, which are more directly usable for primary production. Primary production can occur at very low values of inorganic nitrogen and phosphorous based on their half saturation constants, e.g., 0.014 milligrams per liter (mg/L) and 0.003 mg/L respectively (Tetra Tech 2009). These half saturation constant values are far lower than the estuary concentrations presented in the DEIR.

Response to Comment ORG46-99

Section 3.2.2.4 *Water Quality – Environmental Setting – Nutrients* summarizes the measured nutrient concentrations in the Middle and Lower Klamath River, specifying that in-river nutrient spiraling processes by phytoplankton and periphyton strongly affect nitrogen concentrations in the Klamath River. Please refer to Volume III Attachment 1 Appendix C, Section C.3.2 *Mid- and Lower Klamath Basin* for further discussion of seasonal variations in the nutrients due to primary productivity in the Klamath River, including quantification of the overall nutrient variations in the river due to nutrient removal processes (e.g., storage in phytoplankton/plant biomass) and nutrient production processes (e.g., nitrogen fixation).

The influence of primary production on other water quality parameters is discussed under the relevant water quality parameter sections in the EIR. Section 3.2.2.5 *Water Quality – Environmental Setting – Dissolved Oxygen*, Section 3.2.2.6 *Water Quality – Environmental Setting – pH*, and Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* provides a summary of the influence of primary production in the Klamath River on dissolved oxygen concentrations, pH, and chlorophyll-*a* concentrations, respectively. Section *Water Quality – Environmental Setting* – 3.2.2.6 *pH*

specifically discusses the photosynthesis-driven daily and seasonal variations in pH due to primary production. Appendix C, Section C.4 *Dissolved Oxygen*, Appendix C, Section C.5 *pH*, and Appendix C, Section C.4 *Algal Toxins and Chlorophyll-a* provide further discussion of the influence of primary production in the Klamath River on dissolved oxygen concentrations, pH, and chlorophyll-*a* concentrations, respectively. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality* and the final Appendix C *Water Quality Supporting Technical Information*.

Please refer to Section 3.4.2.4 *Phytoplankton and Periphyton – Environmental Setting – Middle and Lower Klamath River – Periphyton* (pages 3-418 to 3-420) for a discussion of the periphyton communities in the Klamath River during summer, including the prevalence of *Epithemia sorex*, *Epithemia turgida*, and *Rhopalodia gibba*, which all contain cells of cyanobacteria [blue-green algae] that live inside the diatom cells to help the diatoms fix nitrogen. Total nitrogen (TN) measurements in the Klamath River discussed in Section 3.2.2.4 *Water Quality – Environmental Setting – Nutrients* and Appendix C, Section C.3.2 *Mid- and Lower Klamath Basin* would include all sources of nitrogen, including TN from nitrogen fixing periphyton that seasonally dominate the periphyton community in the Lower Klamath River. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality* and the final Appendix C *Water Quality Supporting Technical Information*.

Appendix C, Section C.3.2.3 *Klamath River Estuary* provides a discussion of the ammonia, nitrate, and orthophosphate nutrient concentrations measured in the Klamath River Estuary. Primary production can occur at very low values of inorganic nitrogen and phosphorus. The half-saturation constants for inorganic nitrogen and phosphorus represent the upper concentration at which algae growth is directly proportional to nutrient concentrations (Cole and Wells 2015). Nutrient concentrations greater than the half saturation constants indicate that there are sufficient nutrients available to meet primary productivity growth needs and nutrient concentrations in excess of those half saturation constants would have a diminishing influence on algae growth. Please refer to Volume III Attachment 1 for the final Appendix C *Water Quality Supporting Technical Information*.

In the Klamath River Estuary, inorganic phosphorus (i.e., soluble reactive phosphorus) ranges from approximately 0.004 to 0.102 mg/L, so it is consistently greater than the phosphorus half-saturation constant reported in Tetra Tech (2009) (i.e., 0.003 mg/L), indicating that phosphorus is not limiting algae growth in the estuary. Inorganic nitrogen (i.e., ammonia and nitrate plus nitrite) ranges from approximately 0.011 to 0.348 mg/L, with approximately 70 percent of the measurements representing the primary phytoplankton and periphyton growth season (i.e., May through October) at greater than the nitrogen half-saturation constant reported in Tetra Tech (2009) (i.e., 0.014 mg/L). Since measured inorganic nitrogen concentrations are typically greater than the nitrogen half-

saturation constant, nitrogen generally does not limit algae growth in the estuary. Further, nitrogen-fixing periphyton species that dominate in the lower Klamath River reaches and likely dominate periphyton communities in the estuary would be able to obtain nitrogen from the atmosphere for growth, so nitrogen is unlikely to limit algae growth in the estuary even during the periods when the inorganic nitrogen concentrations are less than the nitrogen half-saturation constant.

Section 3.2.2.4 *Water Quality – Environmental Setting – Nutrients* has been revised to clarify that measured nutrient levels in the Klamath River Estuary typically exceed the half-saturation constant and so may, at times, promote algal growth at levels that cause nuisance effects or adversely affect beneficial uses. Please refer to Volume III Attachment 1 Section 3.2.2.4 *Water Quality – Environmental Setting – Nutrients* for the revisions.

Comment ORG46-100

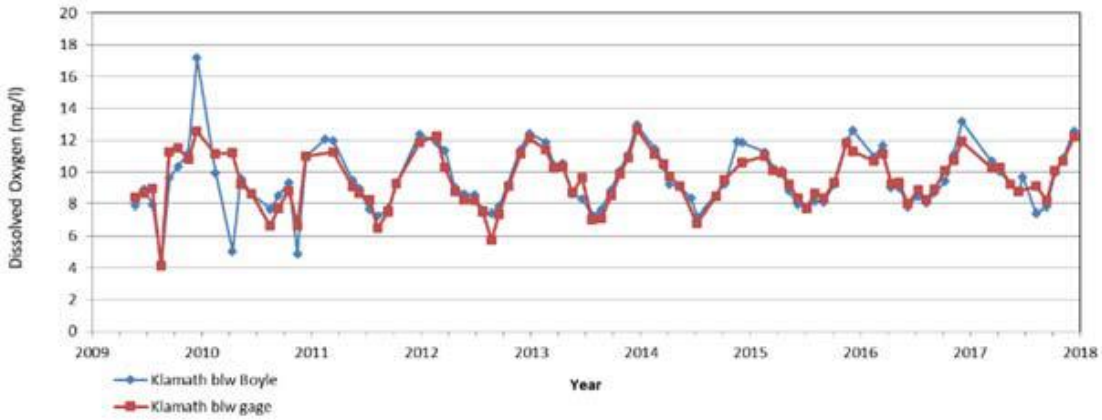
The text in this paragraph focuses solely on blue-green algae and relates all dissolved oxygen conditions to this group of algae, suggesting there are no other algae present or that have an impact on dissolved oxygen conditions. Blue-green algae should be replaced with "phytoplankton" in this text.

Response to Comment ORG46-100

Section 3.2.2.5 *Water Quality – Environmental Setting –Dissolved Oxygen* has been revised to clarify that dissolved oxygen in the reservoirs is mainly driven by phytoplankton, especially large blue-green algae blooms. Please refer to Volume III Attachment 1 Section 3.2.2.5 *Water Quality – Environmental Setting – Dissolved Oxygen* for the revisions.

Comment ORG46-101

While there is some variation in dissolved oxygen concentrations in J.C. Boyle Reservoir, the DEIR erroneously states that "This variation can affect dissolved oxygen concentrations further downstream in the California portion of the Hydroelectric Reach." A simple review of the KHSA Interim Measure 15 data indicates that dissolved oxygen levels downstream of J.C. Boyle Dam (labeled "Klamath blw Boyle" in figure below) are essentially identical to those downstream of the J.C. Boyle Powerhouse (Klamath blw gage in figure below). The DEIR acknowledged that high gradient stream reaches increase dissolved oxygen to near saturation for the reach from Keno Dam to J.C. Boyle Reservoir. The DEIR fails to note that the same effect is found downstream of J.C. Boyle Dam. The reaeration rate is sufficient that by the time waters reach the California-Oregon state line the dissolved oxygen levels in the river are near saturation and any deficit introduced from J.C. Boyle Reservoir has been largely ameliorated via mechanical reaeration.



Response to Comment ORG46-101

The Klamath Hydropower Settlement Agreement (KHSA) Interim Measure 15 (IM 15) dissolved oxygen concentrations are discrete measurements conducted at an approximately two-week to monthly frequency, so they would not characterize the dissolved oxygen variations that occur at the sub-daily time scale of peaking flows. Dissolved oxygen concentrations in the Klamath River would need to be measured at a sub-daily (e.g., hourly) time scale to represent the dissolved oxygen concentration variations resulting from peaking flows with low dissolved oxygen concentrations. While the comment is correct that fast-moving, turbulent flows in the J.C. Boyle Peaking Reach of the Klamath River provide aeration of river water, Klamath River Water Quality Model (KRWQM) and Total Maximum Daily Load (TMDL) modeling of dissolved oxygen concentrations in the J.C. Boyle Peaking Reach indicate that during the summer and fall hydropower peaking flows can release lower dissolved oxygen water from J.C. Boyle Reservoir that potentially affects dissolved oxygen concentrations farther downstream in the California portion of the J.C. Boyle Peaking Reach.

KRWQM modeling of dissolved oxygen concentrations shows dissolved oxygen concentrations upstream and downstream of J.C. Boyle Powerhouse are similar during non-peaking periods, but dissolved oxygen concentrations decrease downstream of J.C. Boyle Powerhouse during hydropower peaking operations (see Figure 4.8-42 below; PacifiCorp 2004a-1). Once peaking operations stop, the dissolved oxygen concentrations downstream of J.C. Boyle Powerhouse become the same as dissolved oxygen concentrations upstream of J.C. Boyle Powerhouse. The pattern of lower dissolved oxygen concentrations during peaking operations and higher dissolved oxygen concentrations during non-peaking periods that is apparent in the modeled dissolved oxygen concentrations downstream of the J.C. Boyle Powerhouse under existing conditions, is also apparent in dissolved oxygen concentration data at the J.C. Boyle Powerhouse measured in 2019 (see Figure ORG46-101-1 below). The 2019 measured data indicate that the dissolved oxygen modeling is correctly characterizing dissolved oxygen dynamics downstream of the J.C. Boyle Powerhouse.

A comparison of the modeled dissolved oxygen concentrations “above Copco” (i.e., downstream of the Oregon-California state line) under existing conditions and under “without-Project” (i.e., dam removal) conditions indicates that the low dissolved oxygen concentrations associated with hydropower peaking operations produce lower dissolved oxygen concentrations for several hours each day as compared with conditions under a dam removal scenario (see Figure 4.8-42 below; PacifiCorp 2004a-1). TMDL dissolved oxygen modeling results at the Oregon-California state line shown in EIR Figure 3.2-19 also indicate periods of lower dissolved oxygen concentrations in the summer under existing conditions (i.e., “TMDL dams-in” [T4BSRN] scenario) as compared with the Proposed Project (i.e., “TMDL dams-out, Oregon” [TOD2RN] scenario), further supporting the notion that hydropower peaking operations have the potential to influence dissolved oxygen concentrations in the California portion of the J.C. Boyle Peaking Reach.

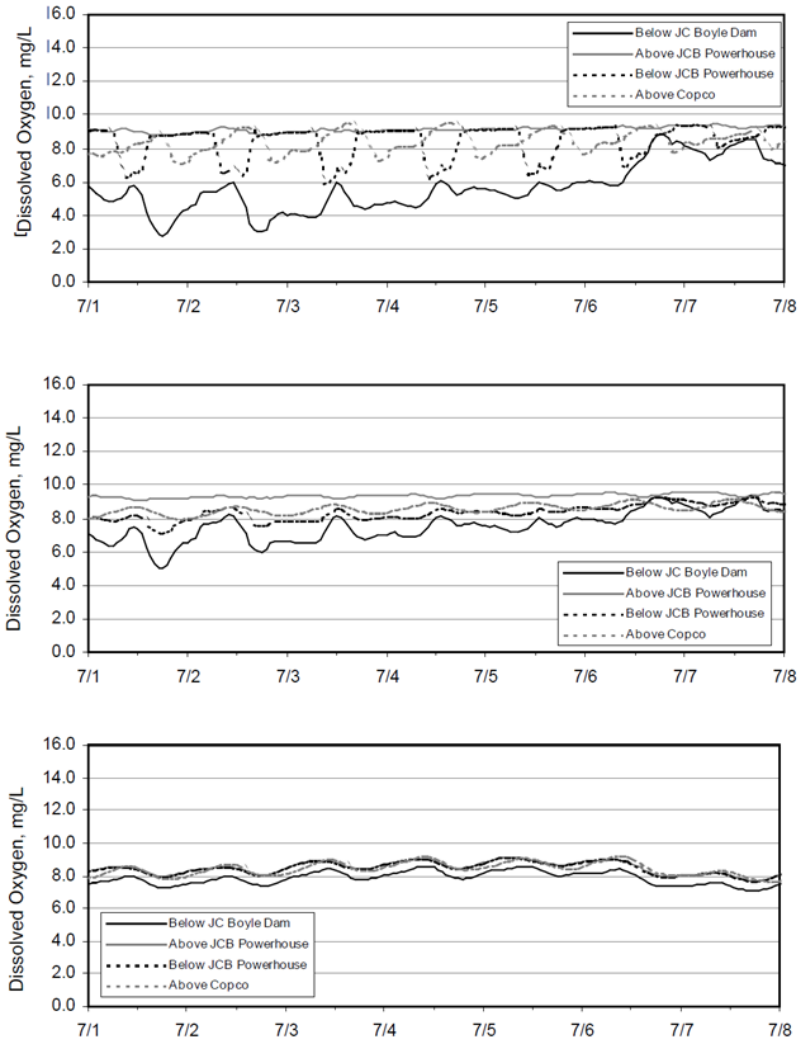


Figure 4.8-42 from PacifiCorp (2004a-1). J.C. Boyle Bypass and Peaking Reach Dissolved Oxygen, 2000: EC [Existing Conditions] (Top), SF [Steady Flow] (Middle), WOP [Without-Project] (Bottom). Note: The Without-Project (WOP) Conditions Modeled in PacifiCorp (2004a-1) Included the Removal of Keno Dam in Addition to Removal of J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate Dams.

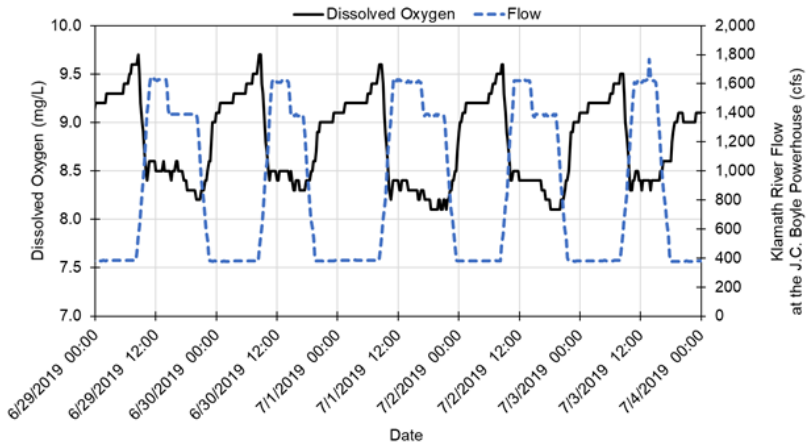


Figure ORG46-101-1. Dissolved Oxygen and Klamath River Flow Measured at the U.S. Geological Survey (USGS) 11510700 Gage Downstream of J.C. Boyle Powerhouse. Source: USGS 2019.

Data directly documenting the influence of low dissolved oxygen concentrations in J.C. Boyle Reservoir on dissolved oxygen concentrations at the Oregon-California state line are unavailable, but USGS dissolved oxygen data measured downstream of the J.C. Boyle Powerhouse indicate that hydropower peaking flows diverted from J.C. Boyle Reservoir decrease dissolved oxygen concentrations in the J.C. Boyle Peaking Reach downstream of the powerhouse, and modeling results consistently indicate that hydropower peaking operations potentially impact dissolved concentrations in the California portion of the Hydroelectric Reach. The data set thus indicates that variations in dissolved oxygen concentrations in J.C. Boyle Reservoir can affect dissolved oxygen concentrations farther downstream in the California portion of the Hydroelectric Reach.

Comment ORG46-102

The DEIR states "The low surface dissolved oxygen levels and their occurrence later in the season at Iron Gate Reservoir is believed to be associated with seasonal algal blooms, as dead algal cells are decomposed by aerobic organisms, exhausting dissolved oxygen in reservoir bottom waters and sediments." The DEIR should clarify that low surface concentrations of dissolved oxygen are associated with seasonally diminishing photosynthesis and continued algae biomatter loading from Upper Klamath Lake and other upstream Klamath River sources. Stratification persists through October for Copco Reservoir and well into November for Iron Gate Reservoir, precluding anoxic bottom waters from mixing with surface waters as is alluded to in the DEIR. Fall cooling and deepening of the epilimnion may contribute to lower dissolved oxygen water; however, the process of fall cooling deepens the epilimnion and increases its volume, and lower primary production cannot overcome the continued oxygen demand associated with organic matter (and associated oxygen demand) in Klamath River inflows.

Response to Comment ORG46-102
Section 3.2.2.5 *Water Quality – Environmental Setting – Dissolved Oxygen* has been revised in Volume III Attachment 1 to clarify that the period of low surface dissolved oxygen in Iron Gate Reservoir corresponds with the period when photosynthesis by algae would decline and organic matter from upstream sources increases, such that the incoming organic matter would also contribute to reduced surface dissolved oxygen concentrations in the reservoir. Please refer to Volume III Attachment 1 Section 3.2.2.5 *Water Quality – Environmental Setting – Dissolved Oxygen* for the revisions.

Comment ORG46-103
The DEIR states "Daily fluctuations in dissolved oxygen (ranging from 1 to 3 mg/L per day) measured in the Klamath River immediately downstream from Iron Gate Dam have been attributed to daytime algal photosynthesis and nighttime bacterial respiration in the upstream reservoirs." This sentence should be corrected to "...algal and bacterial respiration..." The DEIR also should clarify that releases from the reservoir experience modest diurnal variation. Additionally, monitoring locations "immediately downstream of Iron Gate Dam" are some 1,000 feet downstream of the dam. Mechanical reaeration occurs in this reach between the powerhouse and the monitoring equipment, as does aquatic vegetation photosynthesis and respiration (and bacterial respiration). These latter mechanisms also contribute to variable dissolved oxygen conditions downstream of the dam.

Response to Comment ORG46-103
Section 3.2.2.5 *Water Quality – Environmental Setting – Dissolved Oxygen* text has been revised to specify algal and bacterial respiration and to indicate that the Iron Gate Dam monitoring site is 1,000 feet downstream of the dam. Please refer to Volume III Attachment 1 Section 3.2.2.5 *Water Quality – Environmental Setting – Dissolved Oxygen* for the revisions.

Comment ORG46-104
The DEIR should acknowledge that dissolved oxygen levels reach saturation in the Klamath River within a couple of miles downstream Iron Gate Dam (PacifiCorp 2018a), well above Seiad Valley, which is approximately 60 miles downstream.

Response to Comment ORG46-104
Section 3.2.2.5 *Water Quality – Environmental Setting – Dissolved Oxygen* has been revised in Volume III Attachment 1 to clarify that existing data indicate that in 2017 dissolved oxygen concentrations were reaerated to above the minimum Basin Plan saturation levels within approximately 2 to 3 miles downstream from Iron Gate Dam. Please refer to Volume III Attachment 1 Section 3.2.2.5 *Water Quality – Environmental Setting – Dissolved Oxygen* for the revisions.

Comment ORG46-105

The water quality impact assessment of reservoir drawdown on pH does not address sediment-related acidification. This is an important omission that affects the adequacy of this section. The substantial sediment load released by the Proposed Project to downstream reaches will include anoxic sediments. As stated elsewhere in the DEIR (Section 3.2.5.4), these sediments will exert a substantial oxygen demand in downstream reaches during reservoir drawdown. Section 3.2.5.4 states that part of the oxygen demand would be from ferrous iron content of anoxic sediments.

However, nowhere in the DEIR is the re consideration of the acid production potential in these oxidation reactions. Oxidation of sulfidic minerals will produce acid. With such a large sediment load and in such weakly buffered waters (Section 3.2.2.6), the DEIR must assess the potential for acidification in the river downstream of Iron Gate Dam.

Another potential source of acidification that is not acknowledged and assessed in the DEIR is drainage from residual sediments in reservoirs. These drained sediments are no different than dredge spoils in their potential for acidification with oxidation. Acid seeps can form on the exposed banks within the former reservoir areas. Low pH can also mobilize metals in the seeps at concentrations that could have adverse impacts on water quality.

It may be that acidification will not be severe; however, without any analysis, it is impossible to know. Typically, an acceptable analysis of acidification potential is based on analysis of sediment mineralogy and a pH mass balance model is created to assess potential acidification impacts. The DEIR is lacking any of this information.

Response to Comment ORG46-105

While the comment asserts that there is a potential for sediment-related acidification, the comment does not provide substantial evidence regarding this potential physical impact of the Proposed Project on the environment (CEQA Guidelines section 15384). The existing evidence supports the conclusion that sediment-related acidification is unlikely to occur as the result of the project and that further study is not necessary.

Section 3.2.2.6 *Water Quality – Environmental Setting – pH* summarizes the available literature and data on existing conditions. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*. Measurements of the potential for sediment-related acidification were not conducted as part of the previous reservoir sediment investigation (Shannon and Wilson 2006; USBR 2011) because the 2009 or 2018 Sediment Evaluation Framework (SEF) for the Pacific Northwest does not include assessment of the acid generation potential by sediments (RSET 2009, 2018). The 2018 SEF was prepared by Northwest Regional Sediment Evaluation Team Agencies (i.e., the U.S. Army Corps of

Engineers (Northwestern Division and Portland, Seattle, and Walla Walla Districts), U.S. Environmental Protection Agency, Region 10, National Oceanic and Atmospheric Administration, West Coast Region, U.S. Fish and Wildlife Service, Pacific Region, Oregon Department of Environmental Quality, Idaho Department of Environmental Quality, Washington Department of Ecology, and Washington Department of Natural Resources) and incorporates the best available science to evaluate discharges of dredged material. The acid generation potential discussed in the comment is typically evaluated for mining wastes that are extracted from underground anoxic environments (USEPA 1994) rather than anoxic reservoir sediments.

Measurements of pH in the elutriate sediment samples undertaken for the 2012 KHSA EIS/EIR and Secretarial Determination analyses indicate low acid generation potential from reservoir sediments during reservoir drawdown and downstream transport of the sediment deposits. The pH of the reservoir sediment cores ranged from 6.6 s.u. for J.C. Boyle Reservoir samples to 7.8 s.u. for Copco No. 1 Reservoir samples (USBR 2011). Klamath River Renewal Corporation (KRRC) collected measurements of soil pH during 2017 reservoir sediment core sampling and plant nutrient availability (PNA) laboratory analyses and these soil pH data indicate that the soil pH is slightly acidic. During the PNA lab analyses, which were undertaken to evaluate reservoir sediments as a growth medium, the pH ranged from 6.2 to 6.5 s.u. in sediment samples from J.C. Boyle, Copco No. 1, and Iron Gate reservoirs (Volume II Appendix B: *Definite Plan – Appendix H, Section 8.1.2 Reservoir Revegetation and Grow Tests* [pages 141 to 152]). In the reservoir sediment cores (USBR 2011) and the more recently collected PNA reservoir sediment samples, pH was measured after the sediment samples had been stored for several days to approximately five weeks. As a result, the available pH measurements likely represent a range of anoxic to slightly aerobic conditions in the sediments, but they are unlikely to characterize the pH under completely aerobic conditions.

Measurements of elutriate sediment sample pH are potentially the most representative of pH under aerobic conditions. The elutriate sediment samples were prepared by vigorously mixing four parts reservoir sediment with one part native (i.e., reservoir) water for thirty minutes, letting the mixture settle for one hour, extracting the overlying solution, and centrifuging the solution to remove particles. The native water was collected from the surface of the reservoirs where dissolved oxygen levels were measured between approximately 6.5 milligram per liter (mg/L) to approximately 11 mg/L, so the mixing during preparation of the elutriate sediment samples would have exposed the reservoir sediment to an aerobic environment and would thus represent the acid generation potential from rapidly oxidizing iron or sulfide minerals in the sediments. The elutriate sediment sample pH ranged from 7.6 standard units (s.u.) in Iron Gate Reservoir to 8.0 s.u. in J.C. Boyle Reservoir (USBR 2011) suggesting there is a low acid generation potential for reservoir sediments as

they are reaerated during sediment mobilization and transport downstream of the Hydroelectric Reach.

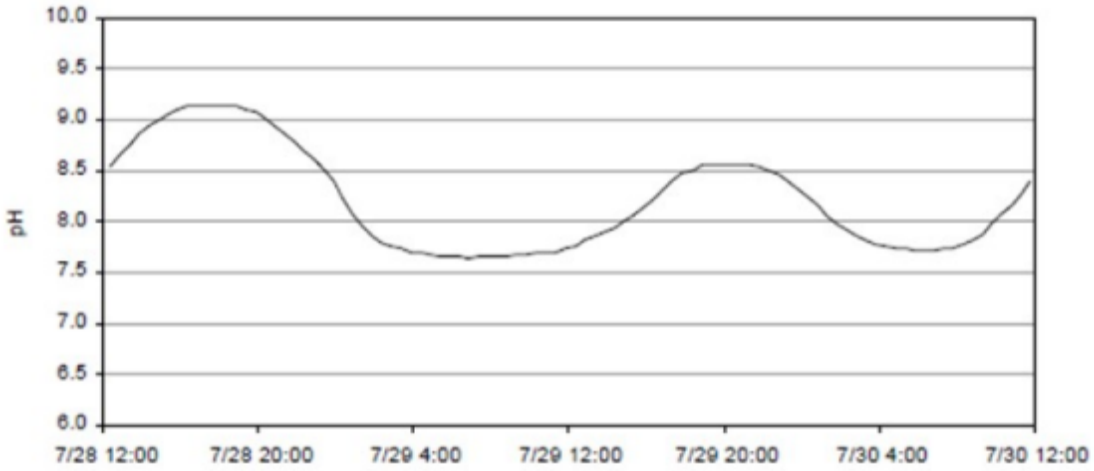
To date, no measurement or analysis results for the Lower Klamath Project reservoir sediments or elutriate test results, including acid volatile sulfide measurements in the reservoir sediments and sulfide measurements in the elutriate sediment samples, have identified a significant potential for acid generation during or following reservoir drawdown and no further testing along these lines has been recommended by the prior studies (Shannon and Wilson 2006; GEC 2006; USBR 2011; CDM 2011).

Overall, the multiple lines of evidence discussed above, including direct measurement of pH after reservoir sediments were exposed to an aerobic environment, indicate that the acid generation potential of reservoir sediments is low and a more detailed analysis of the acid generation potential of the reservoir sediments based on an analysis of sediment minerology and a pH mass balance model is not necessary.

Comment ORG46-106

The DEIR states that alkalinity "Levels below 10 mg/L indicate that the system is poorly buffered and very susceptible to changes in pH." The correct value indicative of a weakly buffered system is 100 mg/L, not 10 mg/L. The pH of water is an important parameter in aquatic systems because many reactions that control water quality are pH dependent. Typically, surface freshwater (rivers and lakes) contain both acids and bases, and biological processes tend to increase either acidity or basicity. The interactions among these opposing compounds and processes determine pH. Carbon dioxide ($CO_{2(aq)}$) is particularly influential in regulating pH in aquatic systems. $CO_{2(aq)}$ is acidic, and its concentration varies as a result of its utilization by aquatic plants in photosynthesis and release in respiration of aquatic organisms. The alkalinity of water results primarily from carbonate (CO_3^{-2}) and bicarbonate ions (HCO_3^-). And alkalinity tends to buffer water against excessive pH change (Boyd 2000; Stumm and Morgan 1996; Tchobanoglous and Schroeder 1987). Alkalinity in environmental waters is beneficial because it minimizes pH changes in response to various factors that include acidification (e.g., acid rain), pollutant inputs to aquatic systems, and primary production (Kalff 2002). Primary production in systems that have low to moderate alkalinity can experience increases in pH during periods of high photosynthesis. During these periods, algae deplete available $CO_{2(aq)}$ and utilize HCO_3^- as a secondary source of $CO_{2(aq)}$, excreting excess hydroxyl ions (OH^-) to the water, contributing the elevated pH conditions (Kirk 2011). Review of the 2009 through 2017 KHSA Interim Measure 15 water quality data indicates that alkalinity concentrations in the Klamath River system typically in the 40 to 70 mg/L (as $CaCO_3$) range in the upper basin (Link River Dam), 65 to 85 mg/L (as $CaCO_3$) range downstream of Iron Gate Dam, and SO to 100 mg/L (as $CaCO_3$) range in the lower basin (Orleans). Given the naturally productive nature of the Klamath River, alkalinity values below approximately 100 mg/L are subject to

seasonal pH deviations during periods of maximum photosynthetic activity. A 48-hour trace of pH is shown in the figure below for the Klamath River downstream of the Shasta River (June 28, 12:00 to June 29, 12:00, 1997; Deas 2000), indicating an increase of 1.5 pH units due to primary production. Elevated pH in the upper basin and throughout the river system in response to seasonal productivity has been identified through the KHSA Interim Measure 15 monitoring program as well as other monitoring efforts. Elevated pH can lead to short duration chronic, and in extreme cases acute ammonia toxicity (USEPA 2013).



Response to Comment ORG46-106

Please refer to Volume III Attachment 1 Section 3.2.2.6 *pH* and Volume II Appendix C, Section C.5 *pH* (pages C-59 to C-68) for a discussion of pH and the variations in pH due to photosynthesis in the Klamath River. The second paragraph in Section 3.2.2.6 *pH* specifically states that the "Klamath River is a weakly buffered system (i.e., has typically low alkalinity less than 100 mg/L as calcium carbonate [CaCO3]; PacifiCorp [2004a], Karuk Tribe of California [2010a]), so it is susceptible to photosynthesis-driven daily and seasonal swings in pH." While alkalinity levels less than 100 mg/L do indicate that the system is weakly buffered, it is also correct that alkalinity levels below 10 mg/L would indicate that the system is ***poorly*** buffered and very susceptible to changes in pH. Volume III Attachment 1 presents the final Section 3.2 *Water Quality*.

Volume II Appendix C, Section C.5.2.1 *Iron Gate Dam to Salmon River* (pages C-62 to C-65) also notes that observed exceedances of pH water quality objectives usually occur during later afternoon or early evening, following the period of maximum photosynthesis (North Coast Regional Board 2010, Asarian and Kann 2013).

Section 3.2.2.6 *pH* has been revised to clarify the range of pH variations measured in the Klamath River downstream of its confluence with the Shasta River during July 1997 (the comment incorrectly identified it as June 1997). Please refer to Volume III Attachment 1 Section 3.2.2.6 *pH* for the revisions.

Comment ORG46-107

The DEIR states "Historically, seasonal algal blooms and elevated chlorophyll-a concentrations have been observed in the Hydroelectric Reach, including a 1975 survey in Iron Gate Reservoir documenting algal blooms in March, July, and October, including diatoms and blue green algae (USEPA 1978)." It should be noted that of the three sample dates in USEPA (19 78), Microcystis sp. and Dolichospermum sp. are absent, and in only one of the three sample dates is a blue-green algae dominant (Oscillatoria sp.).

The "more contemporary data" discussion in this paragraph should be updated following a review of the data generated in the KHSA Interim Measure 15 monitoring program through 2017. The reference in the text to Figure 3.2-5 only includes data through 2007 (note that the DEIR text incorrectly refers to Figure 3.2-25). In addition, the DEIR states that "...chlorophyll-a levels in Copco No. 1 and Iron Gate reservoirs can be two to ten times higher than in the Klamath River..." without telling the reader where in the river the data are being compared. This is important because chlorophyll-a levels in Iron Gate Reservoir, for example, have been consistently lower than those in Keno reservoir. Since 2015, reductions in chlorophyll-a downstream of Iron Gate Dam when compared to Iron Gate Reservoir are at least partially attributable to operation of the intake barrier curtain in Iron Gate Reservoir (Watercourse 2016; PacifiCorp 2017b).

Response to Comment ORG46-107

Water quality data collected under Klamath Hydropower Settlement Agreement (KHSA) Interim Measure 15 (IM15) include chlorophyll-*a* data for summer through early fall (i.e., May to October) during the period 2000 to 2017 at monitoring locations in the Klamath River and the upper 10 meters of the Lower Klamath Project Reservoirs (Figure ORG46-107-1). The IM15 data include chlorophyll-*a* concentrations measured downstream of Iron Gate Dam during periods between 2014 and 2017 when an intake barrier/thermal curtain was used in Iron Gate Reservoir. The IM15 data and the chlorophyll-*a* data plotted in Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* Figure 3.2-5 exhibit generally similar chlorophyll-*a* trends, with the following exceptions: the range of chlorophyll-*a* concentrations in the IM15 2000 to 2017 dataset (Figure ORG46-107-1) is greater than the range of chlorophyll-*a* concentrations in the 2005 to 2007 dataset plotted in Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* Figure 3.2-5, and chlorophyll-*a* concentrations for locations downstream of Keno Dam to upstream of Copco No. 1 Reservoir are generally greater in J.C. Boyle Reservoir in the IM15 2000 to 2017 dataset (Figure ORG46- 107-1) than in the 2005 to 2007 dataset plotted in Figure 3.2-5. Maximum chlorophyll-*a* concentrations measured at multiple Klamath River stations and in Copco No. 1 and J.C. Boyle reservoirs in the IM15 2000 to 2017 dataset are higher than those plotted in Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* Figure 3.2-5, with maximum chlorophyll-*a* concentrations measured in

J.C. Boyle Reservoir (825 micrograms per liter [ug/L]) at two orders of magnitude greater than those measured in the 2005 to 2007 dataset (5 ug/L). Minimum chlorophyll-*a* concentrations measured in Iron Gate Reservoir in the IM15 2000 to 2017 dataset are lower than those plotted in Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* Figure 3.2-5.

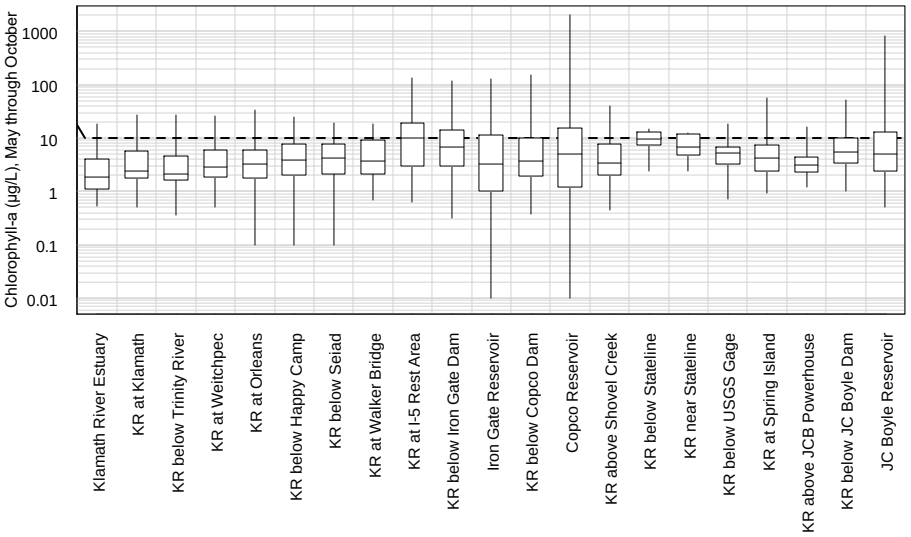


Figure ORG46-107-1. Longitudinal Analysis of Summer Through Fall (May to October) KHSA Interim Measure 15 (IM15) Chlorophyll-*a* Concentrations from 2000 to 2017 Along the Klamath River and in the Upper 10 Meters of the Reservoirs. Whiskers extend from minimum to maximum value, boxes extend from the first to the third quartile, and the horizontal line indicates the median of the dataset at each site. The Dashed Horizontal Line is the Chlorophyll-a Klamath River Total Maximum Daily Load (TMDL) Target (i.e., 10 ug/L). Note the Logarithmic Scale. Chlorophyll-*a* Data From Stations That Shifted Locations Between Years Are Plotted Together (e.g., KR at Walker Bridge). Source: PacifiCorp 2003a, 2004b, 2005b, 2007, 2008b, 2009, 2010, 2011, 2012, 2013, 2014c, 2015b, 2016b, 2017b.

It is appropriate to state “chlorophyll-*a* levels in Copco No. 1 and Iron Gate reservoirs can be two to ten times greater than those in the mainstem Klamath River” without specifying the exact comparison point in the mainstem Klamath River; Figure 3.2-5 provides the reader with the data to determine the multiple locations within the mainstem Klamath River where the statement is true, including the monitoring locations “Abv Shovel”, “I-5”, “Walker Bridge”, “Seiad Valley”, “Orleans”, “Weitch”, “Bel Weitch”, “Turwar”, and “Lower Est” in Figure 3.2-5.

Water quality measurements during 2015 and 2016 when the intake barrier/thermal curtain was in use in Iron Gate Reservoir indicate that the intake barrier/thermal curtain reduces entrainment of blue-green algae into the Iron

Gate Powerhouse intake and subsequent release downstream into the Klamath River. Chlorophyll-*a* concentrations downstream of Iron Gate Dam during 2015 and 2016 when the intake barrier/thermal curtain was in use also showed a decrease compared to chlorophyll-*a* concentrations in Iron Gate Reservoir, with chlorophyll-*a* concentrations consistently below 10 ug/L (i.e., Klamath TMDLs phytoplankton chlorophyll-*a* target) even when chlorophyll-*a* concentrations in the reservoir were greater than 10 ug/L (PacifiCorp 2016a, 2017a). However, water quality monitoring data from 2017 and 2018 downstream of Iron Gate Dam show multiple exceedances of the Klamath TMDLs phytoplankton chlorophyll-*a* target (i.e., 10 ug/L) (Watercourse Engineering, Inc. 2018, 2019). The intake barrier/thermal curtain was completely rolled up during portions of 2017 to maximize dissolved oxygen concentrations for aquatic life (PacifiCorp 2018a), so decreases in chlorophyll-*a* downstream of Iron Gate Dam from operation of the intake barrier/thermal curtain would be potentially limited by the need to access water with higher dissolved oxygen concentrations to comply with dissolved oxygen standards. An analysis of the intake barrier/thermal curtain performance during 2017 or 2018 has not been published and PacifiCorp continues to test and refine the intake barrier/thermal curtain design and operations, but available data do not indicate that this measure would prevent releases from Iron Gate Dam that exceed the Klamath TMDLs phytoplankton chlorophyll-*a* target of 10 ug/L for Iron Gate Reservoir during the May to October growth season (North Coast Regional Board 2010).

Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* has been revised to clarify the algal species present during the 1975 surveys of Iron Gate Reservoir and to clarify the influence of the intake barrier/thermal curtain on chlorophyll-*a*. Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* Figure 3.2-5 also has been revised by replacing it with Figure ORG46-107-1 above showing the measured KHSA IM 15 chlorophyll-*a* concentrations from 2000 to 2017. Please refer to Volume III Attachment 1 Section 3.2.2.7 *Chlorophyll-a and Algal Toxins* for the revisions.

Comment ORG46-108

Algae toxins may be produced wherever conditions are suit able for associated blue-green algae growth (benthic or planktonic forms), and there are no data to support the conclusion that algal toxins in the lower river only occur because of the presence of Iron Gate and Copco reservoirs. The DEIR should be revised to acknowledge this. The DEIR indicates that Copco No. 1 and Iron Gate reservoirs are responsible for the production of algal toxins, such as microcystin, in the Klamath River downstream of Iron Gate Dam. This is not thoroughly correct and is somewhat misleading. Algal toxins (including microcystin) have been documented upstream of the hydroelectric projects in Agency Lake, Upper Klamath Lake, and Keno Reservoir.

The DEIR should be revised to accurately reflect the complexity of algal-toxin production in the Klamath River. For example, in addition to the citation of Otten et al. (2015), the DEIR should include more recent information on the causes and instances of algal toxins in the Klamath River such as presented by Otten (2017), Otten and Dreher (2017), and Paerl et al. (2018). This more recent information indicates that Microcystis blooms and microcystin concentrations have increased in magnitude and persistence in recent years in Upper Klamath Lake, and that microcystin concentrations are consistently elevated in the lake during the bloom season (Otten 2017b; Otten and Dreher 2017). Key message from Paerl et al. (2018) is that management of eutrophication and harmful algae blooms should recognize causes and interconnection across watershed gradients. Paerl et al. (2018) conclude that it makes little sense to attempt controls in the downstream reservoirs without first addressing the predominant sources coming from upstream. However, Paerl et al. (2018) indicate that in practice most management responses to eutrophication issues have involved interventions aimed at treating individual segments of the system and frequently focus on the problem rather than the underlying causes of the blooms that often take place upstream.

Response to Comment ORG46-108

Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* does not claim that algal toxins occur in the Middle and Lower Klamath River only because of Copco No. 1 and Iron Gate reservoirs; instead, this section summarizes the available data characterizing microcystin (an algal toxin) from the Klamath River indicating that Iron Gate Reservoir is the principal source of *Microcystis aeruginosa* cells to the Klamath River downstream of Iron Gate Dam (Otten et al. 2015). The comment is correct that algal toxins potentially would be produced wherever there is suitable habitat for blue-green algae growth in the Klamath River. Blue-green algae growth has been observed in calm, slow-moving habitats along shorelines and protected coves and backwaters during low-flow periods in the Middle and Lower Klamath River under existing conditions (Fetcho 2008; Raymond 2008; Kann and Corum 2009; Kann et al. 2010a; Genzoli and Kann 2016, 2017), but Otten et al. (2015) found no evidence of endemic *Microcystis aeruginosa* populations in the flowing regions of the Klamath River upstream or downstream of Copco No. 1 and Iron Gate reservoirs and concluded that the river itself does not represent favorable cyanobacterial habitat. The longitudinal decrease in *Microcystis aeruginosa* cell density and microcystin concentrations in open-channel and shoreline samples from the Klamath River downstream of Iron Gate Dam to upstream of the Klamath River Estuary suggests that the water velocity and constant mixing in the river are not supportive of blue-green algae reproduction and algal toxin production (Otten et al. 2015; Genzoli and Kann 2017). However, the analysis in Volume I Section 3.4.5 *Phytoplankton and Periphyton – Potential Impacts and Mitigation* Potential Impact 3.4-2 (pages 3-428 to 3-433) specifically acknowledges that algae growth could occur in slow-moving habitats along the river margins after dam removal, stating: “Some phytoplankton growth may still occur after dam removal in calm,

slow-moving habitats along shorelines and protected coves and backwaters during low-flow periods in the Middle and Lower Klamath River, but these habitats already support growth of blue-green algae, including *Microcystis aeruginosa*, that results in occasional exceedances of 2016 CCHAB secondary thresholds and World Health Organization (WHO) guidelines (Falconer et al. 1999; Kann et al. 2010a; State Water Board et al. 2010, updated 2016; Genzoli and Kann 2016, 2017)."

Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* has been revised in Volume III Attachment 1 to clarify the potential for blue-green algae growth along the shoreline, as well as longitudinal trends in *Microcystis aeruginosa* cell density and microcystin concentrations in the Klamath River. Data from Volume II Appendix C, Section C.6 *Algal Toxins and Chlorophyll-a* (pages C-68 to C-83) have also been brought forward into Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* to clarify microcystin trends in the Klamath River. Please refer to Volume III Attachment 1 Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* for the revisions.

Please see Master Response PAP-1 for discussion of upstream sources of algae and associated algal toxins, including Klamath Hydropower Settlement Agreement (KHSA) Interim Measure 15 (IM15) monitoring data for the period 2008 to 2017 that characterize the existing conditions for microcystin (algal toxin) concentrations in the Klamath River upstream of J.C. Boyle Reservoir as consistently less than 4 micrograms per liter [ug/L] (i.e., the microcystin threshold of significance).

Please also refer to Volume I Section 3.4.2 *Phytoplankton and Periphyton – Environmental Setting* (pages 3-392 to 3-422) for further discussion of cyanobacteria [blue-green algae] growth dynamics and associated algal toxin production within the Klamath River, especially Volume I Section 3.4.2.3 *Phytoplankton and Periphyton – Environmental Setting – Hydroelectric Reach* (pages 3-405 to 3-413) and Volume I Section 3.4.2.4 *Phytoplankton and Periphyton – Environmental Setting – Middle and Lower Klamath River* (pages 3-413 to 3-419) for a comparison of the suitability of habitat conditions in the river and reservoir reaches for toxigenic blue-green algae growth, and genetic analyses of *Microcystis aeruginosa* in Copco No. 1 Reservoir, Iron Gate Reservoir, and multiple Klamath River sites downstream of Iron Gate Dam that identify Iron Gate Reservoir as the principal source of *Microcystis aeruginosa* to the Klamath River downstream of Iron Gate Dam (Otten et al. 2015). Volume I Section 3.4.2.3 *Phytoplankton and Periphyton – Environmental Setting – Hydroelectric Reach* (pages 3-405 to 3-413) already incorporates information on *Microcystis aeruginosa* growth dynamics in Copco No. 1 and Iron Gate Reservoirs from Otten and Dreher (2017).

Otten (2017) was not cited in the EIR since it is focused on comparing methodologies for estimating algal toxins and cell densities in the Klamath River (i.e., the effectiveness of molecular assays targeting the genes responsible for toxin production versus measurement of algal toxin concentrations or cell counts). However, Otten (2017) does contain algal toxin and *Microcystis aeruginosa* cell count data, and Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins – Chlorophyll-a and Algal Toxins* and Section 3.4.2.3 *Phytoplankton and Periphyton – Environmental Setting – Hydroelectric Reach* have been revised to include data reported in Otten (2017). The algal toxin and cell count data presented in Otten (2017) support the current summary of existing conditions without additional text changes, so this citation has been added, as appropriate, to the references for the summary of existing conditions. Please refer to Volume III Attachment 1 Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* and Volume III Attachment 1 Section 3.4.2.3 *Phytoplankton and Periphyton – Environmental Setting – Hydroelectric Reach – Phytoplankton* for the revisions.

Volume I Section 3.4.2.1 *Phytoplankton – Environmental Setting – Phytoplankton* (pages 3-392 to 3-403) summarizes the general algal growth dynamics discussed in Paerl et al. (2018), including the influence of habitat suitability and nutrient availability on algal growth and toxin production. While Paerl et al. (2018) provides an overview of the longitudinal algal growth dynamics across a watershed and potential management strategies to influence algal growth dynamics, it does not provide new information on algal growth conditions in the Klamath Basin or specific recommendations for management activities to alter algal growth or algal toxins in the Klamath Basin. Additionally, Paerl et al. (2018) concludes that "it makes little sense to attempt ***nutrient*** [emphasis added] control in the downstream reservoirs without first addressing the predominant source" coming from upstream, but it does not address or make conclusions on the potential for dam removal and elimination of the slow-moving reservoir habitat to reduce blue-green algae growth in a watershed.

Comment ORG46-109

The DEIR states "In contrast, data from 2008 and 2009 did not show microcystin bioaccumulation in the tissue and liver samples from fish collected from Copco No. 1 and Iron Gate reservoirs (CH2M HILL 2009; PacifiCorp 2010)." This discussion is inadequate and incomplete. The DEIR needs to include all the results for fish sampled for microcystin in the Klamath River. In 2008, tissue was collected from a total of 272 resident fish (Yellow Perch, Crappie, and Rainbow Trout) and all laboratory analysis did not detect microcystin in these samples. In 2009, a total of 43 fish tissue and liver samples were collected from Yellow Perch, and again microcystin was not detected. These studies are posted on PacifiCorp's Klamath website (http://www.pacificorp.com/es/hydro/hl/kr.html). The data from the anadromous fish sampling for microcystin that was done in 2007 and 2010 should also be presented and discussed. In 2007, fish and liver samples were collected from 11 adult Chinook Salmon and 8 Steelhead and

microcystin was not detected in any of these samples (CH2M HILL 2009). In 2010, tissue and liver samples were collected from 25 Steelhead, 20 fall Chinook, and 3 Coho in the Klamath River. While microcystin was not detected in any of the fish tissues, four Chinook livers and a Steelhead liver had detectable amounts of microcystin present.

The DEIR analysis needs to go beyond discussion of simple microcystin presence in these sampled tissues and discuss what the toxin quantities mean in terms of associated levels of potential human health risk. The DEIR also needs to distinguish where microcystin concentrations have been detected in fish tissue versus liver since it is toxin levels in the consumed tissue that pose a human health risk because fish livers are not consumed. To PacifiCorp's knowledge, no microcystin has been found in adult salmonid fish tissue in the Klamath River, yet the DEIR fails to mention this. The DEIR discusses the risk to fish but presents no evidence to show what harm, if any, occurs at the individual or population level from microcystin exposure. Any analysis related to microcystin effects on the fisheries must distinguish between resident and anadromous fish since most of the anadromous salmonids enter the river as adults to spawn and die.

Response to Comment ORG46-109
Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to the Affected by the Proposed Project – Algal Toxins* provides further discussion of microcystin bioaccumulation in fish and mussel tissue, including discussion of results from samples collected in 2007, 2008, 2009, and 2010.

Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* also provides a comparison of the detected microcystin concentrations relative to public health guidelines. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality* and the final Section 3.3 *Aquatic Resources*.

Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* has been revised to include the detailed microcystin bioaccumulation results for fish and mussel tissue samples collected in 2007, 2008, 2009, and 2010 and further elaborate on the comparison of detected microcystin concentrations in salmonids and public health guidelines. The additional data do not constitute significant new information (CEQA Guidelines section 15088.5(a)). Please refer to Volume III Attachment 1 Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* for the revisions.

Comment ORG46-110
This section of the DEIR concludes that trace metals decline as water flows downstream, with the exception of nickel, magnesium, and calcium. The decline is attributed to binding and precipitation. However, the section does not provide a reason why such a decline was not observed for nickel, magnesium, and calcium. Please provide more detail to support the conclusions.

Response to Comment ORG46-110
The referenced sentence summarizes the conclusions of Flint et al. (2005), which documented that the concentration of trace elements in the Klamath River decreased as water flowed downstream (with the exception of nickel, magnesium, and calcium) during 2002 and 2003 at four United States Geological Survey (USGS) gage stations downstream of Iron Gate Dam. The authors did not provide data, hypothesis, or analysis to explain why there was no decline observed for nickel, magnesium, and calcium. As such, the reason why nickel, magnesium, and calcium concentrations did not decline in the downstream direction during measurements in 2002 and 2003 is unknown.

Comment ORG46-111
The DEIR indicates that acid volatile sulfides (AVS) were measured but does not indicate if simultaneously extracted metals (SEM) were measured. This is important because AVS measurements are meaningless without the companion SEM measurements. If SEM data were collected, a discussion of the potential for metals toxicity should be discussed using the USEPA's Procedures for the Derivation of Equilibrium Partitioning Sediment Benchmarks (ESBs) for the Protection of Benthic Organisms: Metal Mixtures (Cadmium, Copper, Lead, Nickel, Silver and Zinc (USEPA 2005).

Response to Comment ORG46-111
Simultaneously extracted metals (SEM) data associated with the acid volatile sulfides (AVS) measurements are not reported by USBR (2011). However, the AVS measurements collected by United States Bureau of Reclamation (USBR) are not used to assess the potential for metals toxicity in the EIR analysis. Instead, as stated in Section 3.2.2.8 *Water Quality – Environmental Setting – Inorganic and Organic Contaminants – Sediment Contaminants*, the potential sediment toxicity to benthic organisms, including metals toxicity, was directly assessed by bioassays of sediment and elutriate sediment samples using fish and invertebrate national benchmark toxicity species. Section 3.2.2.8 *Water Quality – Environmental Setting – Inorganic and Organic Contaminants – Sediment Contaminants* and Appendix C, Section C.7.1.1 *Inorganic and Organic Contaminants – Upper Klamath Basin – Hydroelectric Reach – Sediment Toxicity and Bioaccumulation Tests* contain a summary of the bioassay results. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality* and the final Appendix C *Water Quality Supporting Technical Information*.

Additionally, the dissolved metal concentrations in interstitial water are correlated with observed biological effects to sediment-dwelling (i.e., benthic) organisms (USEPA 2005), so the dissolved metal concentrations measured in the elutriate sediment samples would also quantify the potential metals toxicity.

Comment ORG46-112
The DEIR uses the term "dioxin" without defining it. The reader is left to assume that when using that term the authors are referring to the 17 dioxin and furan

congeners. The text further uses the term "toxic equivalency concentrations" without defining that for the reader. To fully inform the reader, the text should be rewritten to clarify the terminology.

Response to Comment ORG46-112
Section 3.2.2.8 *Water Quality – Environmental Setting – Inorganic and Organic Contaminants – Sediment Contaminants* have been revised to clarify what is meant by dioxin and toxic equivalency concentrations. Please refer to Volume III Attachment 1 Section 3.2.2.8 *Quality – Environmental Setting – Inorganic and Organic Contaminants – Sediment Contaminants* for the revisions.

Comment ORG46-113
The DEIR compares "dioxin" concentrations to threshold values. We suspect that these are 2,3,7,8 2,3,7,8-tetrachlorodibenzodioxin (TCDD) toxicity equivalent quotients or toxic equivalents but the DEIR fails to indicate specifically what is being evaluated.

Response to Comment ORG46-113
Dioxin threshold values specified in Section 3.2.2.8 *Water Quality – Environmental Setting – Inorganic and Organic Contaminants – Sediment Contaminants* are toxic equivalent concentrations relative to 2,3,7,8-tetrachlorodibenzodioxin (2,3,7,8-TCDD). Toxic equivalent concentrations are equal to toxic equivalent quotients and abbreviated as TEQ.

Section 3.2.2.8 *Water Quality – Environmental Setting – Inorganic and Organic Contaminants – Sediment Contaminants* has been revised to clarify that dioxin threshold values are expressed as TEQs. Please refer to Volume III Attachment 1 Section 3.2.2.8 *Water Quality – Environmental Setting – Inorganic and Organic Contaminants – Sediment Contaminants* for the revisions.

Comment ORG46-114
The DEIR discusses the results from whole sediment toxicity tests with the amphipod Hyalella azteca. The text states "Toxicity tests generally indicate a low potential for toxicity…." Additional text should be provided that describes the criteria for classifying toxicity as 'low' or 'moderate' potential and what this means for the Proposed Project.

Response to Comment ORG46-114
Section 3.2.2.8 *Inorganic and Organic Contaminants – Sediment Contaminants* has been revised in Volume III to clarify the meaning of "low" and "moderate" potential for sediment toxicity and correct the typo that indicated *Hyalella azteca* had the decreased survival. Please refer to Volume III Attachment 1 Potential Impact 3.2-14 for analysis of the freshwater and marine aquatic species exposure to inorganic and organic contaminants under the Proposed Project due to release of reservoir sediments, including the analysis of what the survival rates of benthic organisms in reservoir sediments means for the Proposed Project and

how percent survival of the benchmark benthic indicator species was used in the determination of "low" and "moderate" potential for sediment toxicity. The analysis in Potential Impact 3.2-14 also correctly identifies the benthic midge *Chironomus dilutus* as having the decreased survival in J.C. Boyle Reservoir sediments. Please refer to Volume III Attachment 1 Section 3.2.2.8 *Inorganic and Organic Contaminants – Sediment Contaminants* for the revisions.

Comment ORG46-115

The DEIR presents comparisons of sediment chemical concentrations to risk-based screening values. The paragraph as written is confusing and hard to follow and it is impossible to differentiate between ecological and human health-based screening values. To increase readability, this paragraph should be split into two, with one devoted to ecological and one to human health.

Response to Comment ORG46-115

Section 3.2.2.8 *Water Quality – Environmental Setting – Inorganic and Organic Contaminants – Sediment Contaminants* has been revised to clarify the human health and ecological screening levels exceeded by the total arsenic, total copper, and total lead concentrations measured in reservoir and estuary sediment samples. Please refer to Volume III Attachment 1 Section 3.2.2.8 *Water Quality – Environmental Setting – Inorganic and Organic Contaminants – Sediment Contaminants* for the revisions.

Comment ORG46-116

The definition for "substantial" is not adequate. The DEIR states that "...substantial, as used in the significance criteria, means the effect on water quality and the support of beneficial uses (or human health or environmental receptors, as specified) is of considerable importance." The connection to the beneficial uses is appropriate, but the term "of considerable importance" is not defined.

Response to Comment ORG46-116

To the extent that identified water quality significance criteria can be expressed quantitatively, Section 3.2.3.1 *Water Quality – Significance Criteria – Thresholds of Significance* does so explicitly, or the details are provided in Volume III Attachment 1 Section 3.2.5 *Water Quality – Potential Impacts and Mitigation*. If it is not possible to identify meaningful quantitative significance criteria, or if such criteria would otherwise be inappropriate for a particular analysis, then qualitative thresholds of significance are presented and discussed instead. The phrase "of considerable importance" does not require definition beyond the ordinary usage of the term. Together, the stated significance criteria and impact analysis approach subsections for water quality provide the necessary context regarding the phrase 'of considerable importance' in determining significance for the water quality effects analyzed in the Lower Klamath Project EIR. Volume III Attachment 1 presents the final Section 3.2 *Water Quality*.

Lastly, lacking any specific identification of a problem with an impact analysis in the EIR due to use of the phrase 'of considerable importance', the assertion that this phrase must be further defined in this section does not constitute substantial evidence regarding the potential physical impacts of the Proposed Project on the environment (CEQA Guidelines section 15384).

Please also refer to Master Response CEQ-3.

Comment ORG46-117

The discussion of turbidity references a lack of data but fails to acknowledge that turbidity data has been routinely collected with all KHSA Interim Measure 15 water quality samples since 2009. While this is spot data at a monthly or bimonthly time-step, it is certainly more precise than the approach taken in the DEIR.

The DEIR connects the criterion for turbidity to "natural conditions" but does not characterize or define natural. According to CEQA the comparison should be made for turbidity impacts relative to baseline conditions (those present at the time of the Notice of Preparation (NOP) for the DEIR.

Response to Comment ORG46-117

Please refer to Section 3.2.3.1 *Water Quality – Significance Criteria – Thresholds of Significance – Suspended Sediments* for an explanation for why sufficient turbidity data are not available for the Klamath Basin to use the Basin Plan turbidity water quality objective to analyze potential impacts under the Proposed Project in the manner anticipated by the Basin Plan (i.e., relative to natural conditions), as well as the rationale for using the specified suspended sediment concentration (SSC) threshold of significance (i.e., 100 milligram per liter [mg/L] for a continuous two week period).

Section 3.2.3.1 *Water Quality – Significance Criteria – Thresholds of Significance – Suspended Sediments* has been revised to further clarify what is meant by "natural conditions" in the turbidity water quality objective in the Basin Plan. Please refer to Volume III Attachment 1 Section 3.2.3.1 *Water Quality – Significance Criteria – Thresholds of Significance – Suspended Sediments* for the revisions.

Turbidity is a measure of the collective optical properties of a water sample that cause light to be scattered and absorbed rather than transmitted in straight lines (Anderson 2004). Turbidity changes as suspended material increases and scatters or absorbs more light in a water sample, but the specific relationship between turbidity and suspended material may vary widely between samples from different monitoring sites and between different watersheds due to variations in the suspended material properties (e.g., the size, shape, and refractive index of particles having different light scattering properties). Flow variations in a river may result in turbidity naturally fluctuating several orders of

magnitude, but turbidity has also been observed to fluctuate by an order of magnitude or more when flows are relatively constant due variations in the suspended material properties being transported during different times (Bash et al. 2001).

While monthly to bi-monthly turbidity data have been collected as part of Klamath Hydropower Settlement Agreement (KHSA) Interim Measure 15 (IM15) water quality samples, monthly to bi-monthly turbidity data represent the turbidity conditions only during the specific time of the measurements, and the IM15 turbidity data would not characterize the full range of turbidity conditions occurring under existing conditions. Turbidity measurements are infrequently collected during high winter flows (likely due to safety concerns of sampling at high flows), with no January, four February, and six March turbidity measurements downstream of Iron Gate Dam (river mile [RM] 193.1) in turbidity data from 2000 to 2017. As such, it is not possible to quantify the full range of turbidity under existing conditions (i.e., those present at the time of the Notice of Preparation [December 22, 2016]), especially during the main reservoir drawdown period between January and March. IM15 turbidity data would not provide a more precise approach to assessing turbidity under the Proposed Project since there is no turbidity data during one of the primary periods that needs to be analyzed.

The Basin Plan turbidity water quality objective (Basin Plan Section 3.3.17 *Turbidity* [page 3-6]) specifies that turbidity shall not be increased more than 20 percent above naturally occurring background levels. The Basin Plan defines natural conditions as conditions or circumstances affecting the physical, chemical, or biological integrity of water that are not influenced by past or present anthropogenic activities. Thus, naturally occurring background levels of turbidity would be those not influenced by past or present anthropogenic activities. However, there are not sufficient data to determine the turbidity under natural conditions or existing conditions, so the Basin Plan numeric turbidity water quality objective relative to natural conditions are not used as a threshold of significance in the EIR suspended sediment analysis. As explained in Section 3.2.3.1 *Water Quality – Significance Criteria – Thresholds of Significance – Suspended Sediments*, narrative sediment water quality objectives were interpreted into a numeric SSC threshold of significant to assess potential impacts to the most sensitive beneficial use (COLD). As explained in Section 3.2.4.2 *Water Quality – Impact Analysis Approach – Suspended Sediments* and analyzed in Section 3.2.5.2 *Water Quality – Potential Impacts and Mitigation – Suspended Sediments*, daily total SSCs were modeled for existing conditions representing WY 1961–2008 (“background”) and changes in SSCs under the Proposed Project are quantitatively compared to the modeled background SSC levels or qualitatively compared relative to existing conditions, as appropriate, to evaluate the potential impacts from suspended sediments.

Comment ORG46-118

The DEIR acknowledges that there are differences between suspended sediment concentrations and total suspended solids but fails to explain what these differences mean in terms of data interpretation and how this difference may affect the impact analysis. The assumption that they are equivalent as made in the DEIR needs to be justified.

Response to Comment ORG46-118

Please refer to Gray et al. (2000) cited in Section 3.2.3.1 *Water Quality – Significance Criteria – Thresholds of Significance – Suspended Sediments* for an in-depth comparison of suspended sediment concentration (SSC) and total suspended solids (TSS) data. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Footnote 39 in Section 3.2.3.1 *Thresholds of Significance – Suspended Sediments* also has been revised to clarify the justification for using TSS and SSC interchangeably. Please refer to Volume III Attachment 1 Section 3.2.3.1 *Thresholds of Significance – Suspended Sediments* for the revisions.

As detailed in Gray et al. (2000), an analysis of 3,235 paired SSC and TSS natural-water samples from eight states showed SSC and TSS values generally follow a line of equal value (i.e., 1:1 line), but SSC values tend to exceed their paired TSS values, particularly at larger values of SSC. The SSC values better represent the actual sediments in a sample because the TSS measurement methodology of using a pipette or pouring often results in underestimating the larger particles (i.e., sand-sized particles) that rapidly settle or may plug up the opening of a pipette. Further analysis of 860 paired SSC and TSS natural-water samples with known relative amounts of sand-size and finer material shows that SSC values tend to be larger than their paired TSS values when the percentage of sand-size material exceeds about 25 percent of the mass of sediment in the sample. SSC values are consistently larger than their paired TSS values when the percentage of sand-sized material exceeds a third of the mass of sediment in the sample. SSC and TSS data are more or less evenly distributed around the line of equal value when particle sizes are finer than 0.062 millimeters [mm](i.e.,1 silts or clays) and TSS is greater than approximately 5 milligram per liter (mg/L).

Overall, the implication of the Grey et al. (2000) results is that TSS measurements tend to underestimate overall suspended material concentrations, especially at higher flows that suspend a higher fraction of larger particles. Sediment transport modeling for the Lower Klamath Project analyses utilized SSCs, so the analysis of potential impacts due to the release of reservoir sediments under the Proposed Project (i.e., Potential Impact 3.2-3) would be unaffected by the differences between SSC and TSS measurements. The analyses in Potential Impact 3.2-4 and Potential Impact 3.2-5 did not rely on TSS measurements, so these analyses would be unaffected by the differences between SSC and TSS measurements. The analysis in Potential Impact 3.2-5

may underestimate the algal-derived (organic) suspended material occurring under existing conditions because the algal-derived (organic) suspended material were measured as TSS, but relative fraction of algal-derived (organic) suspended material that would be likely to settle during TSS measurements is unknown and TSS measurements may in fact accurately reflect actual suspended material. The analysis in Potential Impact 3.2-5 evaluated long-term changes in algal-derived (organic) suspended materials relative to existing conditions, so potential underestimates of algal-derived (organic) suspended material under existing conditions would shift the existing conditions and would not alter the overall conclusions of the analysis.

Comment ORG46-119

The discussion in this section indicates that certain aspects of water quality in the DEIR impact analysis relied on models developed for the Klamath River TMDL. The DEIR' s Thresholds of Significance for these aspects of water quality are tied to specific Klamath River TMDL-derived quantities (such as, for water temperature, dissolved oxygen, nutrients, chlorophyll-a, and algal toxins). The DEIR's analysis of long-term water quality impacts explicitly includes the Klamath River TMDLs and incorporates TMDL scenarios and results of modeling performed for development of the TMDLs. By doing so, the DEIR analysis incorporates the assumption that TMDLs will be fully achieved, despite unknowns and uncertainties regarding potential TMDL actions and their implementation.

The TMDL modeling results are not an appropriate basis for comparing alternatives. PacifiCorp has previously documented substantial technical flaws with the assumptions, modeling, and analyses used in development of the TMDLs. PacifiCorp has previously presented the flaws in the compliance scenarios and the technical analysis and modeling supporting the California Klamath River TMDL during the development of the TMDL and is contained in the Petition for Writ of Mandate filed to challenge the same (PacifiCorp v State Water Resources Control Board, 2011 , case 34-2011-80000769). PacifiCorp does not waive, and expressly preserves, its legal challenge to the TMDL and TMDL models, and preserves its rights to challenge TMDL implementation plan measures and conclusions regarding the Klamath Hydroelectric Project's effects on water quality in other proceedings.

PacifiCorp's position remains that the TMDLs will require nutrient loads in the Klamath River that are less than those that would occur naturally (that is, without anthropogenic effects). Independent assessments of conditions for anadromous fish in the Klamath Basin by the National Research Council (NRC 2004 , 2008) and the Klamath River Expert Panels (Dunne et al. 2011; Goodman et al. 2011), although not referring to the TMDLs specifically, indicate that very substantial water quality improvements in the Klamath Basin, such as assumed in the TMDLs, are unrealistic, unlikely, or at best highly uncertain. Therefore, the DEIR makes the flawed assumption of full attainment of TMDLs which in turn results in an analysis that unrealistically assumes dramatic long-term water quality

improvements in the basin. Disclosure and discussion of substantial uncertainties related to TMDL assumptions is absent in the DEIR. This represents a major flaw relative to the DEIR's ultimate accuracy in assessing the effects of the Proposed Project and utility for supporting decisions on the Proposed Project.

Response to Comment ORG46-119

Please refer to Master Response WQ-5. Additionally, analysis in Section 3.2.5 *Water Quality – Potential Impacts and Mitigation* specifically notes that the Klamath River Total Maximum Daily Load (TMDL) model scenarios include as a starting point assumption that there will be full implementation of the TMDLs and considers the implications of this assumption with respect to the use of TMDL model results in the analysis. Section 3.2.5.1 *Water Quality – Potential Impacts and Mitigation – Water Temperature* Potential Impact 3.2-1 provides a discussion of the TMDL model results in the water temperature analysis, Section 3.2.5.3 *Water Quality – Potential Impacts and Mitigation – Nutrients* Potential Impact 3.2-8 provides a discussion of the TMDL model results in the nutrients analysis, Section 3.2.5.4 *Water Quality – Potential Impacts and Mitigation – Dissolved Oxygen* Potential Impact 3.2-10 provides a discussion of the TMDL model results in the dissolved oxygen analysis, and Section 3.2.5.5 *Water Quality – Potential Impacts and Mitigation – pH* Potential Impact 3.2-11 provides a discussion of the TMDL model results in the pH analysis. As discussed in Section 3.2.4.6 *Water Quality – Impact Analysis Approach – Impact Analysis Approach – Chlorophyll-a and Algal Toxins*, the Klamath River TMDL model results were not used in the analysis of chlorophyll-a and algal toxins because the model appears to over-predict the chlorophyll-a under the "dams-out" scenario. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Please also refer to response to comment ORG46-124 for an additional discussion regarding Klamath River TMDL modeling.

Comment ORG46-120

The DEIR relies on the River Basin Model 10 (RBM10) for quantifying the sensitivity of water quality and related impacts to projected climate change. Specifically, the DEIR states that "The RBM10 model was developed as part of the Klamath Dam Removal Secretarial Determination studies and includes the effects of climate change and KBRA hydrology on water temperatures (Perry et al. 2011)." Given the limitations of the climate change projections and methodology used, the DEIR rightfully limits the use of RBM10-related results for significance determinations. "The climate change predictions are used to give additional context to the temperature discussion, but they are not relied on for significance determinations. Future climate changes are not part of the existing condition against which this EIR compares potential impacts under the Proposed Project." This approach is appropriate because climate change would be expected to compound the errors previously raised regarding the flow modeling. However, in contrast to this statement, the approach used in the DEIR was to

integrate climate change predictions throughout the discussion and finding of impacts in the water quality and aquatic resources sections of the Proposed Project and to a lesser extent the alternatives. More than 20 statements throughout the impacts discussions highlight the climate change adaptation aspects/benefit of the Proposed Project and its benefit over other alternatives. For example, page 3-77 paragraph 4 states "In the long term, the beneficial effects would also help to offset the impacts of climate change on late summer/fall water temperatures." This style of presentation creates confusion in the impacts discussions. A better approach would be to present the climate change adaptation aspects/benefit of the Proposed Project and the other alternatives in a climate change adaptation section.

Response to Comment ORG46-120

As explained in Section 3.2.4.1 Water *Quality – Impact Analysis Approach – Water Temperature* and quoted in the comment, the climate change projections are used to provide additional context for the water temperature discussion, but they are not relied on for significance determinations. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*. Referencing this context in the discussion of long-term potential impacts on water quality under the Proposed Project provides relevant information for understanding the potential impacts for particular water quality parameters over the long term, even as the analysis does not rely on climate change projections for the purpose of making significance determinations. Providing information in a separate section, as the commenter prefers, would require the reader to flip back and forth between the Proposed Project impact analysis for a particular parameter and a separate but corresponding climate change discussion elsewhere in the document. As such, the discussion of the long-term influence of climate change is retained in the analysis of long-term potential impacts under the Proposed Project.

Comment ORG46-121

In this paragraph, the DEIR describes the predicted short-term suspended sediment concentrations during Proposed Project reservoir drawdowns. These suspended sediment concentrations predictions are a major factor used in the DEIR's assessment of impacts, particularly on water quality and aquatic biota. However, these suspended sediment concentrations predictions rely on professional judgement and extrapolations of previous modeling work, rather than detailed quantitative analysis of the actual Proposed Project. In addition, the DEIR assessment makes the simplified and unsupported assumption that the predicted suspended sediment concentrations would be within the range of model-uncertainty. However, this type of extrapolation is inappropriate because it compounds the uncertainty that already exists in the model results. The prediction of suspended sediment concentrations during drawdown also neglects the effects from slump failure and sediment jetting, which would likely further increase suspended sediment concentrations. Given the importance of suspended sediment concentrations as a factor in the assessment of impacts, the DEIR needs a more thorough and rigorous analysis and discussion regarding

the factors that would contribute to predicted suspended sediment concentrations.

Response to Comment ORG46-121
Section 3.2.4.2 *Water Quality – Impact Analysis Approach – Suspended Sediments* summarizes the impact analysis approach and the models used in the analysis of suspended sediments. The discussion referenced by the comment does not describe the predicted short-term suspended sediment concentrations (SSCs) during reservoir drawdown under the Proposed Project. Potential Impact 3.2-3 provides a discussion of the predicted SSCs during reservoir drawdown under the Proposed Project. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*, including Section 3.2.4.2 *Water Quality – Impact Analysis Approach – Suspended Sediments* and Potential Impact 3.2-3.

Contrary to the assertion in the comment, detailed quantitative analyses from two different sediment transport models (i.e., Sediment and River Hydraulics – One Dimension [SRH-1D] and Dam Removal Express Assessment Model – 1 [DREAM-1]) were utilized to estimate the SSCs that would result from dam removal and the release of reservoir sediments. As explained in Section 3.2.4.2 *Water Quality – Impact Analysis Approach – Suspended Sediments*, the SSCs under the Proposed Project are primarily estimated from the detailed quantitative SRH-1D USBR (2012a) modeling results. The maximum drawdown rate under the Proposed Project (i.e., 5 feet per day) is greater than modeled by USBR (2012a) (i.e., 2.25 to 3 feet per day). As such, the quantitative, peer-reviewed DREAM-1 sediment transport model results (Stillwater Sciences 2008) estimating the potential variation in SSCs when the drawdown rates during dam removal change between 3, 6, or 9 feet per day were used to quantify how the maximum drawdown rate under the Proposed Project would alter estimates of SSCs in USBR (2012a) model results. This provides a sufficient quantification of the potential variations in SSCs due to changes in the maximum drawdown rate between USBR (2012a) model results and the Proposed Project because a) the drawdown rates in the DREAM-1 results span the range of drawdown rates under the Proposed Project, and b) the change in the drawdown rate from 3 to 6 feet per day in the DREAM-1 results is similar to the expected change from 3 to 5 feet per day.

Additionally, potential slump failures are implicitly included in the DREAM-1 Stillwater Sciences (2008) sediment transport model results by limiting the stable bank slope to a relatively low slope (i.e., 1:10 V:H). Thus, the model's estimates of changes in SSCs under various drawdown rates would include any change in SSCs from potential slump failures. The processes and physics governing the production of SSCs from reservoir drawdown are similar in both the Stillwater Sciences (2008) DREAM-1 and USBR (2012a) SRH-1D models and thus it is reasonable to assume that the USBR (2012a) SSC model results would exhibit a similar response to changes in reservoir drawdown rates.

Increases in SSC uncertainty from changes to drawdown rates under the Proposed Project compared to those used in the USBR (2012a) SRH-1D model would not be expected to alter the overall analysis and significance determination for SSC. Model uncertainty cannot be directly evaluated since the modeled condition (i.e., dam removal) has not occurred and there are no measured SSCs available for comparison with modeled SSCs, but model uncertainty can be estimated from a sensitivity analysis of the model (Jung et al. 2018). As part of the USBR (2012a) SSC modeling, a sensitivity analysis was conducted to determine how the modeled SSCs would vary due to changes in multiple sediment transport modeling parameters and equations (see USBR [2012a] Section 9.2.1.3 *Concentrations during Dam Removal – Sensitivity Analysis* [pages 9-18 to 9-32]). Such a sensitivity analysis provides an estimate of the uncertainty associated with the modeled SSCs since it highlights how changes in the values of model parameters and equations would potentially alter the modeled SSCs. Comparison of the variations in SSCs with changes in model parameters and equations shows that SSCs remained similar regardless of changes in these parameters and equations during parts of the drawdown period, but SSCs also varied by up to an order of magnitude during other periods (see USBR [2012a] Figures 9.25 and 9.26 [pages 9-31 to 9-32]). Overall, the modeled SSCs would have the most uncertainty during peak SSCs (i.e., approximately 2 to 5 times the estimated SSCs) and when SSCs are declining following peak SSCs (i.e., approximately an order of magnitude). Thus, the potential increase in peak SSCs due to changes in the drawdown rates (i.e., approximately doubling) is generally within the range of the modeled uncertainty. As demonstrated by the sensitivity analysis, all parameters or representations of physical processes (i.e., equations) in the model have an associated uncertainty. The comment is correct that the uncertainty associated with the changes in drawdown rates would increase the overall uncertainty of the modeled SSCs, but it is not inherently inappropriate for the model uncertainty to increase when a model parameter varies (i.e., drawdown rate). Variations in any model parameter could theoretically introduce uncertainty. Accordingly, Section 3.2.4.2 *Water Quality – Impact Analysis Approach – Suspended Sediments* explains the uncertainty associated with the USBR (2012a) model and the additional uncertainty introduced by variations in the drawdown rates between the USBR (2012a) model results and the Proposed Project. Overall, the expected increase in uncertainty would not be expected to alter the overall analysis and significance determination, so it is appropriate to use the DREAM-1 drawdown results with the SRH-1D model results.

Section 3.2.5 *Water Quality – Potential Impacts and Mitigation – Suspended Sediments* Potential Impact 3.2-3 provides an estimate of the changes in the USBR (2012a) SSC model results due to sediment jetting during drawdown. Sediment jetting would be limited to the six areas where restoration actions are proposed within the Copco No. 1 Reservoir footprint (see Volume I Section 2.7.4.2 *Proposed Project – Proposed Project – Restoration Within the Reservoir Footprint – River Restoration Features* Figure 2.7-11 [page 2-75]) and three

areas where restoration actions are proposed within the Iron Gate Reservoir footprint (see Volume I Figure 2.7-12 [page 2-76]). As further clarification of the discussion of sediment jetting under the Proposed Project in Potential Impact 3.2-3, sediment jetting would likely result in negligible to small increases in the total reservoir sediment estimated to erode by USBR (2012a) and associated increases in SSCs, because sediment jetting would be focused on supporting the natural movement of reservoir sediments in the areas where sediment jetting would occur. Additionally, areas with slopes greater than 0.1 to 0.2 are already anticipated to slump toward the river channel in USBR (2012a), so sediment jetting in these areas would not be anticipated to increase the total reservoir sediment estimated to erode by USBR (2012a) or the associated SSCs. Sediment jetting in areas with generally low slopes (less than 0.1 to 0.2) would potentially result in localized slope or bank failure, but this localized slope or bank failure would not be likely to propagate due to the surrounding low slopes. Thus, the analysis in Potential Impact 3.2-3 does consider the increase in SSCs during drawdown from sediment jetting and associated potential slumping.

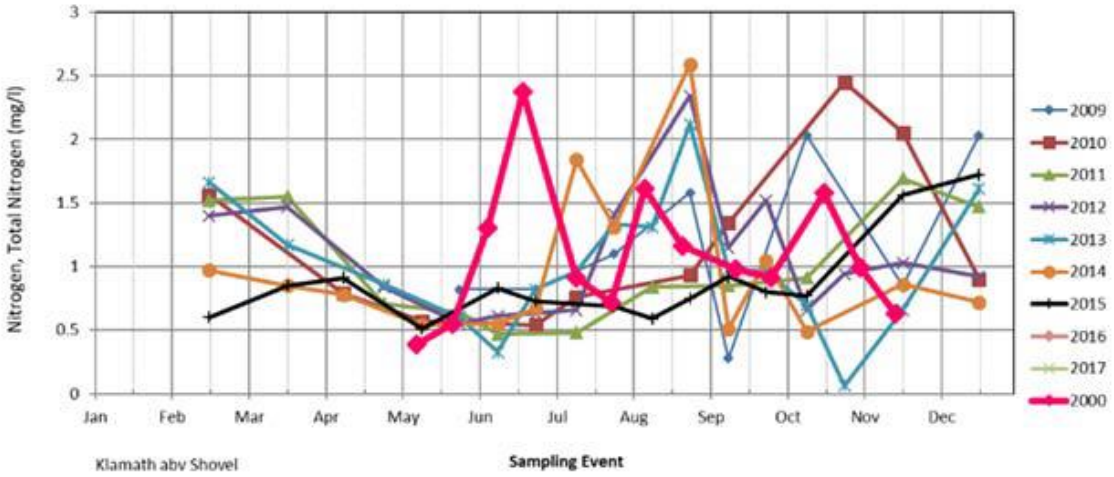
Please also specifically refer to Potential Impact 3.2-3 for discussion of the potential changes in SSCs downstream of Copco No. 1 Dam due to sediment jetting within the Copco No. 1 Reservoir footprint, and of the potential changes in SSCs downstream of Iron Gate Dam due to sediment jetting within both the Copco No. 1 and Iron Gate reservoir footprints. Volume III Attachment 1 presents the final Section 3.2 *Water Quality*.

The best available information and quantitative modeling results are used to analyze the potential impacts from SSCs under the Proposed Project. There are no available data or other evidence to indicate that additional quantitative analysis, improvements in the precision of the modeling, or changes in the model uncertainty would meaningfully alter the sediment analysis provided or alter the conclusion that there would be a significant and unavoidable impact for SSCs under the Proposed Project (see Potential Impact 3.2-3).

Comment ORG46-122

Regarding the TMDL model assumptions for full TMDL implementation the DEIR states that "Despite this assumption, the Klamath River TMDL model results are still informative with respect to the analysis of potential nutrient impacts under the Proposed Project, particularly since nutrient models were not developed for the FERC relicensing process." Nutrient models as part of the Klamath River Water Quality Model (KRWQM) were developed by Watercourse Engineering for the FERC relicensing process (PacifiCorp 2004a). These models were subsequently used with modification by the North Coast Regional Water Board in the developing the Klamath River TMDL in California. The TMDL model included only a single simulation year based on the year 2000. Since the TMDL model was developed, the KRWQM models have incorporated additional years of data that have substantively improved model representation of water quality processes in the Klamath River (see PacifiCorp 2014). The TMDL's use of a

single year yields no information on natural annual variability. As an example of interannual variability, total nitrogen for the Klamath River upstream of Copco Reservoir (Klamath above Shovel Creek site) is plotted below using data from the KHSA Interim Measure 15 monitoring program in comparison to data from 2000 (Watercourse 2003a, 2003b). While the year 2000 may represent a proxy for an "average" condition, the year is not a conservative assumption because there are several years with notably higher total nitrogen concentrations. Similar results are apparent for other constituents, as well. Therefore, relying solely on the TMDL is a serious limitation of the DEIR, not only because a single year is insufficient to capture variability, but also because well over a decade of additional data have been collected since the year 2000 and the modeling upon which the TMDL is based has been substantially improved.



Response to Comment ORG46-122

Contrary to the comment's assertion, and as discussed in Section 3.2.4.3 *Water Quality – Impact Analysis Approach – Nutrients*, the analysis of potential impacts to nutrients under the Proposed Project does not rely solely on results of Total Maximum Daily Load (TMDL) modeling efforts; rather the EIR uses both Klamath River TMDL model results and existing nutrient budget analysis results that compare existing conditions with those under dam removal conditions. While the comment asserts that more recent versions of the Klamath River Water Quality Model (KRWQM) incorporate additional years of data to improve model representation of water quality processes in the Klamath River, the more recent KRWQM results do not compare nutrients for existing conditions with dam removal conditions (PacifiCorp 2008a, 2014a). PacifiCorp (2014a) Section 4.2 *Current Conditions and Processes Affecting Water Quality* (pages 4-4 to 4-56), Section 4.3 *Project Contributions to Water Quality* (pages 4-56 to 4-57), and Section 5.2.11 *Biostimulatory Substances* (pages 5-125 to 5-134) specifically discuss the present conditions (i.e., existing conditions) and the [Lower Klamath] Project contribution to nutrients, but there is no discussion in PacifiCorp (2014a) of updated modeling results of potential nutrient conditions under dam removal conditions or a comparison of nutrients under existing conditions and under dam

removal conditions. PacifiCorp (2014a) is focused on comparing existing conditions with continued operations of the measures to enhance water quality and beneficial uses (i.e., the Proposed Project in PacifiCorp [2014a]). Additionally, analysis of the Lower Klamath Project contributions to nutrient conditions under existing conditions in PacifiCorp (2014a) relies heavily on the nutrient analysis by Kann and Asarian (2005, 2007) and Asarian et al. (2009) that were used in the development of the nutrient budget analysis discussed in Section 3.2.4.3 *Water Quality – Impact Analysis Approach – Nutrients* and used in Potential Impact 3.2-8. PacifiCorp (2019a) documenting the most recent version of the KRWQM also does not compare nutrients under existing conditions and under dam removal conditions. Thus, the Klamath River TMDL model results are the most recent, publicly available nutrient model results comparing existing conditions and dam removal conditions.

The Klamath River TMDL model results are not presented as conservative representations of potential impacts in the EIR. While the Klamath River TMDL model results are only available for one year (i.e., 2000), other models and analysis results are used when available in the EIR to characterize interannual variability and to evaluate potential impacts to water quality parameters. For example, data from 2005 to 2008 were used to develop the nutrient retention rates and nutrient budget for the free-flowing reaches of the Klamath River (Asarian et al. 2010) and the results of this nutrient budget analysis were used in the comparison of nutrients under existing conditions and under dam removal conditions, as explained in Section 3.2.4.3 *Water Quality – Impact Analysis Approach – Nutrients*.

Please refer to Master Response WQ-4 for a discussion of nutrient interannual variability and how nutrient data from 2000 to 2017 were considered in the EIR analysis.

Please also refer to Master Response WQ-5 for further discussion of the appropriateness of using Klamath River TMDL model results in the EIR analysis.

Comment ORG46-123

The challenge with nutrient budgets is that they are generally calculated based on long averaging periods (e.g., annual budgets or monthly budgets) and occur at discrete locations in the reservoir-river system. Thus, they are spatially and temporally coarse. By their very nature, nutrient budgets are not mechanistic models meaning that relationships and processes among constituents are not represented. Overall, they represent a simplification of processes. By using the results of an up-to-date water quality model, a more accurate and effective assessment of potential outcomes associated with the various alternatives could have been conducted in the DEIR.

Response to Comment ORG46-123
Please refer to Section 3.2.4.3 *Water Quality – Impact Analysis Approach – Nutrients* for a summary of the mechanistic Klamath River Total Maximum Daily Load (TMDL) water quality model used in addition to nutrient budgets to analyze the potential impacts to nutrients under the Proposed Project. A nutrient budget approach is a well-accepted and technically appropriate method for estimating the total mass of nitrogen or phosphorus into and out of a river or reservoir reach. Nutrient budgets use a data-driven empirical approach and characterize the net nutrient results of all the processes occurring within the river or reservoir. This approach provides a useful complement to the mechanistic modeling approach used in the Klamath River TMDL model since nutrient budgets do not require numerous assumptions about individual processes (e.g., nutrient uptake rates by periphyton) and interactions between processes (e.g., oxidation of ammonia to nitrate and nutrient uptake by periphyton). Comparison of the results from the two different approaches provide a verification of the accuracy of the nutrient estimate from each approach and an overall more robust analysis of the potential impacts under the Proposed Project. Although the existing nutrient budget for the Klamath River (Asarian et al. 2009, 2010) is relatively spatially coarse as compared with the mechanistic KRWQM, the nutrient budget approach is based on measurements at the boundaries of each reach being modeled and thus is not inherently less accurate than a model that relies on assumptions about nutrient uptake and release mechanisms at a smaller spatial scale.

Please refer to Asarian et al. (2009, 2010) for more details on the nutrient budget approaches summarized in Section 3.2.4.3 *Water Quality – Impact Analysis Approach – Nutrients*, including the technical appropriateness of the nutrient budget approach, refinements to the nutrient budget approach used to address comments from PacifiCorp (2006) and others on an initial nutrient budget analysis, a quantification of the uncertainty associated with the approach, and a comparison of the estimated nutrient budget results with other literature studies. Contrary to the commenter's assumption of an annual or monthly time-scale, daily nutrient concentrations and loads were estimated in the nutrient budget using multiple regression modeling methods along with the available nutrient and hydrologic measurements (Asarian et al. 2009, 2010). Volume III Attachment 1 presents the final Section 3.2 *Water Quality*.

Comment ORG46-124
The TMDL modeling results are not an appropriate basis for comparing alternatives (see comment 3.2-34).

Response to Comment ORG46-124
Aside from the concerns related to the use of the Klamath River Total Maximum Daily Load (TMDL) model in the EIR analysis that are discussed in Master Response WQ-5, the EIR states that both the Klamath River Water Quality Model (KRWQM) and the Klamath River TMDL model include a scenario that is similar to existing conditions (i.e., with the Lower Klamath Project dams in place) and

scenarios with one or more dams removed that are similar to the Proposed Project and/or alternatives analyzed in Section 4 *Alternatives*. While the TMDL modeling results do not include scenarios that exactly reflect the Proposed Project and/or the alternatives, the TMDL model results are still informative with respect to the analyses of water quality parameters presented in the EIR. Section 4 *Alternatives* notes in several locations (i.e., pages 4-186, 4-194, 4-198, 4-250, 4-257, 4-261, 4-262) that the TMDL model results are still informative with respect to the analyses, even though the assumptions inherent to the TMDL models are necessarily different than the existing conditions baseline for the CEQA analysis of the Proposed Project and the alternatives.

Please also refer to responses to comments ORG46-422 and ORG46-424 for discussion of how the assumption of TMDL compliance is considered in the alternatives analysis.

Comment ORG46-125

Rather than explain why the State Water Board believes that the Klamath River TMDL model over-predicts chlorophyll-a for a dam removal scenario, the DEIR simply states "Instead, this EIR's chlorophyll-a impact analysis is based on a qualitative assessment of whether the Proposed Project would result in exceedances of the California 10 µg/L [sic] target for the Lower Klamath Project reservoirs and adversely affect beneficial uses with respect to water column concentrations of chlorophyll-a." The numerical endpoints analysis used in the DEIR is inadequate to assess a "without dams" condition because it does not address the conversion of inorganic nutrients to periphyton and macrophyte biomass in the Klamath River from J.C. Boyle Reservoir to Iron Gate Dam. Periphyton and macrophyte growth will be extensive in this reach due to nutrients from upstream reaches (Upper Klamath Lake and Keno reservoir). Senescence, reproductive processes, sloughing, grazing, and scour of the bed community (periphyton and macrophytes), coupled with phytoplankton release from Upper Klamath Lake and Keno reservoir, have not been addressed in the DEIR.

The assumed timeline to achievement of the TMDL is unclear in the DEIR. Upper Klamath Lake is not expected to achieve compliance with the Upper Klamath Lake TMDL for decades (ODEQ 2002, 2018). Further, even under a future TMDL compliance scenario, compliance at Upper Klamath Lake will not occur in every year. Specifically, very large fluxes of organic matter would still be periodically released into the river from Upper Klamath Lake. According to studies upon which the Upper Klamath Lake TMDL analysis was based, very large fluxes would still occur 2 out of every 8 years after the TMDL measures are achieved (OOEQ 2002). These large nutrient and organic matter fluxes from Upper Klamath Lake are not explicitly considered in the DEIR's analysis. Certainly, DEIR long-term impacts (3 years or more into the future) will occur simply as a result of the decades it will take to achieve TMDL compliance. This point is made in the DEIR (pg. 3-80, paragraph 1): "Note that the Klamath River TMDL model for both "dams-in" and "dams-out" scenarios assumes full

implementation of the TMDLs, a condition that is currently highly speculative with respect to the mechanisms and timing required to achieve future compliance."

The DEIR should clarify the rationale for the use of chlorophyll-a as a surrogate to address toxin producing algae. As stated in the DEIR "chlorophyll-a target of 10 µu/L [sic] (i.e., reduction to) is a conservative estimate of mean summer chlorophyll-a concentrations required to move the system toward support of beneficial uses." These beneficial uses extend beyond toxin-producing algae.

Response to Comment ORG46-125
Comparison of the Klamath River Total Maximum Daily Load (TMDL) modeled and measured chlorophyll-*a* concentrations under existing conditions indicates that the Klamath River TMDL model over-predicts chlorophyll-*a* concentrations, including multiple peaks in modeled chlorophyll-*a* that are not observed in the measured chlorophyll-*a* data (Tetra Tech 2009).

Section 3.2.4.6 *Water Quality – Impact Analysis Approach – Chlorophyll-a and Algal Toxins* has been revised to correct a typo for the citation to Tetra Tech (2009) that discusses the comparison of modeled and measured chlorophyll-*a* concentrations and to clarify that the Klamath River TMDL model would be likely to over-predict chlorophyll-*a* under the "dams-out" scenario since it over-predicted chlorophyll-*a* under existing conditions. Please refer to Volume III Attachment 1 Section 3.2.4.6 *Water Quality – Impact Analysis Approach – Chlorophyll-a and Algal Toxins* for the revisions.

As discussed in Section 3.2.3.1 *Water Quality – Significance Criteria – Thresholds of Significance – Chlorophyll-a and Algal Toxins* and Section 3.2.4.6 *Water Quality – Impact Analysis Approach – Chlorophyll-a and Algal Toxins*, the California Klamath River TMDL suspended algae (i.e., phytoplankton) chlorophyll-*a* target (10 micrograms per liter [ug/L]) used as the threshold of significance in the EIR is based on a previous nutrient numeric endpoints (NNE) analysis (Creager et al. 2006; Tetra Tech 2008). There is no direct application of the NNE approach in the EIR. The water quality analysis includes the NNE phytoplankton chlorophyll-*a* target because it is a surrogate measure of the phytoplankton biomass that could have a potential impact on water quality (i.e., algal toxins). Chlorophyll-*a* is considered a surrogate for phytoplankton [algal] biomass since phytoplankton cells contain chlorophyll-*a* and a greater amount of phytoplankton biomass would release a greater amount of chlorophyll-*a* when the cells break apart (i.e., lyse) and degrade. Higher phytoplankton biomass would also potentially correspond to higher algal toxin concentrations if the phytoplankton biomass includes a relatively large proportion of toxin-producing blue-green algae [cyanobacteria] cells. As presented in Appendix C, Section C.6 *Algal Toxins and Chlorophyll-a*, *Microcystis aeruginosa* cell density correlates significantly with microcystin concentrations measured in Copco No. 1 and Iron Gate reservoirs and Klamath River locations (Kann et al. 2010a). Thus, as explained in Section 3.2.4.6 *Water Quality – Impact Analysis Approach –*

Chlorophyll-a and Algal Toxins, in addition to chlorophyll-*a* concentrations, algal toxins are analyzed based on trends in the density of toxin-producing blue-green algae, including *Microcystis aeruginosa*, to algal toxin concentrations. Volume III Attachment 1 presents the final Section 3.2 *Water Quality.*

Please refer to Volume I Section 3.4.5 *Phytoplankton and Periphyton – Potential Impacts and Mitigation* (pages 3-426 to 3-440) for analysis of the potential changes in phytoplankton and periphyton abundance and extent in the Hydroelectric Reach, Middle and Lower Klamath River, and Klamath River Estuary under the Proposed Project. Periphyton and macrophyte colonization and growth in the new free-flowing river portions of the Hydroelectric Reach would potentially contribute to chlorophyll-*a* concentrations, but there is not sufficient information or models available at this time to quantitively predict the changes in chlorophyll-*a* concentrations from potential periphyton and macrophyte growth under the Proposed Project. Accordingly, Volume I Section 3.4.5 *Phytoplankton and Periphyton – Potential Impacts and Mitigation* (pages 3-426 to 3-440) analyzes the potential changes in periphyton and macrophyte abundance directly rather than using chlorophyll-*a* as a surrogate for periphyton or macrophyte abundance. Please also refer to responses to comments ORG46-33, ORG46-34, ORG46-36, ORG46-89, ORG46-95, ORG46-97, ORG46-99, ORG46-108, ORG46-136, ORG46-137, ORG46-146, ORG46-147, ORG46-149 for further discussion of potential periphyton and macrophyte growth in the Klamath River under the Proposed Project.

Section 3.2.4.6 *Water Quality – Impact Analysis Approach – Chlorophyll-a and Algal Toxins* have been revised to clarify that the chlorophyll-*a* target is based on phytoplankton chlorophyll-*a*. Please refer to Volume III Attachment 1 Section 3.2.4.6 *Water Quality – Impact Analysis Approach – Chlorophyll-a and Algal Toxins* for the revisions.

As explained in Section 3.2.4.6 *Water Quality – Impact Analysis Approach – Chlorophyll-a and Algal Toxins*, the Klamath River TMDL model results are not used in the analysis of potential impacts to chlorophyll-*a* and algal toxins under the Proposed Project and the analysis in Potential Impact 3.2-12 does not rely on achieving TMDL compliance. Please refer to Master Response WQ-5 for discussion of the Klamath River TMDL model results for other water quality parameters.

Episodic large fluxes of organic matter and associated chlorophyll-*a* are part of existing conditions, so data from 2002 to 2010 analyzed in the EIR would characterize these large fluxes. Please also refer to response to comment ORG46-107 for additional summary of Klamath Hydropower Settlement Agreement (KHSA) Interim Measure 15 (IM 15) chlorophyll-*a* data from 2000 to 2017 that would characterize the episodic large fluxes from upstream of the Hydroelectric Reach. Chlorophyll-*a* concentrations measured upstream of J.C. Boyle Reservoir, including episodic large fluxes of chlorophyll-*a* associated with

algae, are generally similar or less than chlorophyll-*a* concentrations in Copco No. 1 and Iron Gate reservoirs and downstream of Iron Gate Dam under existing conditions. The Proposed Project does not include any changes to Klamath River conditions upstream of J.C. Boyle Reservoir, so chlorophyll-*a* concentrations measured at the upstream extent of J.C. Boyle Reservoir would represent the maximum chlorophyll-*a* concentrations entering the Hydroelectric Reach under the Proposed Project. Turbulent-mixing conditions in the river are expected to continue to decrease chlorophyll-*a* concentrations in the Hydroelectric Reach between J.C. Boyle Dam and the upstream end of Copco No. 1 Reservoir under the Proposed Project, as is the case under existing conditions. The conversion of the reservoirs to free-flowing, turbulent river reaches would likely result in a slight decrease in chlorophyll-*a* through the Hydroelectric Reach under the Proposed Project compared to under existing conditions. Thus, chlorophyll-*a* concentrations in the Hydroelectric Reach due to transport of chlorophyll-*a* into this reach from upstream sources, including episodic large fluxes, would be similar to or less than existing conditions under the Proposed Project.

Section 3.2.5.6 *Water Quality – Potential Impacts and Mitigation – Chlorophyll-a and Algal Toxins* Potential Impact 3.2-12 has been revised to clarify that the chlorophyll-*a* concentrations in the Hydroelectric Reach due to transport of chlorophyll-*a* into this reach from upstream sources, including chlorophyll-*a* from Upper Klamath Lake and episodic large fluxes from the Lake Ewauna/Keno Impoundment, would be similar to or less than existing conditions under the Proposed Project. Please refer to Volume III Attachment 1 Section 3.2.5.6 *Water Quality – Potential Impacts and Mitigation – Chlorophyll-a and Algal Toxins* for the revisions.

With respect to the comment regarding organic matter and nutrients entering the Hydroelectric Reach from upstream sources, Section 3.2.5.2 *Water Quality – Potential Impacts and Mitigation – Suspended Sediments* Potential Impact 3.2-6 provides an analysis of the algal-derived (organic) suspended material, including an explicit consideration of the episodic large fluxes of suspended material (i.e., organic matter) from upstream of the Hydroelectric Reach, including Upper Klamath Lake. Section 3.2.5.3 *Water Quality – Potential Impacts and Mitigation – Nutrients* Potential Impact 3.2-8 provides an analysis of long-term nutrient conditions in the Hydroelectric Reach, the Middle and Lower Klamath River, the Klamath River Estuary, and the Pacific Ocean Nearshore Environment under the Proposed Project. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Comment ORG46-126

The DEIR states "The KRWQM did not model water temperatures within the Hydroelectric Reach." This statement is incorrect because the KRWQM did model water temperature in this reach. The KRWQM model was developed for the Klamath River system from Link River Dam, near Klamath Falls (RM 254) to

Turwar (RM 6), and includes existing Klamath Hydroelectric Project facilities, as well as a without dam representation (including alternatives with selected dams removed and others retained). However, the TMDL model that was adapted from the original KRWQM by the North Coast Regional Water Quality Control Board, has an error that under-predicts water temperature in riverine reaches.

Response to Comment ORG46-126

Section 3.2.5.1 *Water Quality – Potential Impacts and Mitigation – Water Temperature* Potential Impact 3.2-1 – *Hydroelectric Reach* has been revised to clarify that documentation of Klamath River Water Quality Model (KRWQM) water temperature results within the Hydroelectric Reach is not available under conditions similar to the Proposed Project (i.e., removal of J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate dams). Dam removal scenarios modeled by the PacifiCorp (2004a-1) KRWQM were different from the Proposed Project because the two dam removal scenarios removed Keno Dam in addition to J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate dams. In the PacifiCorp (2004a-1) KRWQM results, there is a difference between the water temperature upstream of J.C. Boyle Reservoir under existing conditions and under removal of Keno, J.C. Boyle, Copco No. 1, Copco No.2, and Iron Gate dams, indicating that removal of Keno Dam would alter the water temperature in the Hydroelectric Reach. There would be no difference in the water temperature upstream of J.C. Boyle Reservoir under existing conditions and under the Proposed Project since the Proposed Project would not alter conditions upstream of J.C. Boyle Reservoir, so the modeled water temperature difference upstream of J.C. Boyle Reservoir between existing conditions and dam removal scenarios demonstrates PacifiCorp (2004a-1) KRWQM results do not characterize water temperature conditions in the entire Hydroelectric Reach under the Proposed Project. PacifiCorp (2005) KRWQM included modeling of conditions similar to the Proposed Project with only the removal of J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate dams, but no model results for the Hydroelectric Reach were presented and the model results were only presented downstream of Iron Gate Dam. While PacifiCorp (2008, 2014) present California Temperature Objective KRWQM model results for locations in the Hydroelectric Reach (i.e., water temperature in the Klamath River under hypothetical removal of J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate dams increased by 2.8^{o}C), the California Temperature Objective KRWQM results are 7-day average of the maximum water temperatures and they do not describe the hourly or daily variations in water temperature under the Proposed Project. PacifiCorp (2019a) does not present KRWQM water temperature results in the Hydroelectric Reach under dam removal conditions. Please refer to Volume III Attachment 1 Section 3.2.5.1 *Water Quality – Potential Impacts and Mitigation – Water Temperature* for the revisions.

With respect to the comment's concern about how the Total Maximum Daily Load (TMDL) model predicts water temperature in riverine reaches, please refer to Response 10a in Appendix 10 of the Klamath River TMDLs (North Coast

Regional Board 2010), where the North Coast Regional Board explains, in response to a related comment by PacifiCorp, that the TMDL model applied a 20 percent reduction to short-wave solar radiation into riverine segments during model calibration because the solar radiation calculated in the model between J.C. Boyle and Copco No. 1 reservoirs from solar radiations equations that use latitude, longitude, and elevation was approximately 20 percent higher than observed solar radiation. This 20 percent reduction in estimated solar radiation into the riverine segments was justified since the modeled solar radiation equation was not measured data and the adjustment achieved consistency with observed data and more accurate water temperature predictions between J.C. Boyle Dam and Copco No. 1 Reservoir.

Comment ORG46-127

The DEIR erroneously states that "The KRWQM indicates that the overall water temperature influence of the Hydroelectric Reach is mostly attenuated by RM 66.3 at the confluence with the Salmon River (see Figure 3.2-10)." Regarding this statement, PacifiCorp model results (see PacifiCorp 2004a, 2008) show that the thermal effects of the Project reservoirs on water temperatures downstream of Iron Gate Dam (RM 190) progressively diminish until reaching a downstream location where effects are absent. From December through July, the effects are quite small or absent by the time the river reaches the confluence with the Scott River (RM 143.9). In August and November, the effects are small or absent by the time the river reaches Seiad Valley (RM 120), and in September and October, by the time the river reaches the confluence with Clear Creek (RM 95). In no cases does modeling indicate that thermal effects extend to the confluence with the Salmon River.

Response to Comment ORG46-127

Contrary to the comment's assertion, *Section 3.2.5.1 Water Quality – Potential Impacts and Mitigation – Water Temperature* Potential Impact 3.2-1 correctly characterizes 2004/2005 Klamath River Water Quality Model (KRWQM) water temperature results, whereby the influence of Iron Gate Dam (river mile [RM] 193.1) releases on Klamath River water temperature are mostly attenuated by the confluence with the Salmon River (RM 66.3). As reported in PacifiCorp (2005), shown in Section 3.2.5.1 *Water Quality – Potential Impacts and Mitigation – Water Temperature* Figure 3.2-10, and reproduced below, hourly water temperatures simulated by the 2004/2005 KRWQM and based on 2004 data in the Klamath River upstream of the Salmon River for existing conditions (i.e., with the dams) and without J.C. Boyle (JCB), Copco No. 1 and Copco No. 2 (Copco), and Iron Gate (IG) dams (i.e., the Proposed Project) are not identical. While the differences between modeled Klamath River water temperatures upstream of the Salmon River under existing conditions and without the dams are typically less than 1°C, there are visually obvious differences between these two conditions which supports the EIR statement that Iron Gate Dam releases influence Klamath River water temperature upstream of the confluence with the Salmon

River, especially during spring (i.e., March) and summer through fall (i.e., mid-June to early-November).

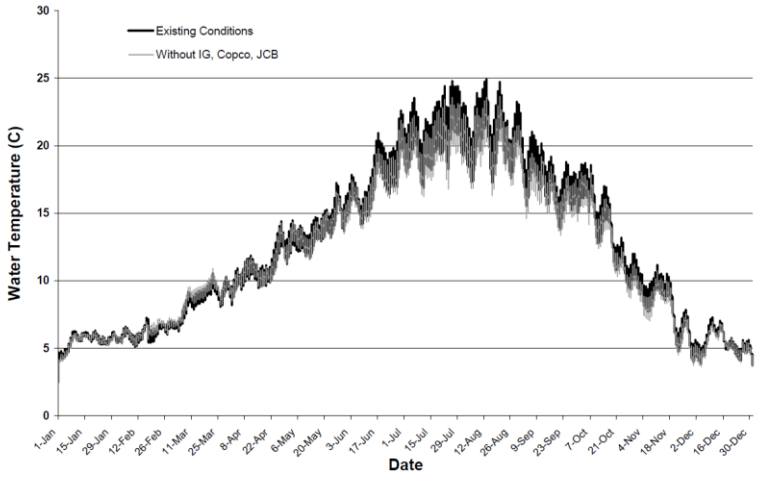


Figure 3.2-10 from Potential Impact 3.2-1. Simulated Hourly Water Temperature in the Klamath River Upstream from the Salmon River (≈RM 66.3) Based on Year 2004 for Existing Conditions Compared to Hypothetical Conditions without J.C. Boyle (JCB), Copco No. 1, Copco No. 2, and Iron Gate (IG) Dams. Source: PacifiCorp 2005.

While not shown in Potential Impact 3.2-1, water temperature results simulated by the 2004/2005 KRWQM in the Klamath River upstream of the Salmon River based on 2000 to 2003 data are also not identical between existing conditions and a dam removal condition (i.e., without Iron Gate, Copco No. 1, and J.C. Boyle dams), further indicating that Iron Gate Dam releases influence water temperature in the Klamath River downstream to the confluence of the Salmon River. For the 2000 to 2003 dataset, the differences between the 2004/2005 KRWQM water temperature results under existing conditions and a without-dams condition are typically less than 1°C, such that the influence of Iron Gate Dam releases on Klamath River water temperature is mostly attenuated by this location. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

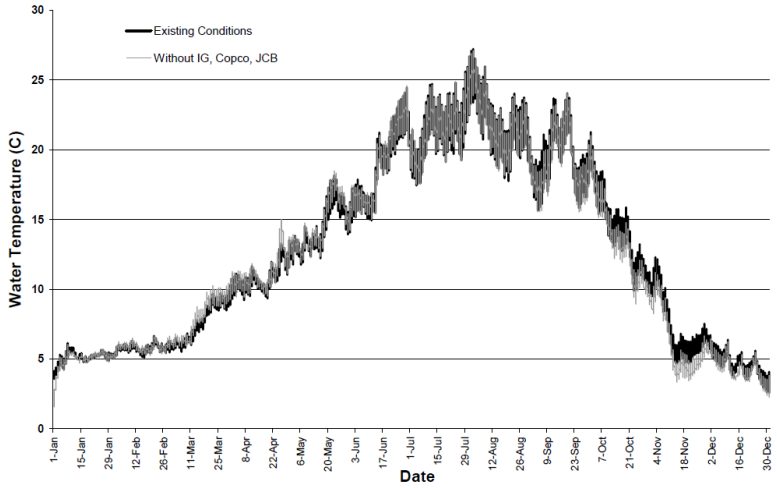


Figure 4-16 from PacifiCorp (2005), Appendix B. Simulated Hourly Water Temperature in the Klamath River Upstream from the Salmon River (≈RM 66.3) Based on Year 2000 for Existing Conditions Compared to Hypothetical Conditions without J.C. Boyle (JCB), Copco No. 1, Copco No. 2, and Iron Gate (IG) Dams.

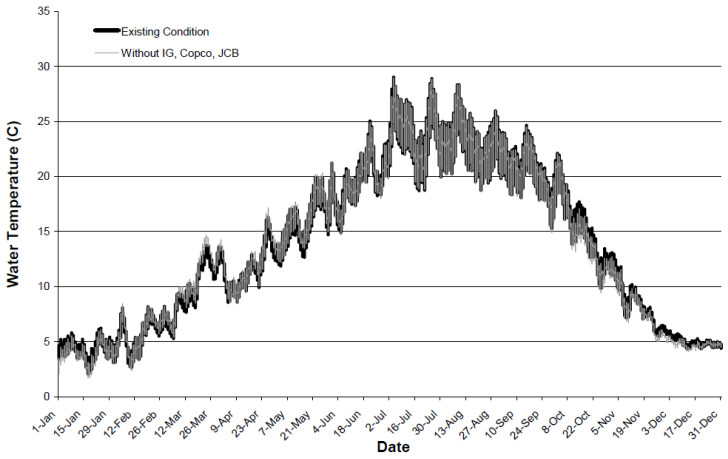


Figure 4-17 from PacifiCorp (2005), Appendix B. Simulated Hourly Water Temperature in the Klamath River Upstream from the Salmon River (≈RM 66.3) Based on Year 2001 for Existing Conditions Compared to Hypothetical Conditions without J.C. Boyle (JCB), Copco No. 1, Copco No. 2, and Iron Gate (IG) Dams.

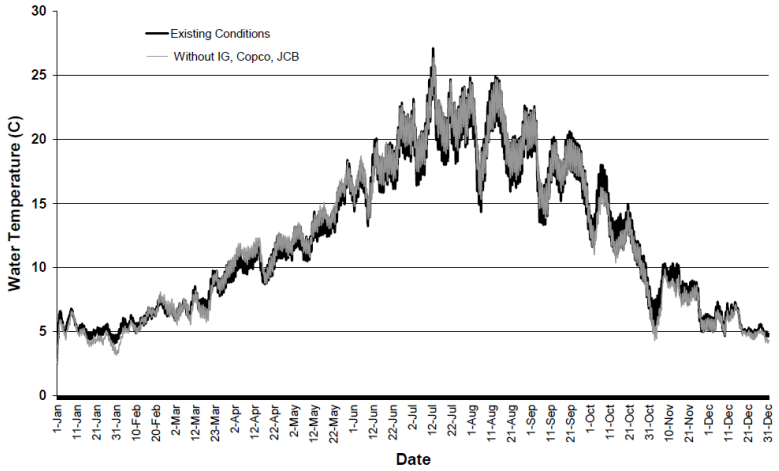


Figure 4-18 from PacifiCorp (2005), Appendix B. Simulated Hourly Water Temperature in the Klamath River Upstream from the Salmon River (≈RM 66.3) Based on Year 2002 for Existing Conditions Compared to Hypothetical Conditions without J.C. Boyle (JCB), Copco No. 1, Copco No. 2, and Iron Gate (IG) Dams.

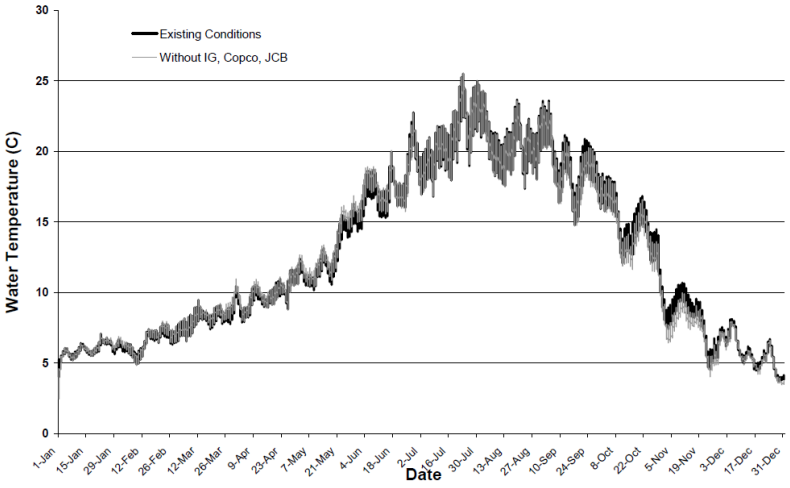


Figure 4-19 from PacifiCorp (2005), Appendix B. Simulated Hourly Water Temperature in the Klamath River Upstream from the Salmon River (≈RM 66.3) Based on Year 2003 for Existing Conditions Compared to Hypothetical Conditions without J.C. Boyle (JCB), Copco No. 1, Copco No. 2, and Iron Gate (IG) Dams.

Additionally, the comment is incorrect to assert "in no cases does modeling [PacifiCorp (2004a-1, 2008a) 2004/2005 KRWQM water temperature results] indicate that thermal effects of Iron Gate Dam releases extend to the confluence with the Salmon River" because KRWQM results from PacifiCorp (2004a-1, 2008a) show Iron Gate Dam releases influencing Klamath River water temperature to the confluence with the Salmon River. In PacifiCorp (2004a-1),

the KRWQM was used to model existing conditions (EC), steady flow conditions (i.e., no peaking flows) with the dams remaining in place (Steady Flow [SF]), and without-Project (WOP) conditions that included the removal of Keno Dam in addition to removal of J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate dams. While the WOP conditions modeled by the KRWQM in PacifiCorp (2004a-1) are different from the Proposed Project, the model results still highlight the influence of Iron Gate Dam releases on downstream water temperature in the Klamath River. As stated in PacifiCorp (2004a-1) Section 4.8.8.2 Temperature (pages 4-79 to 4-84), the "thermal lag effect [of Iron Gate Dam releases] is still evident in the Klamath River just above the Shasta River (RM 177.5) (Figure 4.8-64), but is greatly diminished by Seiad Valley (RM 129) (Figure 4.8-65) and generally absent by the Salmon River (RM 67) (Figure 4.8-66)." As shown in PacifiCorp (2004a-1) Figure 4.8-66 (reproduced below), water temperature differences between the without-Project (i.e., defined as removal of Keno, J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate dams in PacifiCorp [2004]) and existing conditions (i.e., WOP-EC) are typically less than 1°C, but there are still differences between the 2004/2005 KRWQM without-Project and existing conditions water temperatures, especially during spring and fall when the differences approach or exceed 1°C. These water temperature differences indicate releases from Iron Gate Dam are influencing Klamath River water temperature upstream of the Salmon River, although the influence of Iron Gate Dam releases is mostly attenuated.

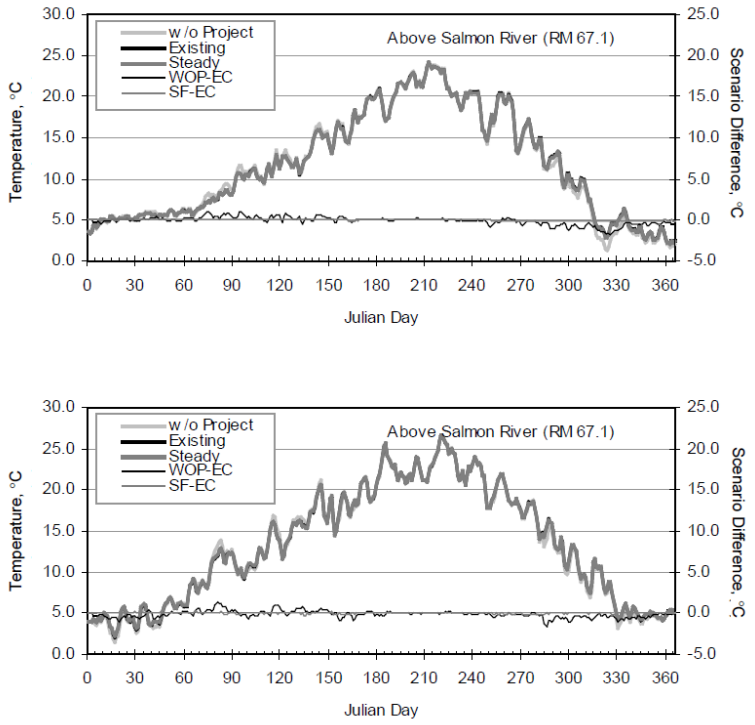


Figure 4.8-66 from PacifiCorp (2004a-1). EC [Existing Conditions] Versus SF [Steady Flow] and WOP [without-Project] Mean Daily Water Temperature in the Klamath River Above the Salmon River for 2000 (top) and 2001 (bottom). Please note that "Without-Project" in PacifiCorp (2004a-1) is defined as removal of Keno, J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate dams.

PacifiCorp (2008a) Section 5.2.3.3 *Project Contributions – Klamath River Farther Downstream of Iron Gate Dam* (pages 5-73 to 5-79) states that the annual maximum water temperature is generally similar at Seiad Valley and at the Salmon River, indicating that the releases from Iron Gate Dam do not significantly influence or control water temperatures in the Lower Klamath River during summer months, compared to the influence on water temperatures of climatological conditions and downstream inflows from various tributary rivers. However, the KRWQM water temperature results plotted in PacifiCorp (2008) Figure 5.2-24 (page 5-77) indicate that the Klamath River water temperatures at the Salmon River are different under existing conditions (i.e., with dams) and under a hypothetical without-Project condition (i.e., without J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate dams and powerhouse developments) during parts of the year (i.e., spring and fall), thus there is an influence of Iron Gate Dam releases on Klamath River water temperatures to the confluence with the Salmon River, as stated in Potential Impact 3.2-1. In PacifiCorp (2008) Figure 5.2-24 (reproduced below), KRWQM water temperature results are presented for the PacifiCorp (2008) Proposed Project (i.e., continued operations of the Lower Klamath Project dams with additional measures to enhance water quality and beneficial uses, whereby the PacifiCorp [2008] Proposed Project is different from

the Lower Klamath Project), Existing Conditions, and a California Temperature Objective (i.e., no more than 5°F [2.8°C] increase in hypothetical without-Project water temperatures [based on model simulations]; labeled as "Objective" in the figure).

While PacifiCorp (2008) Figure 5.2-24 does not present a direct comparison of Klamath River water temperatures at the Salmon River under existing conditions with the dams in place and under hypothetical without-Project conditions (i.e., removal of J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate dams and powerhouse developments), the "Objective" water temperatures shown in Figure 5.2-24 are the hypothetical without-Project conditions shifted up by 2.8°C. Thus, a comparison of the PacifiCorp (2008) Figure 5.2-24 Klamath River water temperatures at the Salmon River under existing conditions and the "Objective" water temperatures shifted down by 2.8°C would ascertain whether there is a difference between KRWQM Klamath River water temperatures at the Salmon River under existing conditions and under dam removal conditions. As shown in Figure ORG46-127-1, the modeled 7-day average of maximum daily water temperatures in the Klamath at the Salmon River under existing conditions, and the "Objective" water temperatures shifted down by 2.8°C (i.e., the blue lower dashed line) representing the water temperature under dam removal conditions, are not identical, with differences between the water temperatures most evident during spring and fall. While the differences in the 7-day average of maximum daily water temperatures are typically less than 1°C, there is a visually obvious water temperature difference during portions of the year that indicate Lower Klamath Project (i.e., Iron Gate Dam) releases are influencing Klamath River water temperatures to the confluence with the Salmon River.

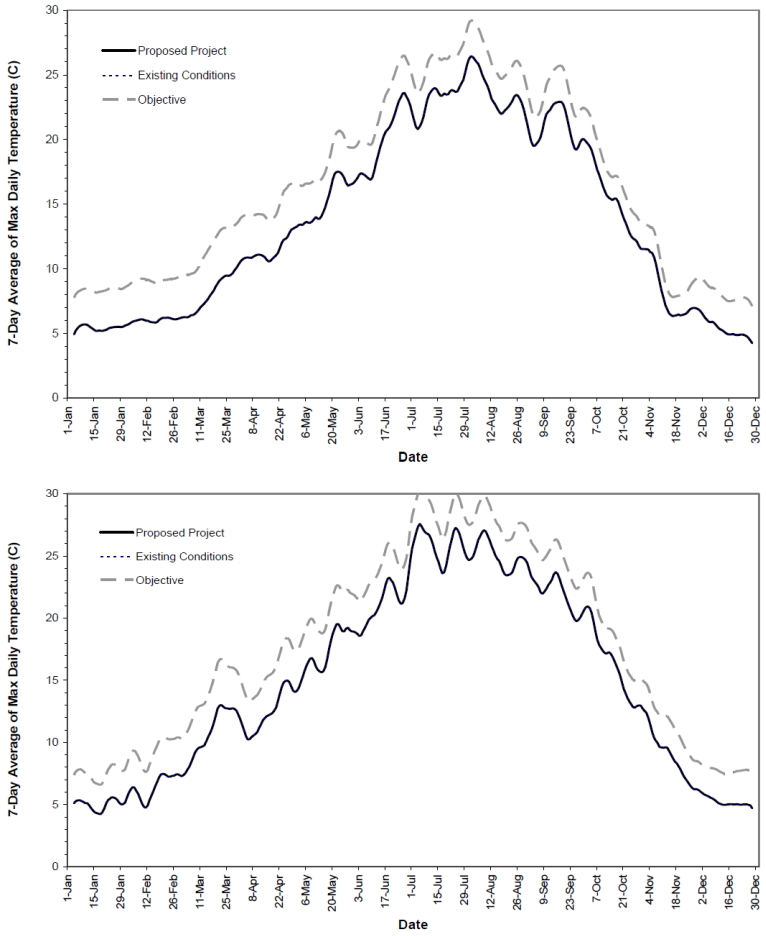


Figure 5.2-24 from PacifiCorp (2008). Time-Series of the 7-Day Average of Maximum Water Temperature (in Degrees C) for the Year 2000 (Top Plot) and 2001 (Bottom Plot) in the Klamath River at the Salmon River, Compared to the California Temperature Objective (i.e., No More Than 5ºF [2.8ºC] Increase Above Hypothetical Without-Project Water Temperatures [Based on Model Simulations]).

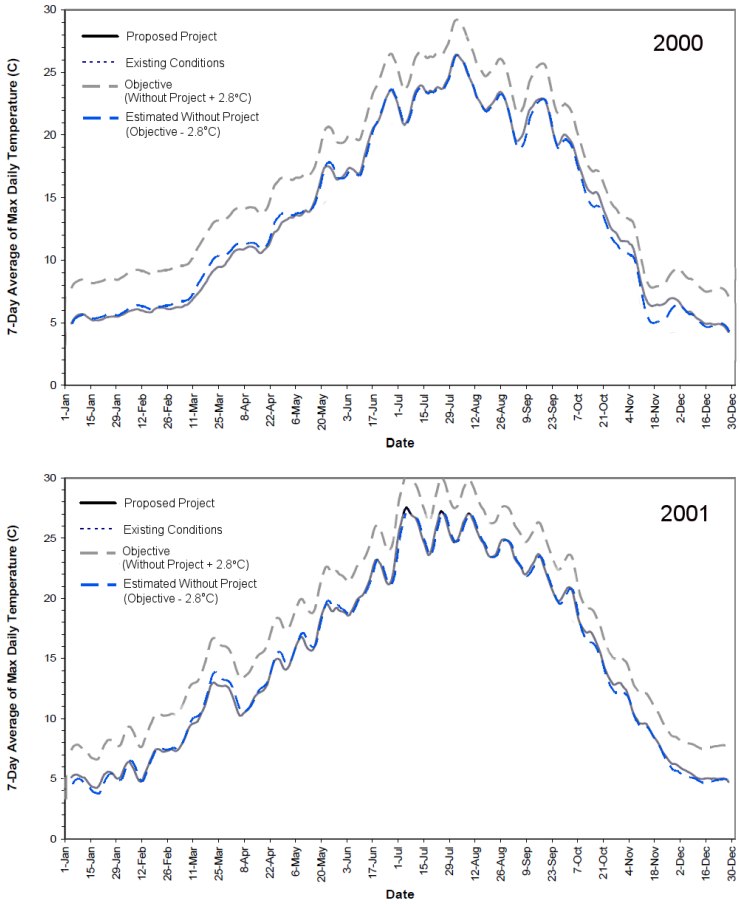


Figure ORG46-127-1 modified Figure 5.2-24 from PacifiCorp (2008). Time-Series of the 7-Day Average of Maximum Water Temperature (˚C) for the Year 2000 (Top Plot) and 2001 (Bottom Plot) in the Klamath River at the Salmon River, Compared to the California Temperature Objective (i.e., No More Than 5˚F [2.8˚C] Increase Above Hypothetical Without-Project Water Temperatures [Based on Model Simulations]) (grey upper dashed line) and the California Temperature Objective shifted 2.8˚C Down to Estimate the Hypothetical Without-Project Water Temperatures (blue lower dashed line).

Additionally, PacifiCorp (2014) presents Klamath River water temperature results at the confluence of the Salmon River from an updated version of the KRWQM in Figure 5.2-25 (reproduced below) for the PacifiCorp (2014) Proposed Project (i.e., continued operations of the Lower Klamath Project dams with additional measures to enhance water quality and beneficial uses, whereby the PacifiCorp [2014] Proposed Project is different from the Lower Klamath Project), Existing Conditions, and a California Temperature Objective (i.e., no more than 5˚F [2.8˚C] increase hypothetical without-Project water temperatures [based on model simulations] where the without-Project is defined as without the J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate dams and powerhouse developments; labeled as “Objective”).

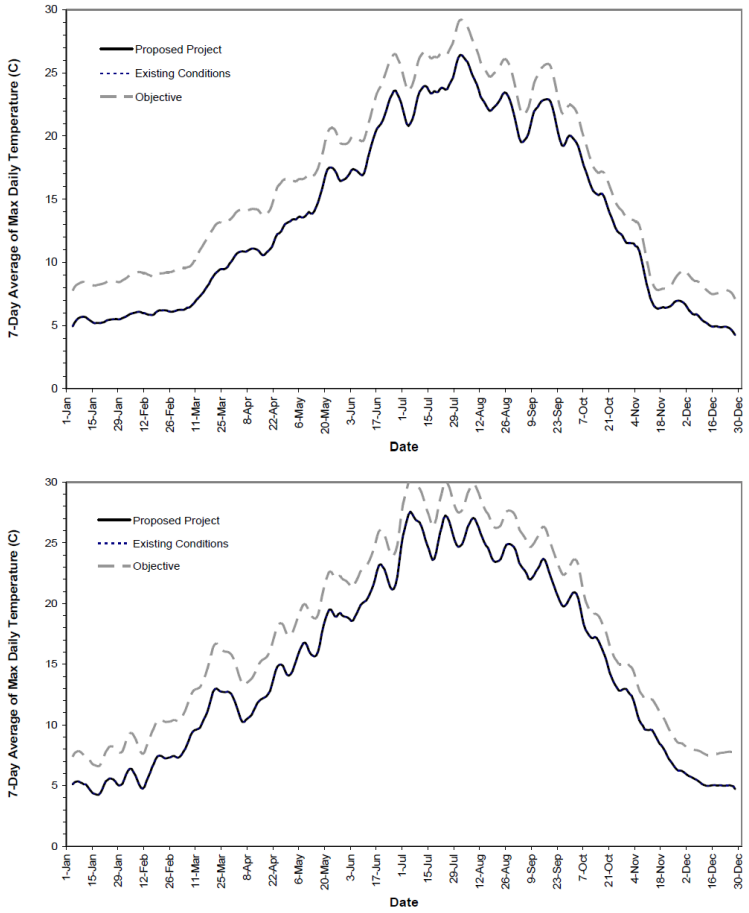


Figure 5.2-25 from PacifiCorp (2014). Time-Series of the 7-Day Average of Maximum Water Temperature (in Degrees C) for the Year 2000 (Top Plot) and 2001 (Bottom Plot) in the Klamath River at the Salmon River, Compared to the California Temperature Objective (i.e., No More Than 5°F [2.8°C] Increase Above Hypothetical Without-Project Water Temperatures [Based on Model Simulations]).

Similar to the previous comparison of PacifiCorp (2008) KRWQM results, a comparison of the PacifiCorp (2014) Figure 5.2-25 Klamath River water temperatures at the Salmon River under existing conditions and the "Objective" water temperatures shifted down by 2.8°C would demonstrate whether there is a difference between the updated 2014 KRWQM water temperature results at the Salmon River under existing conditions and under dam removal conditions. As shown in Figure ORG46-127-2, the PacifiCorp updated 2014 KRWQM 7-day average of maximum daily Klamath River water temperatures at the Salmon River under existing conditions and the "Objective" water temperatures shifted down by 2.8°C (i.e., the blue lower dashed line) are not identical, with differences between the water temperatures being most evident during spring and fall. The differences are typically less than 1°C but they do occur during portions of the year, especially November 2000, and these differences indicate that Lower

Klamath Project (i.e., Iron Gate Dam) releases would potentially influence Klamath River water temperatures to the confluence with the Salmon River.

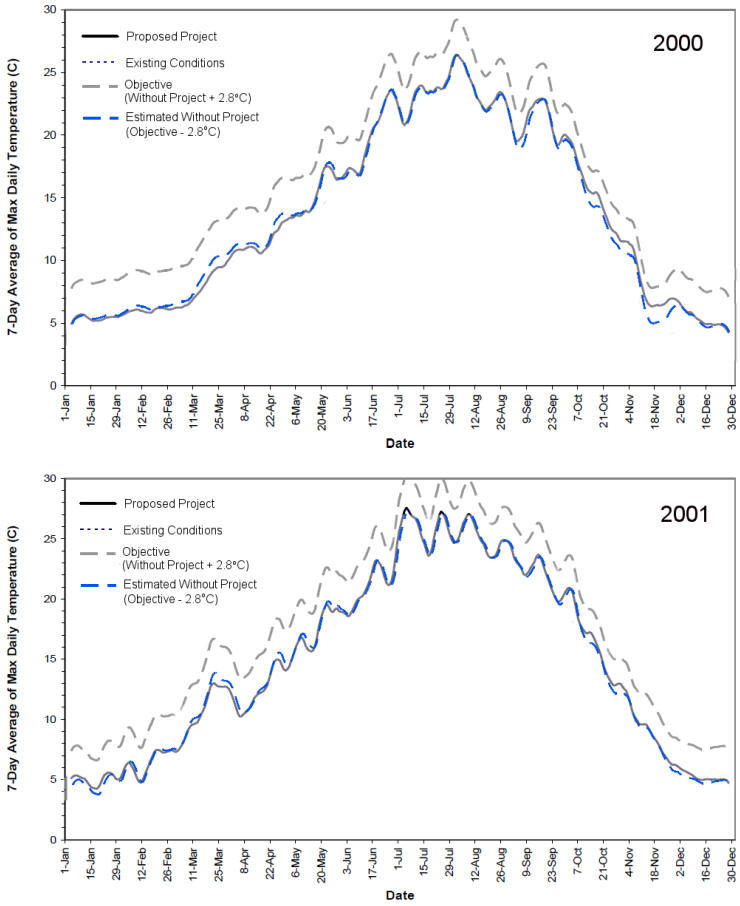


Figure ORG46-127-2 modified Figure 5.2-25 from PacifiCorp (2014). Time-Series of the 7-Day Average of Maximum Water Temperature (°C) for the Year 2000 (Top Plot) and 2001 (Bottom Plot) in the Klamath River at the Salmon River, Compared to the California Temperature Objective (i.e., No More Than 5°F [2.8°C] Increase Above Hypothetical Without-Project Water Temperatures [Based on Model Simulations]) (grey upper dashed line) and the California Temperature Objective shifted 2.8°C Down to Estimate the Hypothetical Without-Project Water Temperatures (blue lower dashed line).

Overall, KRWQM water temperature results from PacifiCorp 2004, 2005, 2008, and 2014 exhibit differences of approximately 1°C or less in Klamath River water temperatures at the confluence with the Salmon River under existing conditions and dam removal conditions during portions of the year. Water temperature differences in the Klamath River at the confluence with the Salmon River between existing conditions and dam removal conditions are most consistently evident across all KRWQM simulations during spring (i.e., March) and fall (i.e., October through November), although the specific time period where water temperature differences exist varies between years. While the differences are

relatively small (i.e., approximately 1°C or less), they indicate that Iron Gate Dam releases do influence water temperature conditions to the confluence of the Salmon River during portions of the year (typically spring and fall months) and support the EIR statement that the water temperature influence of the Hydroelectric Reach is mostly attenuated by RM 66.3 at the confluence with the Salmon River. Differences of less than 1°C in KRWQM water temperatures typically in winter (i.e., December through February) and late spring to early fall (i.e., May through September) months suggest that the water temperature influence of Iron Gate Dam releases typically attenuates farther upstream in the Klamath River during these time periods, but interannual variations (i.e., PacifiCorp (2005) 2001 versus 2004/2005 KRWQM results) suggest the influence of Iron Gate Dam releases could extend to the confluence of Salmon River even during some summer to early fall months.

While the comment focused on KRWQM water temperature results, River Basin Model-10 (RBM-10) water temperature modeling results for a 50-year simulation period under existing conditions (i.e., “dams in”) and under removal of J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate dams (i.e., “dams out”) also show a difference in the mean monthly water temperature of greater than 1°C extending downstream of Iron Gate Dam to upstream of the Salmon River during November (Risley et al. 2012).

The consistency of modeled water temperature differences between existing conditions and dam removal scenarios occurring in the Klamath River from Iron Gate Dam to the confluence of the Salmon River during fall conditions across multiple versions of the KRWQM (PacifiCorp 2004, 2005, 2008, 2014) and the RBM-10 model (Risley et al. 2012) provides evidence that the water temperature influence of the Hydroelectric Reach does extend to the confluence with the Salmon River (RM 66.3), and the relatively small magnitude of the water temperature differences (i.e., approximately 1°C or less) provides evidence that the influence of the Hydroelectric Reach is mostly attenuated by the confluence with the Salmon River.

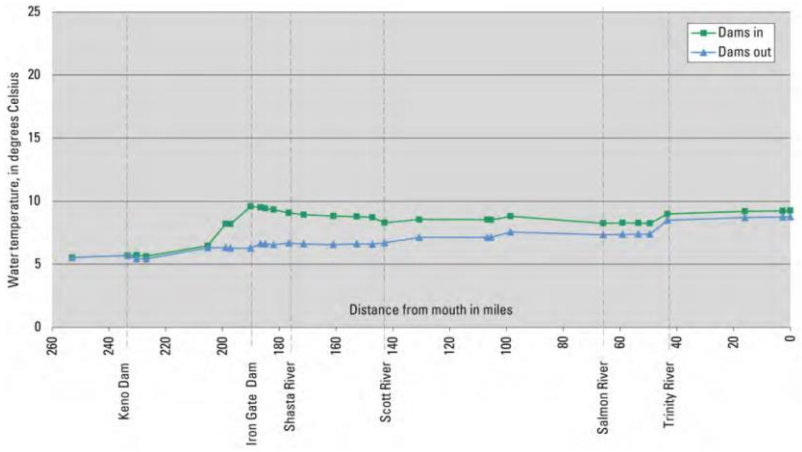


Figure 12 from Risley et al. (2012). Graph Showing Simulated Klamath River Mean November Water Temperatures Using National Marine Fisheries Service 2010 Biological Opinion Flow Requirements as Input Values.

Comment ORG46-128

The DEIR states that water temperatures would be "more favorable for salmonids in the mainstem" under the Proposed Project. This conclusion is not supported by available information either spatially or temporally. PacifiCorp (2008) concludes that the Klamath Hydroelectric Project-related effects on water temperature progressively diminish until reaching a downstream location where effects are absent (see comment 3.2-42). From a temporal perspective, Klamath Hydroelectric Project dams serve to cool water temperatures during the spring months, which may lessen Ceratonova shasta (C. shasta) severity in the reach of the river downstream of Iron Gate Dam. Klamath Hydroelectric Project dams also reduce summer peak water temperatures, which decreases stress on salmonids (see Figure 3.2-8).

The DEIR asserts that "...fall-run Chinook salmon spawning in the mainstem Klamath River during fall would no longer be delayed (reducing pre-spawn mortality), and adult migration would occur in more favorable water temperatures than under existing conditions." This assertion completely ignores the fact that, as discussed above, during fall migration (September-October) the existing Klamath Hydroelectric Project's effects on water temperature are not apparent downstream of the confluence with Clear Creek (RM 95). When fall-run Chinook migration is delayed by water temperatures, the fish are typically downstream of the confluence with the Trinity River (RM 40). Review of water temperature data for locations at Weitchpec and downstream of Iron Gate Dam in September and October illustrates that water temperatures are quite similar. That is, prior to reaching the spawning areas in the vicinity of Iron Gate Dam, fish must first migrate through warm water in the lower Klamath River where water temperature effects from dam removal would not occur (e.g., see "Significance" page 3-82 where it is stated: "No significant impact for the Middle Klamath River downstream from the Salmon River, Lower Klamath River, Klamath"). If

migrating fish are moving past the Trinity River under current conditions without delay, then there would be no additional delay upstream near Iron Gate Dam.

Response to Comment ORG46-128
Section 3.3.5.4 *Aquatic Resources – Potential Impacts and Mitigation – Water Temperature* provides a comprehensive spatial assessment (i.e., the analysis is specific to locations within the watershed that relate to key aquatic species distribution and life history) and temporal assessment (i.e., the analysis considers specific seasons that relate to key aquatic resource life history events) of aspects of the Proposed Project that are predicted to provide more favorable water temperature conditions for salmonids, as well as those aspects of the Proposed Project that would not improve water temperature conditions for salmonids. As discussed in the section, cooler water temperatures in fall are predicted to result in earlier spawning by fall run Chinook salmon downstream of Iron Gate Dam. This relationship between water temperature and spawning timing is distinct from the relationship between water temperature and migration in the lower Klamath River that the commenter raises. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Please also refer to response to comment ORG46-127, which affirms that the Lower Klamath Project effects on water temperature in the mainstem river are apparent to the confluence with the Salmon River (river mile [RM] 66.3).

Comment ORG46-129
The DEIR states "The return to a more natural thermal regime compared with existing conditions would align better with the California Thermal Plan's prohibition on increased temperature discharges above natural temperatures and would be beneficial." Natural temperatures in certain reaches could lead to elevated temperatures at critical times of the year. (e.g., spring outmigration). This is also a condition that could be exacerbated by climate change, as noted on page 3-81 (paragraph 2): "...water temperatures in the Upper Klamath Basin are expected to increase on the order of 2°F to 5°F between 2012 and 2061." The DEIR should explain the risk that the future thermal regime, even if more natural, might not support current (and desired) beneficial uses (e.g., salmon populations) under expected climate change conditions.

The DEIR should recognize the limitation of the TMDL assessment in that temperature criteria (as well as other constituents) are based on only a single year (2000). There is no hydrology or meteorology variability assessed in the TMDL. Year 2000 is neither a particularly wet nor a particularly dry hydrologic year. Under more variable dry or wet year conditions, it is unclear if temperature targets can be met. This is a serious limitation of the TMDL that is not addressed in the DEIR.

Response to Comment ORG46-129
Section 3.2.5.1 *Water Quality – Potential Impacts and Mitigation – Water Temperature* Potential Impact 3.2-1 has been revised in Volume III Attachment 1 to clarify the Chinook Salmon Expert Panel conclusion that removal of the Lower Klamath Project dams offers greater potential than the existing conditions for Chinook salmon to tolerate climate change even with River Basin Model-10 (RBM-10) modeled warming under the combined effects of the Proposed Project and climate change. Please refer to Volume III Attachment 1 3.2.5.1 *Water Quality – Potential Impacts and Mitigation – Water Temperature* for the revisions.

Comment ORG46-130
The DEIR states "Warmer springtime temperatures would result in fry emerging earlier, encountering favorable temperatures for growth sooner than under existing conditions, which could support higher growth rates and encourage earlier outmigration downstream, similar to what likely occurred under historical conditions, and reduce stress and disease." This statement regarding the effects of water temperatures on egg development and fry emergence is incorrect (see comment 3.3-55 and Major Issue 2.9.4). Additionally, elevated temperatures could exacerbate disease effects on fish. The DEIR should clarify the importance of the natural variability of thermal condition in the spring period. Water temperatures respond to meteorological conditions in a highly variable manner with spring period conditions experiencing both cool (e.g., high snowmelt runoff years) and warm (e.g., drought years) spells. Thus, fish may remain upriver later in cool to moderate spring weather conditions, only to be caught far from the ocean when warmer weather conditions occur later in the spring. The DEIR's qualitative assessment is overly simplistic to accurately represent the complexities of water temperature and fish movement.

Response to Comment ORG46-130
Section 3.3.5.4 *Aquatic Resources – Potential Impacts and Mitigation – Water Temperature* provides an analysis of the potential influence of warmer water on salmonids, including egg development and fry emergence under the Proposed Project. Please refer to Volume III Attachment 1 for the final Section 3.3. *Aquatic Resources*. Please also refer to response to comments ORG46-19 and ORG46-212 for additional discussion of how the EIR analyzes temperature-related impacts to salmonids.

Comment ORG46-131
The DEIR claims that the predicted suspended sediment concentrations during Proposed Project reservoir drawdowns are conservative, but this claim relies on extrapolation of model results and does not include the effects of bank slumping or sediment jetting. The realized short-term suspended sediment concentrations could be higher and extend for a longer period of time.

Response to Comment ORG46-131
Potential Impact 3.2-3 presents a conservative estimate of the *short-term impacts* of suspended sediment releases rather than a conservative estimate of the suspended sediment concentrations (SSCs) under the Proposed Project. As discussed in Section 3.2.4.2 *Water Quality – Impact Analysis and Approach – Suspended Sediments* and Section 3.2.5.2 *Water Quality – Potential Impacts and Mitigation – Suspended Sediments* Potential Impact 3.2-3, the analysis of the short-term impacts of suspended sediment releases under dam removal are conservative because variations between the drawdown rates and sediment jetting would likely result in a shorter duration of SSCs greater than the magnitude of the SSC threshold of significance (i.e., 100 mg/L) under the Proposed Project than estimated by USBR (2012a) modeling. The higher drawdown rates and sediment jetting proposed by Klamath River Renewal Corporation (KRRC) would result in relatively more erosion of the total reservoir sediment deposit during the drawdown period (i.e., November of dam removal year 1 to March 15 of dam removal year 2), rather after the drawdown period (i.e., after March 15 of drawdown year 2). Although peak SSCs during drawdown would increase compared to USBR (2012a) modeled SSCs given a higher drawdown rate and sediment jetting, the USBR (2012a) modeled SSCs during drawdown already exceed the magnitude of the SSC threshold of significance and the expected increase in SSCs with a higher drawdown rate and sediment jetting would not alter the overall impact from SSCs in the Klamath River. Additionally, the transport of a higher percentage of the total erodible reservoir sediments during drawdown would reduce the amount of reservoir sediments transported and SSCs in the Klamath River after drawdown. Thus, USBR (2012a) model estimates of SSCs with a lower drawdown rate and no sediment jetting are likely to represent an overestimate of the duration of SSCs greater than 100 mg/L and the duration of short-term impacts from SSCs due to dam removal compared to the Proposed Project.

Overall, Potential Impact 3.2-3 considers that a higher reservoir drawdown rate and sediment jetting would increase peak SSCs over those modeled in USBR (2012a), and it also considers that a higher reservoir drawdown rate and sediment jetting would decrease the duration of SSCs greater than the SSC threshold of significance (i.e., 100 milligram per liter [mg/L]) relative to that modeled by USBR (2012a); thus the analysis provides a conservative estimate of the *short-term impacts* due to elevated SSCs in the Klamath River. Additionally, USBR (2012a) model results do not include potential reductions in SSCs due to vegetation growth on reservoir sediments, so USBR (2012a) modeled SSCs potentially overestimate the actual SSCs under the Proposed Project during the winter following dam removal (i.e., late-dam removal year 2 through early post-dam removal year 1). As such, the analysis of USBR (2012a) modeled SSCs during the winter following dam removal also would result in a conservative estimate of short-term impacts from SSCs in the Klamath River. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Comment ORG46-132

The DEIR acknowledges that sediment jetting could potentially increase the amount of sediment discharged from the reservoirs but fails to specifically quantify this or discuss the effects of this in the DEIR. Because sediment jetting would occur during drawdown, reservoir sediments may not yet have dewatered or consolidated sufficiently for the sediments to be stable. Thus, sediment jetting, which the DEIR states could mobilize up to 34 and 41 percent of expected sediment erosion in Copco and Iron Gate reservoirs, respectively, could increase sediment delivery to the river if it induces slope and bank failures in areas of the reservoir that were anticipated by USBR (2011) to be stable following drawdown.

Response to Comment ORG46-132

Please refer to Section 3.2.5 *Water Quality – Potential Impacts and Mitigation* Potential Impact 3.2-3 for an estimate of the potential maximum and minimum sediment volume that could be transported by sediment jetting during reservoir drawdown and an estimate of the changes in suspended sediment concentrations (SSCs) due to sediment jetting. Table 3.2-12 in Potential Impact 3.2-3 presents estimates of the potential range of sediment volume that would be transported by sediment jetting during drawdown and compares this sediment volume with the potential range of total 2020 sediment volume anticipated to erode under dam removal. Sediment jetting would be undertaken to support the natural erosion of reservoir sediment during reservoir drawdown, at a time when potential water quality impacts from elevated SSCs would already be occurring under the Proposed Project, and would decrease the potential for erosion to occur after drawdown concludes. Sediment jetting would primarily transport reservoir sediment deposits that are already considered to be erodible during drawdown (USBR 2012a).

Potential increases in the total reservoir sediment estimated to erode under the Proposed Project due to the combination of reservoir drawdown and sediment jetting flows would be likely be small compared to the total reservoir sediment volume estimated to erode by USBR (2012a) due to only drawdown. Sediment jetting would occur in the six areas where restoration actions are proposed within the Copco No. 1 Reservoir footprint (see Volume I Section 2.7 *Proposed Project – Proposed Project* Figure 2.7-11) and three areas where restoration actions are proposed within the Iron Gate Reservoir footprint (see Volume I Section 2.7 *Proposed Project – Proposed Project* Figure 2.7-12). Areas with slopes greater than 0.1 to 0.2 are already anticipated to slump toward the river channel in USBR (2012a), so sediment jetting in these areas would not be anticipated to increase the total reservoir sediment estimated to erode by USBR (2012a). Sediment jetting in areas with generally low slopes (less than 0.1 to 0.2) would potentially result in localized slope or bank failure, but this localized slope or bank failure would not be likely to propagate due to the surrounding low slopes.

Overall, because sediment jetting would be focused on supporting the natural erosion of reservoir sediments, the constrained area where sediment jetting

would occur within the reservoir footprints, and the limited, localized potential for sediment jetting-induced slope or bank failure, sediment jetting would be likely to result in negligible to small increases in the total reservoir sediment estimated to erode by USBR (2012a) and associated SSCs. Available sediment transport models or model results for the Klamath River cannot exactly quantify the potential increase in the total reservoir sediment eroded under dam removal due to sediment jetting, but Table 3.2-12 does provide an estimate of the potential range of sediment volumes that would be transported by sediment jetting during drawdown. Additionally, the overall water quality impact of increases in SSCs due to release of reservoir sediments currently trapped behind the Lower Klamath Project dams would not be altered by sediment jetting-induced increases in the total reservoir sediment eroded since any potential increases in SSCs would occur during drawdown when previously modeled SSCs (USBR 2012a) would already exceed the SSCs threshold of significance (i.e., 100 mg/L for a continuous two week period). Sediment jetting also would not increase the duration of elevated SSCs in the Klamath River to be greater than the SSCs duration threshold of significance (i.e., 100 mg/L for a continuous two week period).

Please also specifically refer to Section 3.2.5 *Water Quality – Potential Impacts and Mitigation* Potential Impact 3.2-3 for discussion of the potential changes in SSCs downstream of Copco No. 1 Dam due to sediment jetting within the Copco No. 1 Reservoir footprint, and the potential changes in SSCs downstream of Iron Gate Dam due to sediment jetting within both the Copco No. 1 and Iron Gate reservoir footprints. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Comment ORG46-133

The DEIR indicates the need to stabilize stranded sediments along banks of the Klamath River that would be formed by the former lake bed sediments. However, bank stabilization would be primarily a function of geomorphology. The DEIR does not clearly discuss how the newly exposed river banks (composed primarily of reservoir sediments) would be formed into stable slopes and landforms that can be further stabilized by planting.

Moreover, as it is likely that the sediments could strongly acidify, the DEIR should describe how it is that plants can be established (see comment 3.2-22 for discussion of acidification). This discussion is necessary to evaluate the feasibility of the Proposed Project's plan for revegetation.

Response to Comment ORG46-133

Please refer to Volume I Section 3.11.5 *Geology, Soils and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 (pages 3-765 to 3-775) for analysis of how consolidation and strengthening of reservoir sediments as they dry out reduces their erodibility and stabilizes the slopes and landforms. As reservoir sediment is transported and a new river channel forms through the

reservoir footprint, sediments along the newly exposed riverbanks would form stable slopes based on the sediment properties (e.g., above water angle of repose, friction slope, shear strength). While the relatively low strength of saturated reservoir sediments makes them erodible during drawdown, the shear strength of the reservoir sediments increases exponentially as the reservoir sediments dry, with the shear strength increasing rapidly once the reservoir sediments reached about 50 percent of the initial saturated weight after several weeks (Volume II Appendix B: *Definite Plan* and USBR [2012]). The reservoir sediment shear strength and critical shear stress needed to erode the reservoir sediments increases by 2 to 3 orders of magnitude between moist and dry reservoir sediments, decreasing the erodibility of these sediments (Volume II Appendix B: *Definite Plan*). Thus, slopes and landforms composed primarily of reservoir sediments would stabilize as the reservoir sediment consolidate and dry out after the new river channel is cut through the reservoir sediments during drawdown. The shear strength of reservoir sediments would decrease during re-wetted conditions (e.g., rainfall), but it would still be two orders of magnitude greater than initial shear strengths measured (please refer to Volume II Appendix B: *Definite Plan – Appendix H, Section 8.1.1 Reservoir Sediment Characteristics [pages 127 to 141]* for more details). However, as analyzed in Potential Impact 3.2-3, repeated wetting (e.g., from rainfall) and drying of reservoir sediment deposits under conditions similar to those expected to occur in the reservoir footprints after drawdown would form easily erodible fine particles, so unvegetated reservoir sediments would potentially produce elevated suspended sediment concentrations (SSCs) during rainfall events (Appendix B: *Definite Plan – Appendix H, Section 8.1.1 Reservoir Sediment Characteristics*). Laboratory "grow tests" indicates vegetation growth on reservoir sediments would reduce the formation of easily erodible fine particles, stabilize the reservoir sediments, and reduce the potential for short-term and long-term elevated SSCs.

As noted in Section 3.2.5.2 *Water Quality – Potential Impacts and Mitigation – Suspended Sediments* Potential Impact 3.2-3, laboratory revegetation "grow tests" have been conducted to evaluate the effectiveness of reservoir sediments for growing plants and the resulting vegetation for stabilizing reservoir sediments. As discussed in the Volume II Appendix B: *Definite Plan – Appendix H, Section 8.1.2 Reservoir Revegetation and Grow Tests* (pages 141 to 152), laboratory (i.e., greenhouse) grow tests and plant nutrient availability (PNA) lab analyses were conducted during 2018 to evaluate reservoir sediments as a growth medium and to identify the ideal seed mix for a cover crop and for each planting zone in each unique reservoir setting. Grow tests reported successful germination and plant growth in 71 to 81 percent of the seed locations for the various habitat types (i.e., riparian bank, riparian floodplain, upland, and cover), with healthy plant growth and undetectable plant mortality at four weeks even as the reservoir sediment consolidated. PNA test results were similar for J.C. Boyle, Copco No. 1, and Iron Gate reservoir sediments, with moderate acidity, fine-texture, low calcium, and high magnesium and organic matter. The average pH of reservoir sediment samples ranged from 6.2 to 6.5 s.u., which is slightly more

acidic than the optimum range of 6.5 to 7.5 s.u. for plant growth, but the majority of the species planted were successfully able to germinate and grow. Overall, the laboratory grow tests and PNA analysis indicates reservoir sediments would support vegetation growth.

Additionally, preliminary (late August 2019) results of Klamath River Renewal Corporation's (KRRC's) native vegetation test plot experiments for Copco No. 1 and Iron Gate reservoirs indicate that without a straw cover, the sediments' surface transitions very quickly (within several days) after removing the overlying water column from a soft and moist surface to a very hard, dense and dry surface that precludes abundant seed germination. When seeding was undertaken early (February) followed by placement of a thin layer of native grass straw on the surface of the seeded sediments, germination success increased significantly, achieving up to 95 percent cover of small fescue, and to some degree chick lupine, lacy phacelia, and sterile wheat. The straw mulch made appears to have provided not only frost protection but also maintained the sediment surface moist for extended periods allowing seedlings to grow into the clayey sediment (KRRC 2019c).

Please also refer to response to comment ORG46-105.

Volume III Attachment 1 presents the final Section 3.2 *Water Quality*.

Comment ORG46-134

In this paragraph, the DEIR conclude s that there will be no long-term impact to suspended sediment concentrations based on model predictions. However, three factors are not considered in the DEIR that affect this conclusion:

1. The sediment load currently being trapped by the reservoirs would be transported downstream under the Proposed Project (an increase over existing baseline conditions).

2. Any fine sediment released during the drawdowns, that deposits along the channel margins, back waters, pools, or point bars in the 200 miles of river downstream of Iron Gate may become remobilized during future high flow events.

3. Proposed erosion control measures (revegetation) would not be 100 percent effective. There would likely be an increase in long-term fine sediment supply from erosion within the reservoirs.

Response to Comment ORG46-134

The three factors discussed by the comment were included in the EIR analysis of long-term potential impacts of suspended sediment concentrations (SSCs) in the Klamath River.

Section 3.2.5.2 *Water Quality – Potential Impacts and Mitigation – Suspended Sediments* Potential Impact 3.2-3 analyzes the short-term and long-term potential impacts from increases in suspended sediments due to release of sediments currently trapped behind the Lower Klamath Project dams. It specifically analyzes the transport of reservoir sediment deposits during and following drawdown, concluding from USBR (2012a) model results that SSCs in the Klamath River from the erosion of reservoir sediment deposits would resume modeled background SSCs by the end of post-dam removal year 1 regardless of the type of hydrology (i.e., dry, normal, or wet conditions) present during the drawdown period. As such, the SSCs in the Klamath River from the erosion of reservoir sediment deposits would be less than the SSC threshold of significance (i.e., 100 milligram per liter [mg/L] for two or more consecutive weeks) by the end of post-dam removal year 1 and there would be no significant impact due to the release of reservoir sediment deposits currently trapped behind the Lower Klamath Project dams.

As analyzed in Potential Impact 3.2-3, USBR (2012a) model results indicate that SSCs would resume modeled background SSCs by the end of post-dam removal year 1 regardless of the type of hydrology (i.e., dry, normal, or wet conditions) present during the drawdown period, but these USBR (2012a) model results do not include potential reductions in SSCs due to vegetation growth on reservoir sediments. Thus, USBR (2012a) model results indicate that SSCs would resume modeled background SSCs as the reservoir sediments consolidate and harden regardless of the effectiveness of revegetation. Furthermore, please refer to Potential Impact 3.2-3 for a discussion of monitoring and adaptive management to address uncertainties associated with revegetation and sediment stabilization activities (e.g., variations in plant germination success, plant growth rate, seasonal precipitation, reservoir sediment changes). Overall, the monitoring and adaptive management analyzed in Potential Impact 3.2-3 would likely result in revegetation that stabilizes remaining reservoirs sediments, so long-term potential increases in SSCs due to production of erodible sediments from the remaining reservoir sediment deposits would be unlikely to result in elevated SSCs in the Klamath River and there would be a long-term less than significant impact on SSCs in the Klamath River.

Section 3.2.5.2 *Water Quality – Potential Impacts and Mitigation – Suspended Sediments* Potential Impacts 3.2-5 and 3.2-6 analyzes the long-term potential impacts from changes in SSCs in the Klamath River due to the lack of interception and retention of upstream sediment loads by the Lower Klamath Project dams. Potential Impacts 3.2-5 and 3.2-6 analyze the potential long-term increase in SSCs due to the lack of continued interception and retention of inorganic and organic suspended materials by the Lower Klamath dam, but the analysis determines that this potential long-term increase in inorganic or organic suspended material is not expected to exceed levels that would substantially adversely affect the cold freshwater habitat (COLD) beneficial use or any other existing designated beneficial use at the levels currently supported, exacerbate

an existing exceedance of water quality standards, or result in a failure to maintain an existing beneficial use. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

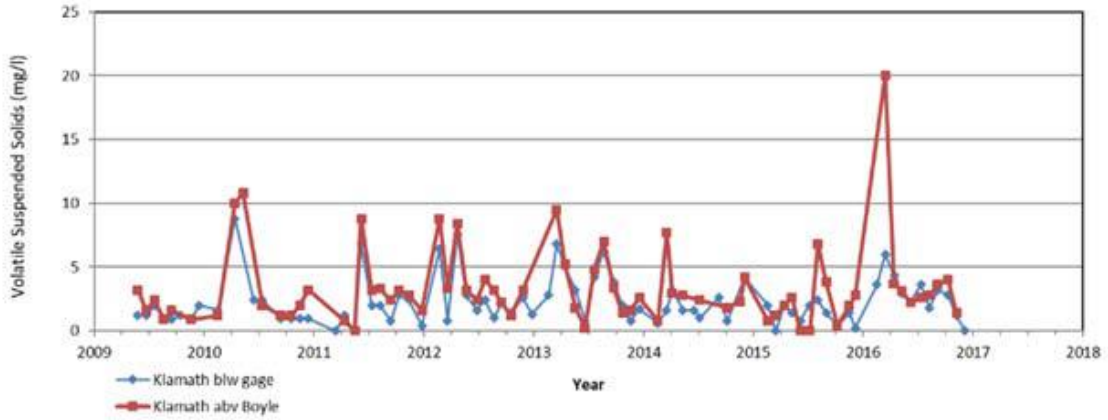
Please refer to Master Response GEO-1 for discussion of potential fine sediment deposition. Although most suspended sediment is expected to move downstream during drawdown (as described above) and Stillwater Sciences (2008) found that the amount of pool filling within the Klamath River bed would be small, there would be some spatially discrete sedimentation effects, such as deposition in slack water areas (e.g., pools, eddies, alcoves) (see Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation,* Potential Impact 3.11-5 [pages 3-772 to 3-773]). As described in Master Response GEO-1, the persistence of any fine sediment deposits along the Klamath River would be dependent on the flow magnitude required to remobilize these sediments, with the flow magnitudes required to mobilize sediments varying between reaches and across surface features (e.g., pools or riffles). Potential depositional areas are spatially limited and remobilization of sediment in the Klamath River reaches and across surface features would occur at different times throughout the flood hydrograph. Given that the median estimate for initiation of mobilization of the existing bed substrate between Bogus Creek and Cottonwood Creek, where most sediment deposition is expected following dam removal, is a flow of approximately 10,250 cubic feet per second (cfs) (return period probability of approximately four years [USBR 2012a]), any SSCs generated by remobilized sediment from dam removal would be expected to occur at the same time as substantial sediment and debris mobilization that would occur in the Klamath River with or without dam removal (i.e., during floods when SSCs are typically highest). Downstream of Cottonwood Creek, spatially discrete fine sediment deposition would be sufficiently small (see Master Response GEO-1) that SSCs associated with any remobilization would also be small and insignificant (i.e., within the range of background SSC conditions).

Comment ORG46-135

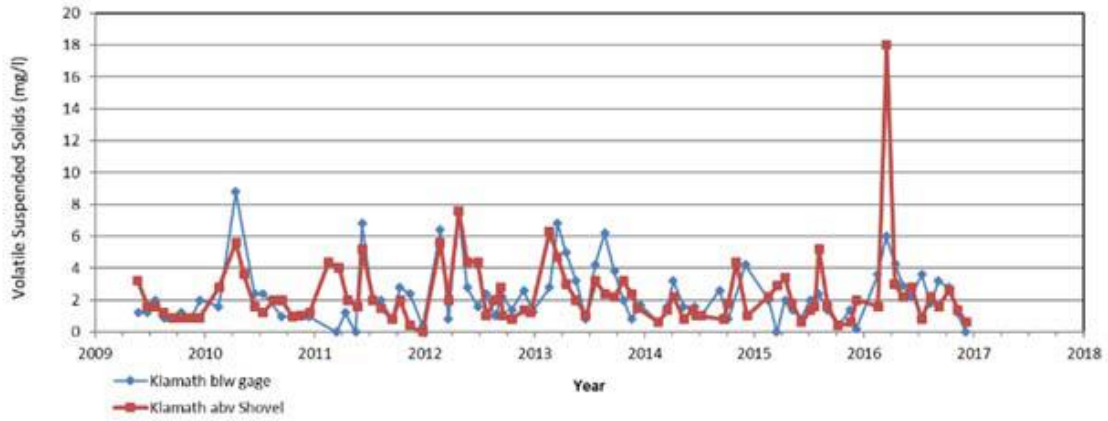
The DEIR states "Measurements of organic suspended sediment between 2001 and 2003 and median turbidity values over the long-term historical record (1950-2001) both follow a similar pattern, with values decreasing with distance downstream to J.C. Boyle Reservoir, indicating it is likely that the suspended sediment concentrations crossing the Oregon-California state line under the Proposed Project would not increase beyond typical existing conditions concentrations of 10 to 15 mg/L." The DEIR should be updated to present the more recent data that are readily available from the KHSA Interim Measure 15 water quality monitoring program. Shown in the graphs below are volatile suspended solids (organic fraction of total suspended solids) for (a) Klamath River upstream of J.C. Boyle Reservoir (Klamath abv Boyle) and downstream of the J.C. Boyle Powerhouse (labeled "Klamath blw gage"), and (b) J.C. Boyle Powerhouse (Klamath blw gage) and upstream of Copco Reservoir (Klamath abv Shovel). These figures indicate modest decreases through the reach due to

short residence time in J.C. Boyle Reservoir as well as the peaking power operations at J.C. Boyle Powerhouse. These modest reductions are largely a function of dilution from springs input in the bypass reach. Deas (2008) also found that there was little change in total nitrogen, total phosphorous and dissolved organic carbon between Keno Dam and J.C. Boyle Reservoir. This reach is a useful surrogate for possible conditions in a downstream river reach without dam.

(a)



(b)



Response to Comment ORG46-135

Klamath Hydropower Settlement Agreement (KHSA) Interim Measure 15 (IM15) volatile suspended solids (VSS) monitoring data presented in the comment do not agree with the KHSA IM15 VSS monitoring data posted at https://www.pacificorp.com/energy/hydro/klamath-river/water-quality.html under Water Quality Reports & Data (accessed September 2019). The VSS data that are posted online provide a method reporting limit for multiple samples in 2009 and 2017, but the VSS data presented in the comment appear to report VSS values less than the method detection limit (MDL) for these samples, suggesting the VSS data presented in the comment are raw VSS data. Figures ORG46-135-1 and ORG46-135-2 below plot the KHSA IM15 VSS data that are posted online for the locations shown in the comment, with VSS samples below the method reporting limit plotted as 0.5 times the method reporting limit (VSS values below the method reporting limit generally are some value between zero and the method reporting limit).

KHSA IM15 VSS monitoring data from 2003 to 2017 generally support the analysis in Potential Impact 3.2-6 that mechanical breakdown in the Hydroelectric Reach along with dilution from the springs downstream of the J.C. Boyle Dam

would be likely to reduce the concentration of algal-derived (organic) suspended material crossing the Oregon-California state line. VSS was not often measured at two or more of the three monitoring locations on the same day or VSS was less than the method reporting limit for one or more monitoring locations on the days it was measured at multiple monitoring locations, so there are a very limited number of days when the difference in VSS between monitoring locations can be estimated in the Klamath River from upstream of J.C. Boyle Dam (river mile [RM] 233.3) to upstream of Copco No. 1 Reservoir/upstream of Shovel Creek (RM 211.2). Frequently, VSS upstream of Copco No. 1 Reservoir/upstream of Shovel Creek (RM 211.2) was measured one to two days later than VSS upstream of J.C. Boyle Dam (RM 233.3), so episodic increases in algal-derived (organic) suspended material from upstream of the Hydroelectric Reach potentially would not be characterized by VSS measurements. However, the limited number of days with KHSA IM15 monitoring data at two or more locations from 2003 to 2017 indicate VSS decreases in the downstream direction in 100 percent of measurements (i.e., 8 of 8) between upstream of J.C. Boyle Reservoir (RM 233.3) and the USGS 11510700 gage downstream of the J.C. Boyle Powerhouse (RM 225.2) and in approximately 70 percent of measurements (i.e., 23 of 34) between upstream of J.C. Boyle Reservoir (RM 233.3) and upstream of Copco No. 1 Reservoir/upstream of Shovel Creek (RM 211.2).

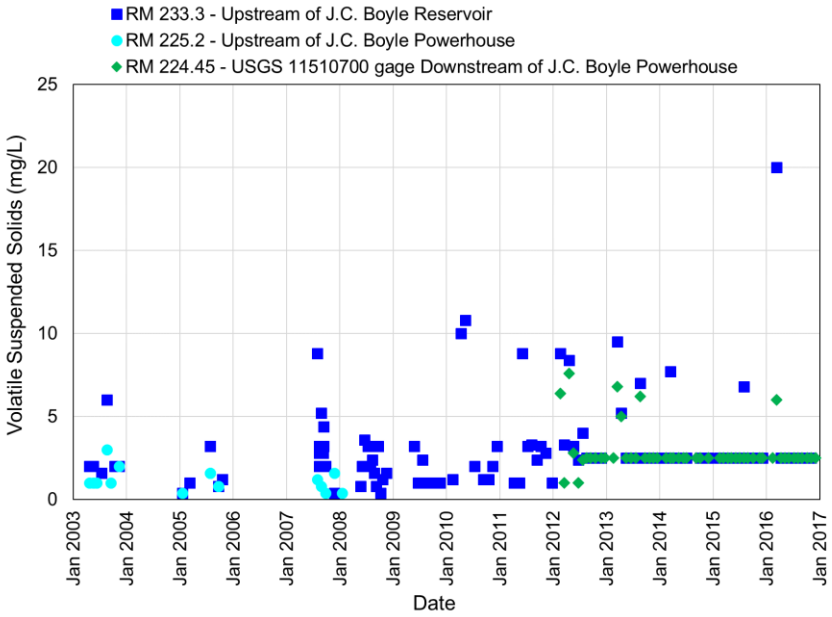


Figure ORG46-135-1. Volatile Suspended Solids (VSS) Concentrations in the Klamath River at RM 233.3—Upstream of J.C. Boyle Reservoir, RM 225.2—Upstream of J.C. Boyle Powerhouse, and RM 224.45—USGS 11510700 Gage Downstream of J.C. Boyle Powerhouse from 2003 to 2017. Non-detect Values of VSS (i.e., Less Than the Method Reporting Limit [MRL]) Are Plotted as 0.5 Times the MRL. Source: PacifiCorp 2003a, 2004b, 2005b, 2007, 2008b, 2009, 2010, 2011, 2012, 2013, 2014c, 2015b, 2016b, 2017b.

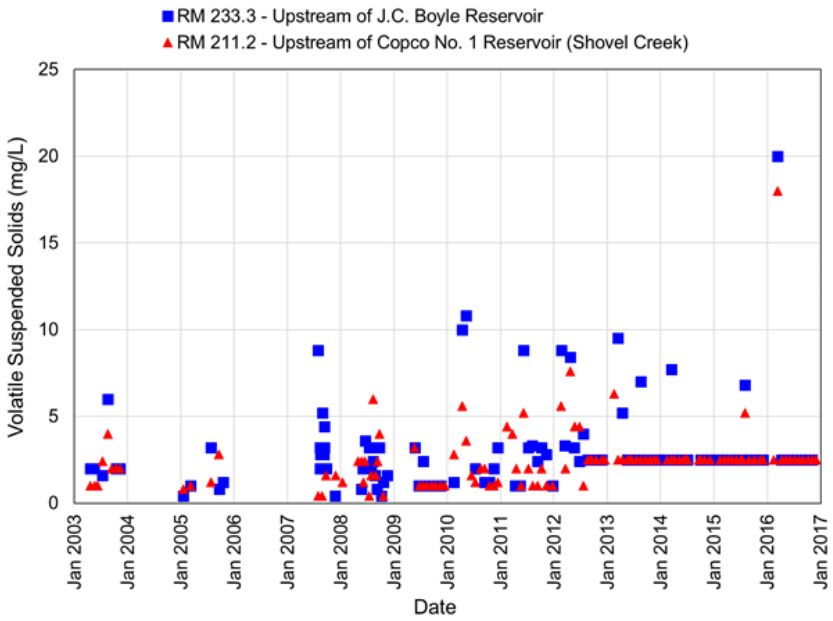


Figure ORG46-135-2. Volatile Suspended Solids (VSS) Concentrations in the Klamath River at RM 233.3—Upstream of J.C. Boyle Reservoir and RM 211.2—Upstream of Copco No. 1 Reservoir/Upstream of Shovel Creek from 2003 to 2017. Non-detect Values of VSS (i.e., Less Than the Method Reporting Limit [MRL]) Are Plotted as 0.5 Times the MRL. Source: PacifiCorp 2003a, 2004b, 2005b, 2007, 2008b, 2009, 2010, 2011, 2012, 2013, 2014c, 2015b, 2016b, 2017b.

VSS typically decreases in the downstream direction in the Klamath River reach from upstream of J.C. Boyle Reservoir to upstream of Copco No. 1 Reservoir/upstream of Shovel Creek, but VSS would not represent all of the algal-derived (organic) suspended material being transported into the Hydroelectric Reach since volatile organic material would be only a fraction of the total algal-derived (organic) suspended material. While VSS measurements would underestimate the total algal-derived (organic) suspended material, total suspended solids (TSS) measurements would overestimate the algal-derived (organic) suspended material, because TSS measures both the mineral (inorganic) and algal-derived (organic) suspended material. However, TSS would characterize all of the algal-derived (organic) suspended material, so it is primarily used in the EIR analysis as a conservative estimate of the long-term potential changes in algal-derived (organic) suspended material crossing the Oregon-California state line under the Proposed Project. Figures ORG46-135-3 and ORG46-135-4 below plot the KHSA IM15 TSS data that are posted online for the locations shown in the comment, with TSS samples below the method reporting limit plotted as 0.5 times the method reporting limit (since TSS values below the method reporting limit generally are some value between zero and the method reporting limit).

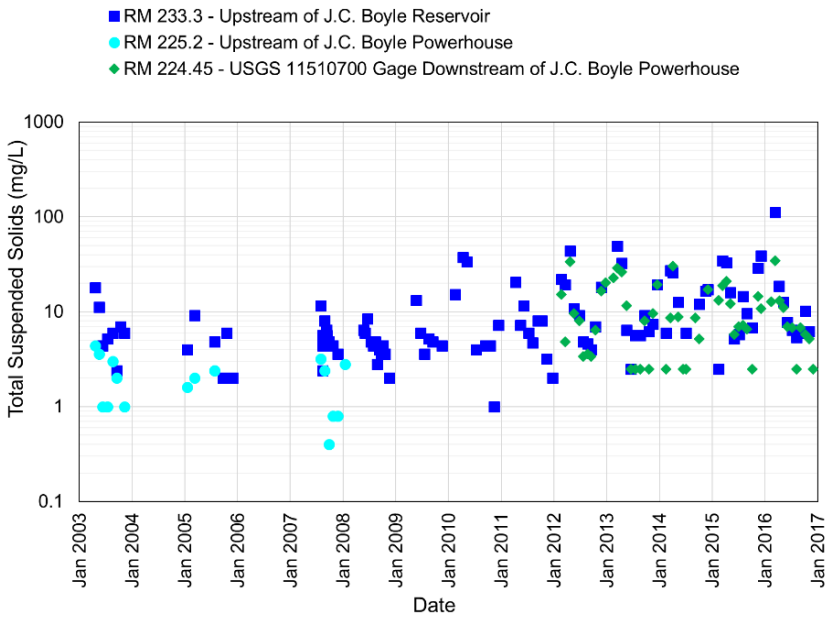


Figure ORG46-135-3. Total Suspended Solids (TSS) Concentrations in the Klamath River at RM 233.3-Upstream of J.C. Boyle Reservoir, RM 225.2—Upstream of J.C. Boyle Powerhouse, and RM 224.45-USGS 11510700 Gage Downstream of J.C. Boyle Powerhouse from 2003 to 2017. Non-detect Values of VSS (i.e., Less Than the Method Reporting Limit [MRL]) Are Plotted as 0.5 Times the MRL. Source: PacifiCorp 2003, 2004, 2005, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017.

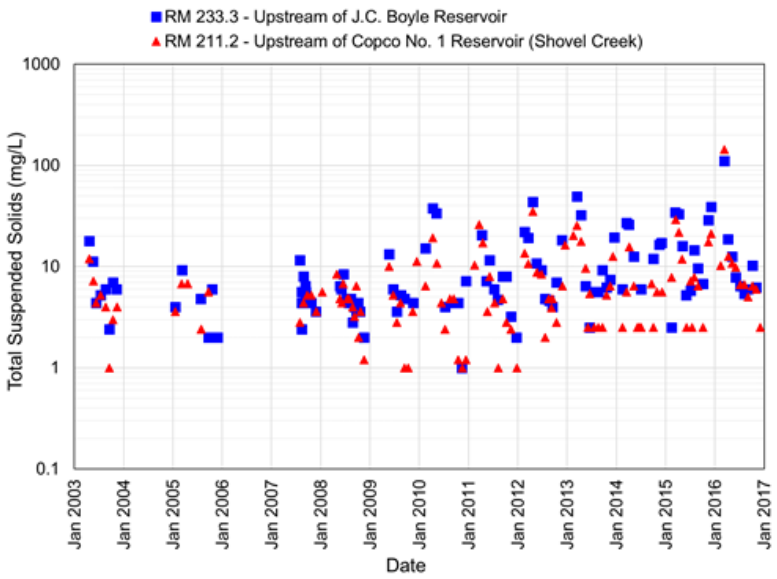


Figure ORG46-135-4. Total Suspended Solids (TSS) Concentrations in the Klamath River at RM 233.3—Upstream of J.C. Boyle Reservoir and RM 211.2—Upstream of Copco No. 1 Reservoir/Upstream of Shovel Creek from 2003 to 2017. Non-detect Values of VSS (i.e., Less Than the Method Reporting Limit [MRL]) Are Plotted as 0.5 Times the MRL. Source: PacifiCorp 2003a, 2004b, 2005b, 2007, 2008b, 2009, 2010, 2011, 2012, 2013, 2014c, 2015b, 2016b, 2017b.

KHSA IM15 TSS monitoring data from 2003 to 2017 show TSS typically decreasing in the downstream direction, supporting the analysis in Potential Impact 3.2-6 that mechanical breakdown in the Hydroelectric Reach along with dilution from the springs downstream of the J.C. Boyle Dam would be likely to reduce the concentration of algal-derived (organic) suspended material crossing the Oregon-California state line. TSS measurements greater than 20 mg/L are likely to be primarily composed of mineral (inorganic) suspended material because they only occurred between December and April and they usually coincided with high winter flows greater than 3,000 cubic feet per second (cfs). Peak TSS measurements of over 100 milligram per liter (mg/L) on March 15 and 16, 2016, shown in Figures ORG46-135-3 and ORG46-135-4, occurred when high winter flows of approximately 10,000 cfs were recorded at the United States Geological Survey (USGS) 11510700 gage downstream of J.C. Boyle Powerhouse. TSS measurements from May through October typically range from less than the method reporting limit to 12.2 mg/L at the USGS 11510700 gage downstream of J.C. Boyle Powerhouse, or less than the method reporting limit to 11.8 mg/L upstream of Copco No. 1 Reservoir/upstream of Shovel Creek (Figures ORG46-135-5 and ORG46-135-6), consistent with the analysis in Potential Impact 3.2-6 that the typical TSS crossing the Oregon-California state line under existing conditions is in the range of 10 to 15 mg/L.

Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

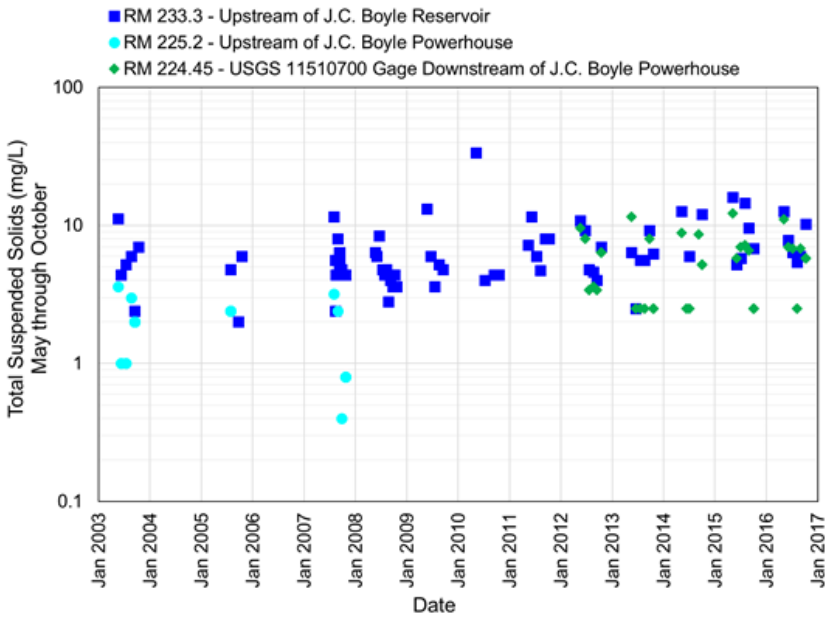


Figure ORG46-135-5. Total Suspended Solids (TSS) Concentrations in the Klamath River from May through October at RM 233.3—Upstream of J.C. Boyle Reservoir, RM 225.2—Upstream of J.C. Boyle Powerhouse, and RM 224.45—USGS 11510700 Gage Downstream of J.C. Boyle Powerhouse from 2003 to 2017. Non-detect Values of VSS (i.e., Less Than the Method Reporting Limit [MRL]) Are Plotted as 0.5 Times the MRL. Source: PacifiCorp 2003a, 2004b, 2005b, 2007, 2008b, 2009, 2010, 2011, 2012, 2013, 2014c, 2015b, 2016b, 2017b.

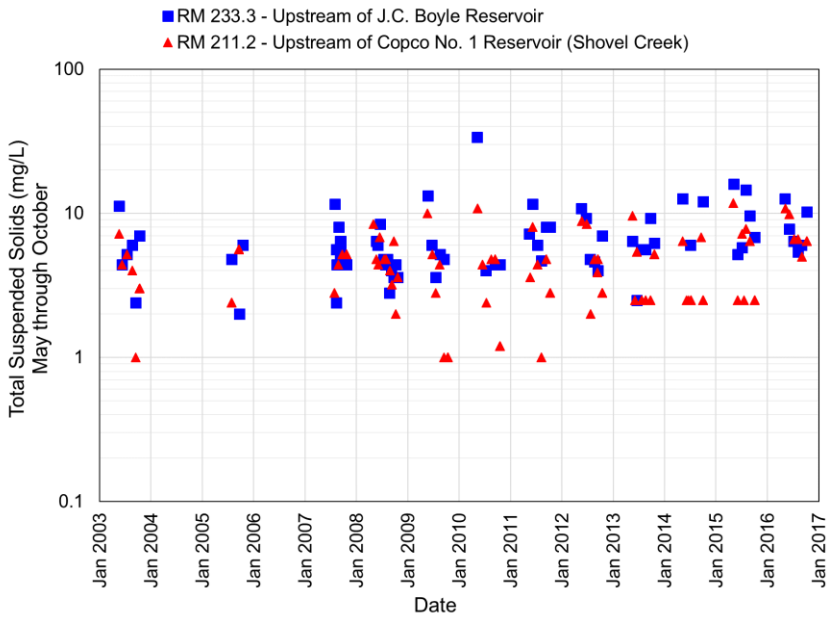


Figure ORG46-135-6. Total Suspended Solids (TSS) Concentrations in the Klamath River from May to October at RM 233.3—Upstream of J.C. Boyle Reservoir and RM 211.2—Upstream of Copco No. 1 Reservoir/Upstream of Shovel Creek from 2003 to 2017. Non-detect Values of VSS (i.e., Less Than the Method Reporting Limit [MRL]) Are Plotted as 0.5 Times the MRL. Source: PacifiCorp 2003a, 2004b, 2005b, 2007, 2008b, 2009, 2010, 2011, 2012, 2013, 2014c, 2015b, 2016b, 2017b.

Comment ORG46-136

The DEIR should also include a discussion of periphyton and aquatic macrophytes that will colonize the reaches in question, including J.C. Boyle Reservoir, the Klamath River from J.C. Boyle Dam to Copco Reservoir, and the reach downstream to Iron Gate Dam. This aquatic vegetation will convert nutrients imported from the upper basin (e.g., Upper Klamath Lake) into aquatic vegetation biomass, which will in turn contribute to particulate organic matter, leading to a potential increase in organic suspended materials.

Response to Comment ORG46-136

With respect to the comment's concern regarding periphyton, please refer to Volume I Potential Impact 3.4-4 (pages 3-435 to 3-437) for a discussion of periphyton growth in the Hydroelectric Reach due to conversion of the reservoir areas to a free-flowing river and elimination of hydropower peaking operations under the Proposed Project.

Periphyton colonization and growth in the new free-flowing river portions of the Hydroelectric Reach would potentially contribute to organic suspended material, but there is not sufficient information available to quantify the organic suspended material production from potential periphyton growth under the Proposed Project.

As defined in the introduction to Volume I Section 3.4 *Phytoplankton and Periphyton* (page 3-389), periphyton are aquatic organisms that live attached to underwater surfaces such as rocks on a riverbed. While periphyton may contribute organic suspended material when scoured from the streambed or sloughed off the streambed after death, periphyton typically are not associated with ongoing high levels of organic suspended material production since they live attached to the streambed. The magnitude of potential organic suspended material production from periphyton growth in the Klamath River is unknown because there are no data in the Klamath River on the potential organic suspended material production from specifically periphyton. Available volatile suspended solids (VSS) and total suspended solids (TSS) measurements from the Klamath River cannot be used to estimate potential organic suspended sediment production from periphyton growth because these measurements include organic suspended material from phytoplankton in addition to any potential organic suspended material from periphyton growth, especially downstream of the reservoirs on the Klamath River during episodic phytoplankton blooms. Periphyton are typically assumed to not contribute high levels of organic suspended material, except potentially during high flow events that scour the streambed when inorganic suspended sediments would comprise the majority of suspended material. While there would be an increase in periphyton growth in the new free-flowing river portions of the Hydroelectric Reach (see Volume I Potential Impact 3.4-4 [pages 3-435 to 3-436]), periphyton growth is unlikely to result in an increase in suspended sediment concentrations (SSCs) above the suspended sediment threshold (i.e., 100 milligram per liter [mg/L]) based on the best available information on periphyton in the Klamath River. As discussed in Volume I Potential Impact 3.4-5 (pages 3-437 to 3-440), some processes in the Middle and Lower Klamath River and the Klamath River Estuary under the Proposed Project would favor periphyton growth (i.e., increasing nutrient transport and recycling) and some processes would be detrimental to periphyton growth (i.e., increasing uptake and retention of nutrients by periphyton in the Hydroelectric Reach, increasing frequency and intensity of scouring events, eliminating seasonal nutrient releases from reservoir sediments). As such, periphyton growth and biomass in the Middle and Lower Klamath River and the Klamath River Estuary under the Proposed Project would not be expected to significantly increase and it would likely remain within the range of annual variations under existing conditions in parts of these reaches. Thus, the organic suspended material production from periphyton in the Middle and Lower Klamath River and the Klamath River Estuary under the Proposed Project also would not be expected to significantly increase; organic suspended material from periphyton would likely remain within the range of annual variations under existing conditions in parts of these reaches; and periphyton growth is unlikely to result in an increase suspended sediment concentrations above the suspended sediment threshold (i.e., 100 mg/L for a continuous two week period).

With respect to the comment's concern regarding aquatic macrophytes, macrophyte abundance (as grams, dry weight per square meter of [g DW/m^2]

biomass) in the Klamath River upstream of the Hydroelectric Reach (i.e., Link River to Keno Dam) has been quantified by one study (Sullivan et al. 2013), but estimates of macrophyte abundance from that study would not be representative of the potential macrophyte abundance in the Hydroelectric Reach under the Proposed Project due to differences in the aquatic habitats where macrophytes were measured (i.e., between Link River and Keno Dam) and the types of habitats that would occur in the Hydroelectric Reach under the Proposed Project. Water velocity significantly affects the abundance of aquatic macrophytes, with higher velocities resulting in a decrease in abundance (Chambers et al. 1991). Sullivan et al. (2013) primarily sampled macrophytes in the calm, slow-moving reservoir habitat of the Lake Ewuana/Keno Impoundment that dominates conditions between Link River and Keno Dam, with most macrophyte abundance occurring in the slow-moving, shallow water (less than approximately 7 feet) near shore. However, the generally high-gradient river channel in the Hydroelectric Reach (USBR 2012a) would result in primarily turbulent, fast-moving river habitat in this reach under the Proposed Project, so estimates of macrophyte abundance from the slow-moving reservoir habitat between Link River and Keno Dam would likely significantly overestimate macrophyte abundance under the Proposed Project.

Additionally, the types of macrophytes likely to occur in the turbulent, fast-moving Hydroelectric Reach under the Proposed Project would be different from those measured in the slow-moving, lake-like conditions within the Link River to Keno Dam reach of the Klamath River. Coontail (*Ceratophyllum demersum*), common waterweed (*Elodea canadensis*), curlyleaf pondweed (*Potamogeton crispus*), and small pondweed (*Potamogeton pusillus*) comprised the majority of the macrophytes sampled during summer and fall (June to October) of 2011 (Sullivan et al. 2013), but these types of macrophytes are not expected to occur in the faster-moving river conditions in the Hydroelectric Reach under the Proposed Project. The types of macrophytes likely to occur in the Hydroelectric Reach under the Proposed Project would include emergent species such as hardstem bulrush (*Schoenoplectus acutus*) and cattail (*Typha latifolia*) that would be planted during restoration efforts and potentially other species that self-recruit and persist in a riverine environment (e.g., smart weed (*Persicaria* spp.) and spikerush [*Eleocharis* spp.]). Thus, the types of macrophytes that occur in the Klamath River from Link River to Keno Dam likely would be different from those occurring in the Hydroelectric Reach under the Proposed Project. Overall, both the macrophytes types and abundance from Link River to Keno Dam would not be representative of those in the Hydroelectric Reach and the upstream estimates of macrophyte abundance would not be appropriate to apply to the Hydroelectric Reach under the Proposed Project.

As discussed in the introduction of Volume I Section 3.4.2 *Environmental Setting* (page 3-392), there is also no known quantitative (e.g., abundance, percent cover) information on aquatic plant species (i.e., submerged and/or floating macrophytes) in the Hydroelectric Reach or the Middle and Lower Klamath River.

Prior studies (City of Klamath Falls 1986, 1989) documented that macrophytes in the Hydroelectric Reach between J.C. Boyle Dam and Copco No. 1 Reservoir typically were found only along the river margins or pools and low gradient areas of the Klamath River due to the steep gradient, associated high water velocities, and lack of fine sediment substrate within this reach. Observations of aquatic macrophytes are common in the main channel in the Middle Klamath River from Iron Gate Dam to the Scott River (river mile [RM] 145.1), but they are only present in the quiet backwater areas in the Klamath River downstream of the Scott River confluence (PacifiCorp 2005c; Stillwater Sciences 2009). There are no reports of excessive aquatic macrophyte biomass in the available data record, so aquatic macrophytes have typically been assumed to not play a dominant role in primary productivity or nutrient cycling in the Middle or Lower Klamath River (Stillwater Sciences 2009).

Macrophyte colonization and growth in the new free-flowing river portions of the Hydroelectric Reach would potentially contribute to organic suspended material, but there is not sufficient information available to quantify the organic suspended material production from potential macrophyte growth under the Proposed Project. As previously discussed, there is limited data on macrophyte abundance in the Klamath River, so the potential organic suspended material production from macrophytes cannot be directly estimated from data. Available volatile suspended solids (VSS) and total suspended solids (TSS) measurements from the Klamath River cannot be used to estimate potential organic suspended sediment production from macrophyte growth because VSS and TSS measurements in the Klamath River include episodic increases in organic suspended material from phytoplankton blooms in addition to organic suspended material from macrophyte growth, especially within and downstream of the reservoirs on the Klamath River.

Additionally, the potential organic suspended material from macrophytes cannot be quantitatively estimated because the area that macrophytes would colonize under the Proposed Project, the macrophyte growth rate per area in the Klamath River, and the relationship between macrophyte abundance and organic suspended material production are unknown and one or more of these parameters would be necessary to analyze the potential organic suspended material from macrophytes. While the new river channels in the Lower Klamath Project reservoir footprints are expected to re-occupy their historical channels, the specific area of the river channels that would form in the sediment deposits under the Proposed Project is not well defined. Further, the potential area of slow-moving habitat within the new river channels that would be available for macrophyte growth is currently unknown. While estimates of the macrophyte growth rates per area for other rivers are available, growth rates vary widely depending on the conditions in the systems and the macrophytes species in those systems (Kadlec and Knight 1996). More specifically, macrophyte growth rate per area is influenced by variations in water velocity, water depth, light availability, nutrient availability, water temperature, seasonal flow, sediment

transport, and competition between periphyton and macrophytes. Thus, a representative macrophyte growth rate per area in the Hydroelectric Reach under the Proposed Project would be speculative. Additionally, a quantitative relationship between macrophyte abundance and organic suspended material production has not been determined for the Klamath River, so the potential range of increases in organic suspended material from macrophytes in the Klamath River under the Proposed Project cannot be estimated with any confidence based on assumptions of the potential range of macrophyte abundance in the Hydroelectric Reach following dam removal.

Overall, the potential increase in organic suspended material from changes in macrophyte growth in the Hydroelectric Reach, Middle and Lower Klamath River, and the Klamath River Estuary under the Proposed Project is unknown due to lack of data on macrophyte conditions in the Klamath River. Additionally, there is not sufficient quantitative information on the potential area of macrophyte growth, macrophyte growth rates, or macrophyte production of organic suspended sediments to estimate the potential increase in organic suspended material from changes in macrophyte growth in the Klamath River. However, as there are no reports of excessive aquatic macrophyte biomass in the existing Hydroelectric Reach (i.e., the J.C. Boyle Bypass and Peaking reaches), the steep gradient of the Hydroelectric Reach would limit the availability of slow-moving habitat for macrophyte growth under the Proposed Project, and there are no studies linking macrophyte growth in the downstream Middle and Lower Klamath River to high suspended sediment concentrations (SSCs), there the potential increase in organic suspended material from macrophytes in the newly-created river channel through the reservoir sediment deposits would be unlikely to increase suspended sediment concentrations above the suspended sediment threshold (i.e., 100 mg/L).

Additionally, the macrophyte conditions and associated organic suspended sediment production in the Middle and Lower Klamath Rivers and the Klamath River Estuary would be similar to existing conditions under the Proposed Project for reasons similar to those discussed for periphyton in Volume I Section 3.4.5.2 *Phytoplankton and Periphyton – Potential Impacts and Mitigation – Periphyton* Potential Impact 3.4-5 (pages 3-437 to 3-440) since the processes that influence periphyton abundance in the Middle and Lower Klamath River and the Klamath River Estuary (e.g., light availability, nutrient availability, water temperature, seasonal flow variations, sediment transport) similarly influence macrophyte abundance in these reaches. While some processes would potentially favor macrophyte growth downstream from Iron Gate Dam (i.e., increasing nutrient transport and recycling), other processes would potentially reduce macrophyte growth (i.e., increasing uptake and retention of nutrients in the Hydroelectric Reach due to potential periphyton and macrophyte growth, increasing frequency and intensity of scouring events, eliminating seasonal nutrient releases from reservoir sediments). Short-term deposition of coarse sediment (i.e., sand and larger) between Iron Gate Dam and Cottonwood Creek following drawdown of

the reservoirs and transport of these sediments in subsequent years (see Volume I Potential Impact 3.11-5 [pages 3-765 to 3-775] and Master Response GEO-1) may both favor macrophyte growth or reduce macrophyte growth by creating slower-moving and/or faster-moving habitats in the Iron Gate Dam to Cottonwood Creek. Please also refer to response to comment ORG46-34 for a discussion of the potential impacts of sediment transport on macrophytes, ORG46-146 for a discussion of potential impacts from periphyton and macrophyte growth on nutrients, and ORG46-149 for a discussion of the potential impacts of periphyton and macrophytes on pH in the Klamath River. The overall contribution of organic suspended material from macrophytes in the Middle and Lower Klamath Rivers and the Klamath River Estuary under the Proposed Project would be expected to be within the range of organic suspended material from macrophytes under existing conditions and not result in an increase in suspended sediment concentrations above the suspended sediment threshold (i.e., 100 mg/L for a continuous two week period).

Section 3.2.5.2 *Water Quality – Potential Impacts and Mitigation – Suspended Sediments* Potential Impact 3.2-6 assumes no decrease in organic suspended material in the Hydroelectric Reach even though it is likely that mechanical breakdown and dilution in this reach would reduce algal-derived (organic) suspended material concentrations to account for potential increases in organic suspended material production within the Hydroelectric Reach that cannot be quantified, including potential organic suspended material production from periphyton and macrophyte growth. As discussed above, the magnitude of organic suspended material production from periphyton and macrophyte growth within the Hydroelectric Reach under the Proposed Project is unknown because there are no data to estimate this potential organic suspended material production. Furthermore, Potential Impact 3.2-6 acknowledges there potentially would be a slight relative long-term increase in organic suspended materials under the Proposed Project, but such increases would be well below the organic suspended material previously produced in Copco No. 1 and Iron Gate reservoirs and would not exceed levels that would substantially adversely affect the cold freshwater habitat (COLD) beneficial use or any other existing designated beneficial use at the levels currently supported, exacerbate an existing exceedance of water quality standards, or result in a failure to maintain an existing beneficial use. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*, including Potential Impact 3.2-6.

Potential Impact 3.2-6 has been revised to clarify that periphyton and potential macrophyte growth in the newly created free-flowing river reaches replacing the reservoirs may contribute organic suspended material to the river, but the magnitude of this contribution cannot be quantified with available data and models. Additionally, Potential Impact 3.2-6 has been revised to clarify the conservative assumption that there would be no decrease in organic suspended material through the Hydroelectric Reach under the Proposed Project, after accounting for both the elimination of settling of suspended material in the

reservoirs and the potential for increases in organic suspended material from potential periphyton and/or macrophyte growth within this reach. Please refer to Volume III Attachment 1 Section 3.2.5.2 *Water Quality – Potential Impacts and Mitigation – Suspended Sediments* Potential Impact 3.2-6 for the revisions.

Comment ORG46-137

The DEIR states "Following completion of the Proposed Project, it is very unlikely that summertime algal-dominated (organic) suspended material in the Middle and Lower Klamath River would increase beyond a sustained 100 mg/L for two weeks (the water quality criterion adopted for significant adverse impacts on the COLD beneficial use for the Lower Klamath Hydroelectric Project EIR analysis (see Section 3.2.3.1)." The 100 mg/L criteria developed in Section 3.2.3.1 referred to potential impact of increases in suspended sediments due to release of sediments currently trapped behind the dams. This suspended sediment criterion cannot be reasonably applied to long-term alterations in algal-derived (organic) suspended material from the lack of continued interception and retention by the dams. Therefore, the DEIR should be revised to include the appropriate criterion for algal-derived material. A reasonable criterion would be to assess if there will be an increase from current condition to a future condition without dams such as under the Proposed Project.

The DEIR goes on to state "If slight long-term increases in suspended materials did occur, such increases would be well below the algal-derived suspended material previously produced in Copco No. 1 and Iron Gate reservoirs and would not exceed levels that would substantially adversely affect the cold freshwater habitat (COLD) beneficial use or any other existing designated beneficial use at the levels currently supported, exacerbate an existing exceedance of water quality standards, or result in a failure to maintain an existing beneficial use." This statement acknowledges that slight increases could occur (although the magnitude is unquantified). While the statement focuses on the reach downstream of Copco Reservoir, the DEIR does not address such potential impacts upstream of Copco Reservoir, where the implications of a cessation of peaking and removal of J.C. Boyle Reservoir would potentially lead to higher pH excursions and production of organic matter generated by colonization of this reach by periphyton and macrophytes. Without such an assessment, the level of effect the Proposed Project may have on organic suspended material cannot be determined.

Response to Comment ORG46-137

Section 3.2.3.1 *Water Quality – Significance Criteria – Thresholds of Significance - Suspended Sediments* provides an explanation of how the narrative Basin Plan water quality objectives for suspended material, settleable material, and sediment were interpreted to develop a numeric threshold of significance for suspended sediment (i.e., 100 milligram per liter [mg/L] for two consecutive weeks) based on the suspended sediment concentration (SSC) and duration that would cause nuisance or adversely affect the most sensitive beneficial use

(COLD). The long-term threshold of significance recommended by the comment (i.e., any increase in algal-derived [organic] suspended material concentrations from existing conditions) does not consider whether the increase would actually cause a nuisance or adversely affect a beneficial use at the levels currently supported, exacerbate an existing exceedance of water quality standards, or result in a failure to maintain an existing beneficial use.

The threshold of significance for suspended sediments (i.e., 100 mg/L for a continuous two week period) is determined in the EIR using a generalized "dose-response" approach based on the Newcombe and Jensen (1996) Severity Index and the Suspended Sediment Dose Index for salmonids listed in the North Coast Regional Board Desired Conditions Report (2006) since the most sensitive beneficial use for water quality is the cold freshwater habitat (COLD) associated with salmonids (North Coast Regional Board 2011). The sustained 100 mg/L for two weeks threshold of significance is the water quality criterion adopted for significant adverse impacts on the COLD beneficial use during reservoir drawdown based on the "dose-response" approach, but theoretically this threshold is a reasonable long-term threshold of significance since it evaluates whether there would be an adverse impact on a beneficial use. However, it is not the only threshold of significance that can be considered for salmonids (i.e., the most sensitive beneficial use [COLD]).

The "dose-response" approach specifically evaluates how exposure to different concentrations over a range of time periods (i.e., hours, days, weeks, months) produces various impacts (i.e., negligible, behavioral, sub-lethal, and lethal) on salmonids. The "dose" in the "dose-response" approach is a combination of the magnitude of suspended sediments over a duration, so a lower magnitude of suspended sediments than 100 mg/L would need to occur for a longer period than two weeks to produce a similar adverse impact. As an example, a suspended sediment concentration of 15 mg/L would need to occur continuously for approximately 90 days to result in the same sublethal effects (i.e., long-term reduction in feeding rate and feeding success, poor condition) on salmonids as the threshold of significance (i.e., 100 mg/L for two continuous weeks). While the future algal-derived suspended material concentrations entering the Hydroelectric Reach are unknown, there is nothing in the available data record or in the comment to suggest that a sustained 15 mg/L suspended sediment concentration for approximately 90 days would occur either upstream of J.C. Boyle Reservoir or immediately downstream of Iron Gate Dam during the algal growth season (i.e., May to October) under a dam removal scenario such that there would be an adverse impact on the most sensitive beneficial use (COLD).

Due to the many different possible combinations of an algal-derived (organic) suspended material concentration over a specified time that could be used as a threshold of significance for an adverse impact on the most sensitive beneficial use (COLD), the analysis in Potential Impact 3.2-6 evaluates whether the slight increase in algal-derived (organic) suspended material under the Proposed

Project would be likely to result in suspended material exceeding either 100 mg/L for a two consecutive weeks or a lower concentration sustained over a longer period, causing an adverse impact on the most sensitive beneficial use (COLD).

Section 3.2.5.2 *Water Quality – Potential Impacts and Mitigation – Suspended Sediments* Potential Impact 3.2-6 has been revised to clarify that the slight increase in algal-derived (organic) suspended material under the Proposed Project is analyzed with respect to the potential for an adverse impact on the most sensitive beneficial use (COLD) due to a sustained 100 mg/L for two weeks or a lower concentration sustained over a longer period of time. Please refer to Volume III Attachment 1 Section 3.2.5.2 *Water Quality – Potential Impacts and Mitigation – Suspended Sediments* for the revisions.

The discussion of algal-derived (organic) suspended material upstream of Copco No. 1 Reservoir occurs two paragraphs before the statement quoted by the comment about algal-derived (organic) suspended material downstream of Copco No. 1 Reservoir. Please refer to Potential Impact 3.2-6 for the analysis of algal-derived (organic) suspended material in the Hydroelectric Reach upstream of Copco No. 1 Reservoir. Please refer to Volume III Attachment 1 Section 3.2.5.2 *Water Quality – Potential Impacts and Mitigation – Suspended Sediments* for the revisions.

Please refer to the response to comment ORG46-136 for an explanation of how the analysis in Potential Impact 3.2-6 accounts for potential increases algal-derived (organic) suspended material from periphyton and macrophyte growth in the Hydroelectric Reach.

Comment ORG46-138

The DEIR states "However, minimal deposition of fine suspended sediments, including associated nutrients, would occur in the river channel and the estuary." Given the importance and potential severity of suspended sediments impacts under the Proposed Project, the DEIR should carefully and thoroughly define "minimal" in this context. The DEIR should also recognize that following events that produce excessive sediment, deposition of fine material can accumulate on the banks and bed of streams, pools, and side channels, and within point bars (see Major Issue 2.4).

Response to Comment ORG46-138

Please refer to Volume 1 Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 (pages 3-765 to 3-775) and modifications in Volume III Attachment 1 for a discussion of the magnitude of short-term sediment deposition in the Klamath River downstream of Iron Gate Dam due to erosion of reservoir sediment deposits and a long-term change in sediment supply and transport due to dam removal, including an evaluation of potential spatial sediment deposition patterns in pools and other slack water areas (e.g., eddies) along the river.

Please also refer to Master Response GEO-1 for additional discussion of the expected deposition of sediments under the Proposed Project.

Comment ORG46-139

The DEIR states "Modeling conducted for development of the California Klamath River TMDLs (North Coast Regional Board 2010) does provide some information applicable to the assessment of long-term impacts of the Proposed Project on nutrients at locations in the Hydroelectric Reach (Kirk et al. 2010)." The DEIR goes on to state "Klamath River TMDL model results indicate that if the Lower Klamath Hydroelectric Project dams were to be removed ("TMDL dams-out, Oregon" [TOD2RN] scenario), TP [total phosphorus] and TN [total nitrogen] in the Hydroelectric Reach immediately downstream from J.C. Boyle Dam would increase slightly (by less than 0.015 mg/L TP and less than 0.05 mg/L TN) during summer months compared to existing conditions." The increase by less than 0.015 mg/L total phosphorus and less than 0.05 mg/L total nitrogen are not necessarily "slight." The DEIR should recognize that the half saturation constant for phosphorous and nitrogen in the TMDL models is on the order of 0.003 mg/L and 0.014 mg/L, respectively (Tetra Tech 2009). Thus, increases of up to 0.015 mg/L total phosphorus is five times the half saturation constant. Similarly, an increase of 0.05 mg/L in total nitrogen is about 3.5 times the half saturation constant. These increases are clearly potentially biostimulatory in magnitude.

Further, increases of up to 0.015 mg/ L total phosphorus are of the same approximate magnitude of the monthly TMDL mean concentration targets in the Copco tailrace (see Table 5.10 below from NCRWQCB [2010]). Given that the TMDL targets will be challenging to meet, essentially doubling the total phosphorus concentrations would seem to be a significant impact. This impact would be further exacerbated by the existing nitrogen-fixing periphyton (e.g., Epithemia sp.) in the river that, given sufficient or even just additional phosphorous will dominate periphyton communities in late summer and fall (Power et al. 2016). The nitrogen-fixing by these organisms will provide another source of nitrogen to the Klamath River and this source of nitrogen is not assessed in the DEIR.

Table 5.10: Nutrient and organic matter monthly mean concentration targets (mg/L) for Copco 2 and Iron Gate tailraces

Copco 2 Tailrace						
	May	**June**	**July**	**August**	**September**	**October**
TP	0.017	0.015	0.016	0.016	0.015	0.015
TN	0.259	0.201	0.174	0.178	0.168	0.211
CBOD^5	2	1	1	1	1	1
	November	**December**	**January**	**February**	**March**	**April**
TP	0.017	0.023	0.016	0.019	0.019	0.018
TN	0.264	0.341	0.241	0.315	0.303	0.278
CBOD^5	1	1	1	2	2	2
Iron Gate Tailrace						
	May	**June**	**July**	**August**	**September**	**October**
TP	0.255	0.202	0.157	0.149	0.140	0.161
TN	0.016	0.014	0.013	0.013	0.013	0.013
CBOD^5	1	1	1	1	1	1
	November	**December**	**January**	**February**	**March**	**April**
TP	0.203	0.276	0.195	0.298	0.299	0.267
TN	0.015	0.017	0.013	0.018	0.019	0.017
CBOD^5	1	1	1	2	2	2

Response to Comment ORG46-139

Section 3.2.2.4 *Water Quality – Environmental Setting* – Nutrients and Appendix C, Section C.3 *Nutrients* provide a summary of the concentrations of total nitrogen (TN) and total phosphorus (TP) at locations in the Hydroelectric Reach, the Middle and Lower Klamath River, and the Klamath River Estuary. Nutrient half-saturation constants characterize the upper nutrient concentration at which algal growth is directly proportional to the nutrient concentration (Cole and Wells 2015). Once the nutrient concentrations are greater than the half-saturation constant, additional nutrient inputs would have a diminishing influence on algal growth since nutrients would no longer be limiting algal growth. In other words, doubling the phosphorus and/or nitrogen concentrations would not result in a corresponding doubling of algal growth once phosphorus and nitrogen concentrations are greater than their respective half-saturation constant. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality* and the final Appendix C *Water Quality Supporting Technical Information*.

In the Klamath River Total Maximum Daily Load (TMDL) model, there were separate nitrogen and phosphorus half-saturation constants for phytoplankton and periphyton that could be adjusted during model calibration. While the half-saturation constants for nutrients varies by algal species (Cole and Wells 2015), calibration of the Klamath River TMDL model to most accurately match observed data and maintain consistency among all the waterbodies determined the overall algal community response to nutrients would be best characterized by the half-saturation constant for inorganic phosphorus (i.e., orthophosphate) and inorganic nitrogen (i.e., ammonium/ammonia and nitrate+nitrite) being equal to 0.003 milligrams per liter (mg/L) and 0.014 mg/L, respectively, as noted in the comment (Tetra Tech 2009).

Klamath River water quality monitoring from 2002 to 2017 documents TP concentrations downstream of J.C. Boyle Dam under existing conditions that typically range from 0.044 to 0.370 mg/L (Figure ORG46-139-1). The mean TP concentration for each day of the year based on 2002 to 2017 TP data is shown as a black line, while the 95 percent confidence bands around the mean TP shown in cyan. The 95 percent confidence bands indicate that there is a 95 percent probability that the mean TP concentration would occur within the band. Measurements of TP were infrequently (i.e., twice in 2014, once in 2015, and once in 2016) less than the method reporting limit (i.e., 0.05 mg/L TP), but orthophosphate (PO_4) measurements associated with these TP measurements ranged from 0.054 to 0.097 mg/L PO_4 (the method reporting limit for orthophosphate is lower at 0.01 mg/L PO_4). TP measurements include orthophosphate, so it can be reasonably inferred that TP during these three measurements were at least equal to the measured orthophosphate (i.e., 0.054 to 0.097 mg/L). Measurements of TP were also infrequently greater than 0.370 mg/L TP (i.e., four times in 2004, once in 2015). During the typical May to October algal growth season, TP generally ranges from 0.053 to 0.370 mg/L TP. Orthophosphate concentrations downstream of J.C. Boyle Dam under existing conditions range from 0.011 to 0.320 mg/L PO_4 based on Klamath River water quality monitoring from 2002 to 2017, excluding orthophosphate measurements that are less than the method reporting limit (i.e., 0.01 mg/L) (Figure ORG46-139-2). The mean orthophosphate concentration for each day of the year based on 2002 to 2017 TP data is shown as a black line, while the 95 percent confidence bands around the mean orthophosphate shown in cyan. The 95 percent confidence bands indicate that there is a 95 percent probability that the mean orthophosphate concentration would occur within the band. A negative concentration is impossible, so a negative orthophosphate result indicates there was an error in the laboratory test. Orthophosphate concentrations downstream of J.C. Boyle Dam during the May to October algal growth season ranged from 0.033 to 0.32 mg/L PO_4.

Overall, based on the available data (2002 to 2017), phosphorus does not appear to limit algal growth in the Klamath River downstream of J.C. Boyle Dam since the minimum orthophosphate concentration (i.e., 0.011 mg/L) is approximately 4 times greater that the inorganic phosphorus half-saturation constant (i.e., 0.003 mg/L) and the minimum TP concentration (i.e., 0.044 mg/L) is approximately 15 times greater than the inorganic phosphorus half-saturation constant. As such, an increase of less than 0.015 mg/L TP due to dam removal under the Proposed Project is considered to be slight in the EIR analysis because there is sufficient phosphorus to meet algal growth needs under existing conditions and the estimated increase in TP is not be expected to be biostimulatory.

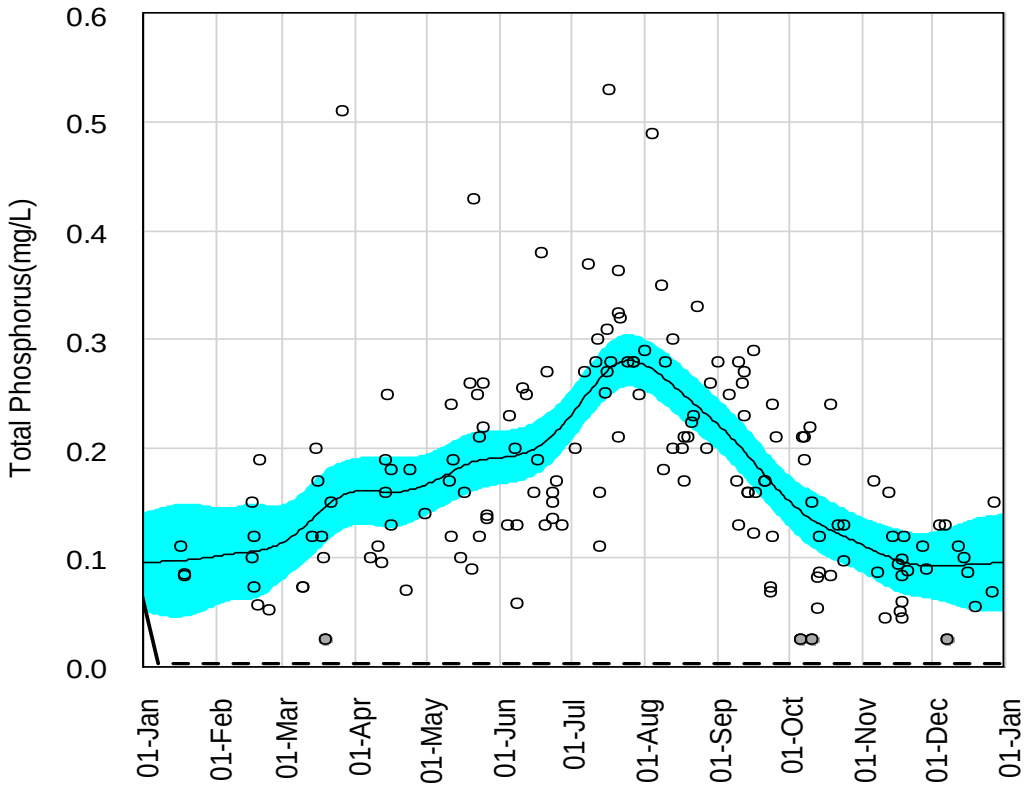


Figure ORG46-139-1. Total Phosphorus Concentrations in the Klamath River Downstream of J.C. Boyle Dam from 2002 to 2017. Mean Total Phosphorus Concentration Plotted as a Solid Black Line, While the 95 percent Confidence Bands Around the Mean Shown in Cyan. Inorganic Phosphorus Half-Saturation Concentration (i.e., 0.003 mg/L) is Shown as a Dashed Horizontal Line. Non-detect Values of Total Phosphorus (i.e., Less Than the Method Detection Limit [MDL] or Between the MDL and the Method Reporting Limit [MRL]) Are Plotted as Gray Circles at Half the MDL/MRL. Negative Total Phosphorus Concentrations Discarded. Source: PacifiCorp 2003a, 2004b, 2005b, 2007, 2008b, 2009, 2010, 2011, 2012, 2013, 2014c, 2015b, 2016b, 2017b.

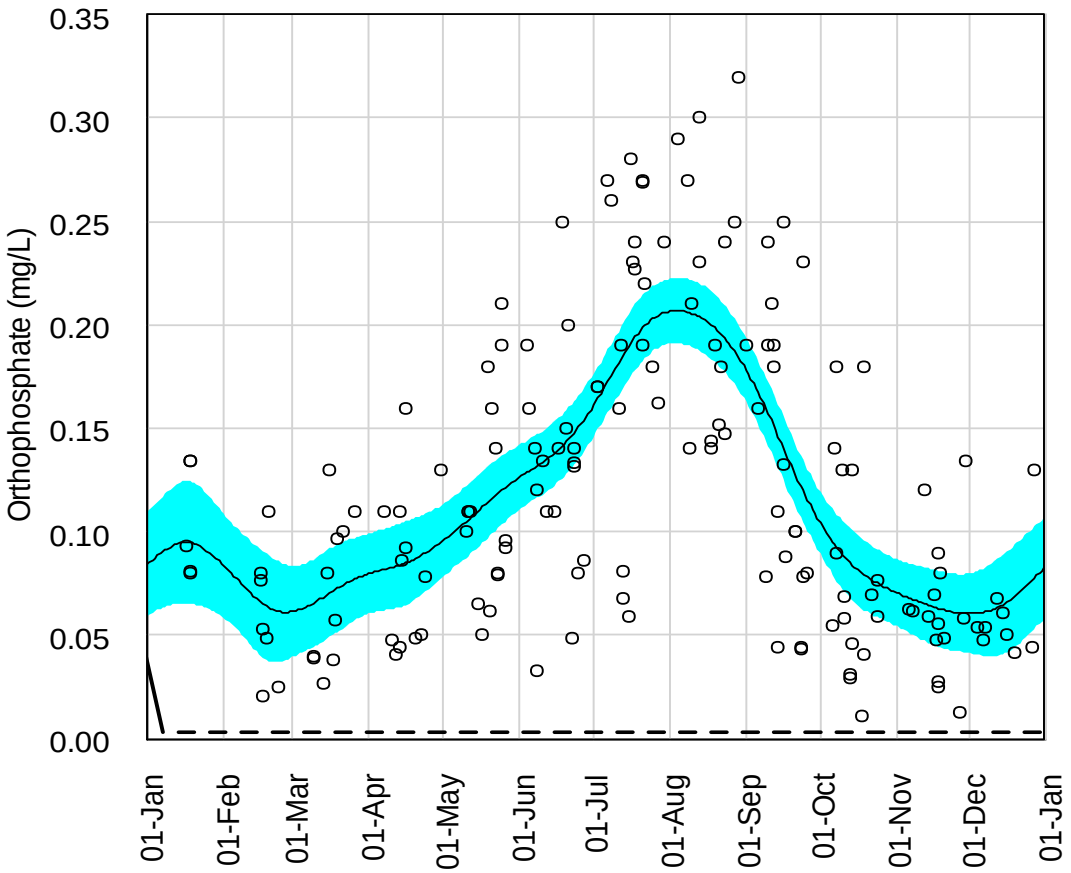


Figure ORG46-139-2. Orthophosphorus (i.e., Inorganic Phosphorus) Concentrations in the Klamath River Downstream of J.C. Boyle Dam from 2002 to 2017. Mean Orthophosphorus Concentration Plotted as a Solid Black Line, While the 95 percent Confidence Bands Around the Mean Shown in Cyan. Inorganic Phosphorus Half-Saturation Concentration (i.e., 0.003 mg/L) is Shown as a Dashed Horizontal Line. Non-detect Values of Orthophosphorus (i.e., Less Than the Method Detection Limit [MDL] or Between the MDL and the Method Reporting Limit [MRL]) Are Plotted as Gray Circles at Half the MDL/MRL. Negative Orthophosphorus Concentrations Discarded. Source: PacifiCorp 2003a, 2004b, 2005b, 2007, 2008b, 2009, 2010, 2011, 2012, 2013, 2014c, 2015b, 2016b, 2017b.

Klamath River water quality monitoring from 2002 to 2017 documents TN concentrations downstream of J.C. Boyle Dam under existing conditions ranging from 0.46 to 3.15 mg/L, with TN ranging from 0.54 to 2.77 mg/L during the typical May to October algal growth season (Figure ORG46-139-3). The mean TN concentration for each day of the year based on 2002 to 2017 TP data is shown as a black line, while the 95 percent confidence bands around the mean TN shown in cyan. The 95 percent confidence bands indicate that there is a 95 percent probability that the mean TN concentration would occur within the band. Total inorganic nitrogen (i.e., ammonia/ammonium and nitrate+nitrite)

concentrations downstream of J.C. Boyle Dam from 2002 to 2017 under existing conditions range from less than the method reporting limits (i.e., 0.05 mg/L ammonia, 0.01 nitrate+nitrite) to 1.65 mg/L, but total inorganic nitrogen concentrations were infrequently less than 0.05 mg/L (i.e., once in 2009 twice in 2010) or greater than 1.4 mg/L (i.e., twice in 2008, once in 2010, once in 2017) (Figure ORG46-139-4). The mean total inorganic nitrogen concentration for each day of the year based on 2002 to 2017 total inorganic nitrogen data is shown as a black line, while the 95 percent confidence bands around the mean total inorganic nitrogen shown in cyan. The 95 percent confidence bands indicate that there is a 95 percent probability that the mean total inorganic nitrogen concentration would occur within the band. During the typical May to October algal growth season, total inorganic nitrogen concentrations downstream of J.C. Boyle Dam generally range from approximately 0.05 to 1.4 mg/L.

Overall, based on the available data (2002 to 2017), nitrogen does not appear to limit algal growth in the Klamath River downstream J.C. Boyle Dam since the typical minimum total inorganic nitrogen concentration (i.e., 0.005 mg/L) is approximately 4 times greater the total inorganic nitrogen half-saturation constant (i.e., 0.014 mg/L) and the minimum TN concentration (i.e., 0.46 mg/L) is approximately 33 times greater than the total inorganic nitrogen half-saturation constant. As such, an increase of less than 0.05 mg/L TN due to dam removal under the Proposed Project is considered to be slight in the EIR analysis because there is sufficient nitrogen to meet algal growth needs under existing conditions and the estimated increase in TN is not be expected to be biostimulatory.

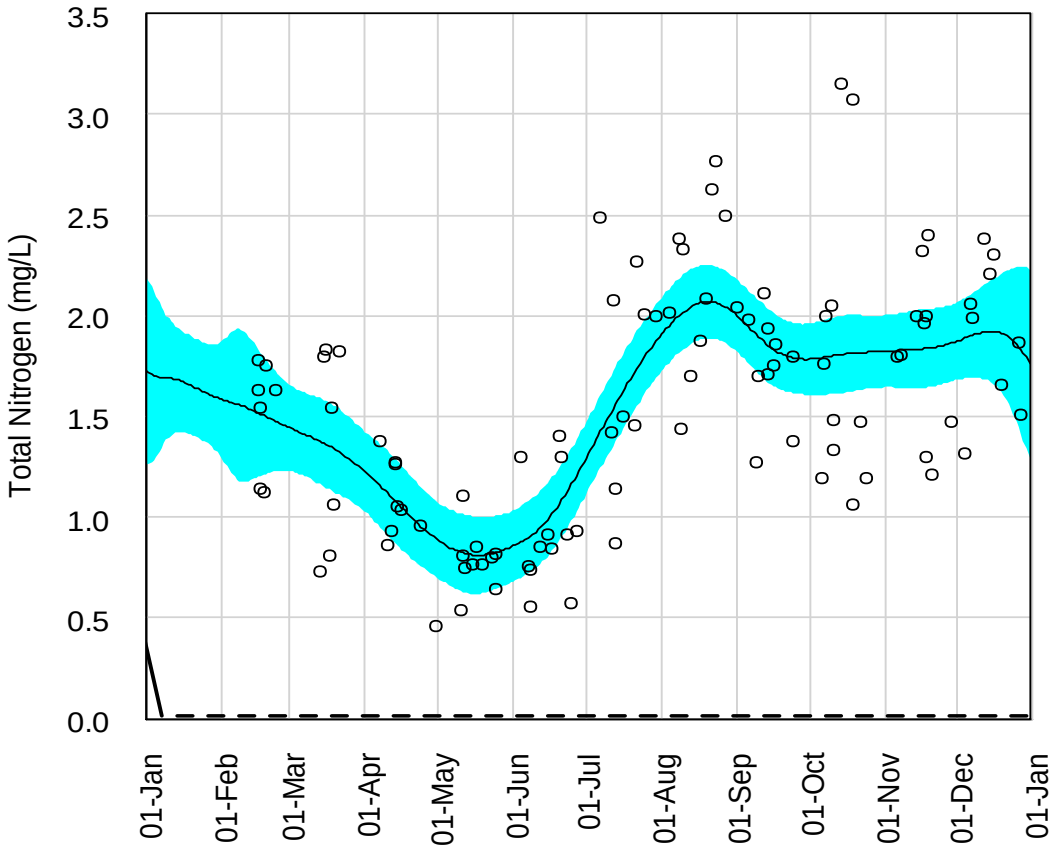


Figure ORG46-139-3. Total Nitrogen Concentrations in the Klamath River Downstream of J.C. Boyle Dam from 2002 to 2017. Mean Total Nitrogen Concentration Plotted as a Solid Black Line, While the 95 percent Confidence Bands Around the Mean Shown in Cyan. Total Inorganic Nitrogen Half-Saturation Concentration (i.e., 0.014 mg/L) is Shown as a Dashed Horizontal Line. Non-detect Values of Total Nitrogen (i.e., Less Than the Method Detection Limit [MDL] or Between the MDL and the Method Reporting Limit [MRL]) Are Plotted as Gray Circles at Half the MDL/MRL. Negative Total Nitrogen Concentrations Discarded. Source: PacifiCorp 2003a, 2004b, 2005b, 2007, 2008b, 2009, 2010, 2011, 2012, 2013, 2014c, 2015b, 2016b, 2017b.

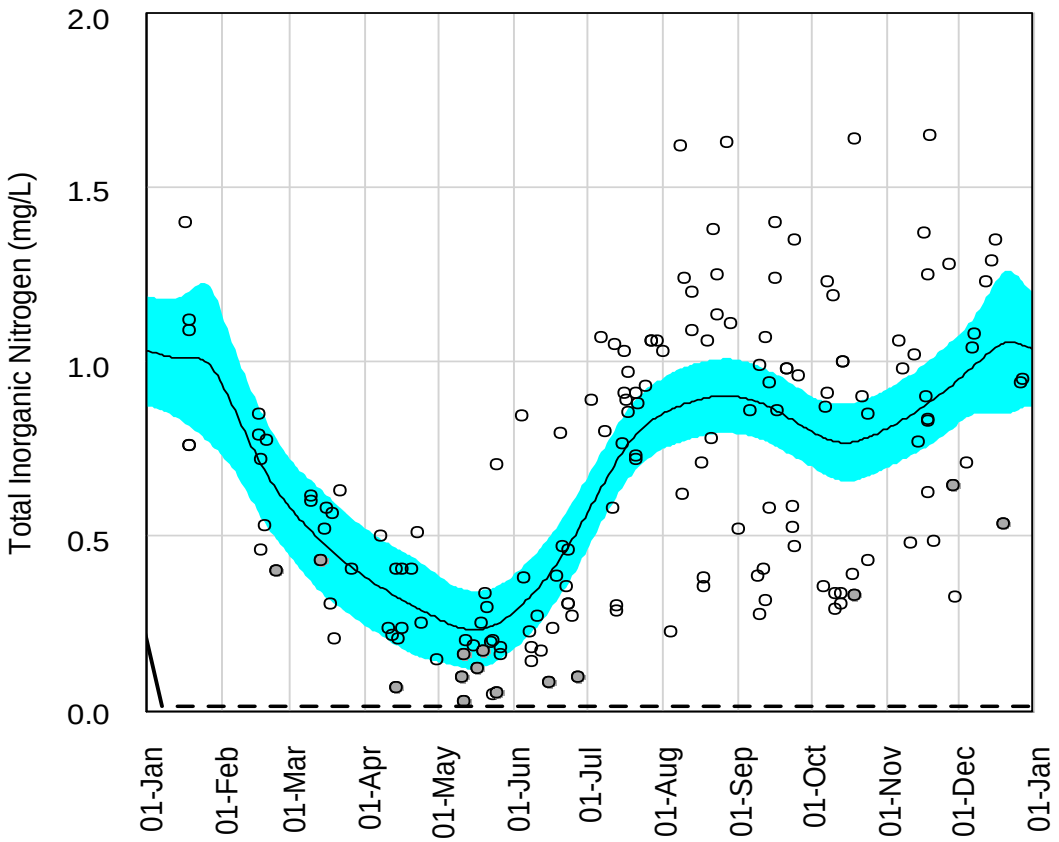


Figure ORG46-139-4. Total Inorganic Nitrogen (i.e., Ammonia/Ammonium and Nitrate+Nitrite) Concentrations in the Klamath River Downstream of J.C. Boyle Dam from 2002 to 2017. Mean Total Nitrogen Concentration Plotted as a Solid Black Line, While the 95 percent Confidence Bands Around the Mean Shown in Cyan. Total Inorganic Nitrogen Half-Saturation Concentration (i.e., 0.014 mg/L) is Shown as a Dashed Horizontal Line. Non-detect Values of Total Inorganic Nitrogen (i.e., Less Than the Method Detection Limit [MDL] or Between the MDL and the Method Reporting Limit [MRL]) Are Plotted as Gray Circles at Half the MDL/MRL. Negative Total Inorganic Nitrogen Concentrations Discarded. Source: PacifiCorp 2003a, 2004b, 2005b, 2007, 2008b, 2009, 2010, 2011, 2012, 2013, 2014c, 2015b, 2016b, 2017b.

With respect to the commenter's reference to the Copco No. 2 and Iron Gate tailrace TMDL nutrient targets, these targets were established at monthly mean concentrations that coincide with attaining the in-reservoir chlorophyll-*a* summer mean target of 10 micrograms per liter (ug/L), *Microcystis aeruginosa* cell density target of 20,000 cells/mL, and microcystin target of 4 ug/L (North Coast Regional Board 2010). Potential nutrient increases under the Proposed Project that would be equal to or greater than the Copco No. 2 and Iron Gate tailrace TMDL nutrient targets would not be a significant impact because 1) elimination of the slow-moving reservoir habitat that supports algal blooms of *Microcystis aeruginosa* in the Hydroelectric Reach would reduce the *Microcystis aeruginosa* cell density

and chlorophyll-*a* and microcystin concentrations and help achieve the goal of the Copco No. 2 and Iron Gate tailrace TMDL nutrient targets; and, 2) **in-reservoir** chlorophyll-*a*, *Microcystis aeruginosa*, and microcystin numeric TMDL targets would be irrelevant after the removal of the reservoirs under the Proposed Project.

As analyzed in Volume I Section 3.4.5.2 *Phytoplankton and Periphyton – Potential Impacts and Mitigation – Periphyton* Potential Impacts 3.4-4 (pages 3-435 to 3-427) and 3.4-5 (pages 3-437 to 3-429), nutrients are not likely to be limiting phytoplankton or periphyton growth in the Klamath River from the Hydroelectric Reach to Seiad Valley (river mile [RM] 132.7) since nutrient concentrations are high enough (i.e., greater than the half-saturation constants) that phytoplankton and periphyton growth are nutrient saturated under existing conditions and additional upstream nutrients due to dam removal under the Proposed Project would not have a biostimulatory effect on phytoplankton or periphyton growth in this reach. Instead, the potential increase in periphyton abundance in the Hydroelectric Reach from Copco No. 1 Reservoir to Iron Gate Dam would be due to habitat increases (i.e., conversion of reservoir into river habitat). The additional periphyton growth would uptake some nutrients and decrease the magnitude of the upstream nutrients being transported through the Hydroelectric Reach into the Middle Klamath River, but the Yurok Tribe analysis (Asarian et al. 2010) still estimates a potential nutrient increase in the Middle and Lower Klamath River under dam removal even with this assimilative uptake by periphyton (see Potential Impact 3.2-8 for additional details; please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*, including Potential Impact 3.2-8).

In the reaches where sufficient nitrogen is available to meet periphyton growth (i.e., upstream of Seiad Valley), the abundance of nitrogen-fixing algal species is low since nitrogen-fixing algal species primarily have a competitive advantage over other algal species when nitrogen concentrations are low. Downstream of Seiad Valley, the abundance of nitrogen-fixing algal species in the Klamath River increases and they become dominant, suggesting periphyton growth becomes nitrogen-limited in the Klamath River downstream of Seiad Valley under existing conditions. As such, increases in TN due to dam removal may alter the composition of the periphyton community, but the increase in TN would likely shift the location where nitrogen-fixing species begin to dominate farther *downstream* in the Klamath River (Asarian et al. 2010). The downstream shift in the reaches dominated by nitrogen-fixing algal species would likely reduce the nitrogen-fixing algal species abundance in the Klamath River and potentially reduce the nitrogen inputs to the Klamath River from nitrogen-fixing algal species, so the commenter is incorrect to assert that nitrogen-fixing algal species would provide another source of nitrogen to the Klamath River under the Proposed Project.

Additionally, potential increases in TP due to dam removal under the Proposed Project are not expected to increase periphyton abundance or biomass because TP concentrations in the Middle and Lower Klamath River and the Klamath River Estuary suggest there is sufficient phosphorus to meet algal growth needs under existing conditions and additional phosphorus would not have a biostimulatory effect. As summarized in Section 3.2.2.4 *Water Quality – Environmental Setting – Nutrients* and Appendix C, Section C.3 *Nutrients*, inorganic phosphorus (i.e., orthophosphate or soluble reactive phosphorus) in the Middle and Lower Klamath River and the Klamath River Estuary is typically 0.003 mg/L or greater, especially during the typical May to October algal growth season. Orthophosphate concentrations measured at Orleans (RM 58.9) for the available period of record (i.e., 2009 to 2017) ranged from 0.003 to 0.22 mg/L PO_4, but orthophosphate was infrequently less than 0.009 mg/L PO_4 (i.e., twice in 2010, once in 2015) or greater than 0.093 mg/L PO_4 (i.e., four times in 2014) (Figure ORG46-139-5). Farther downstream in the Klamath River, orthophosphate concentrations measured at Klamath/Turwar (approximately RM 6) for the available period of record (i.e., 2009 to 2017) ranged from 0.005 to approximately 0.063 mg/L PO_4, but orthophosphate was infrequently less than 0.006 mg/L PO_4 (i.e., once in 2014, once in 2015) or greater than 0.040 mg/L PO_4 (i.e., once in 2009, once in 2014, once in 2015) (Figure ORG46-139-6). Based on the available data, inorganic phosphorus (i.e., orthophosphate) concentrations under existing conditions are typically greater than the inorganic phosphorus half-saturation constant (i.e., 0.003 mg/L), thus there is sufficient inorganic phosphorus to meet algal growth needs such that additional inorganic phosphorus inputs due to dam removal under the Proposed Project would not be expected to be biostimulatory to phytoplankton or periphyton.

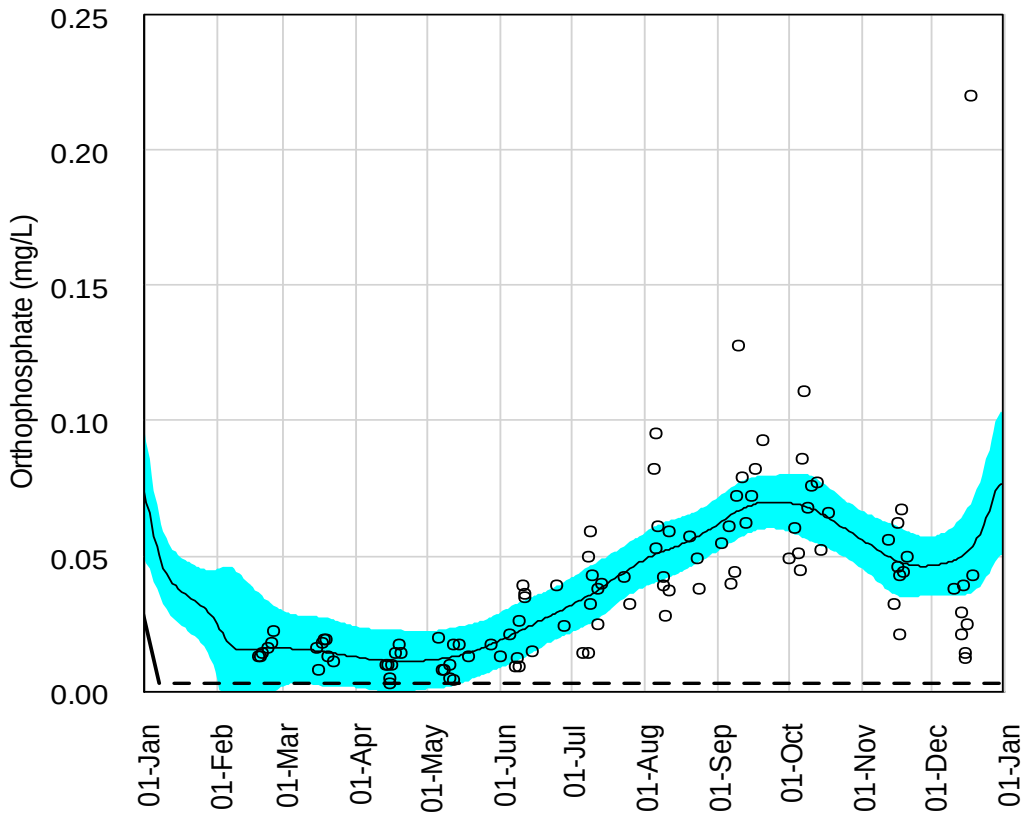


Figure ORG46-139-5. Orthophosphorus (i.e., Inorganic Phosphorus) Concentrations in the Klamath River at Orleans (RM 58.9) from 2009 to 2017. Mean Orthophosphorus Concentration Plotted as a Solid Black Line, While the 95 percent Confidence Bands Around the Mean Shown in Cyan. Inorganic Phosphorus Half-Saturation Concentration (i.e., 0.003 mg/L) is Shown as a Dashed Horizontal Line. Non-detect Values of Orthophosphorus (i.e., Less Than the Method Detection Limit [MDL] or Between the MDL and the Method Reporting Limit [MRL]) Are Plotted as Gray Circles at Half the MDL/MRL. Negative Orthophosphorus Concentrations Discarded. Source: PacifiCorp 2009, 2010, 2011, 2012a, 2013b, 2014c, 2015b, 2016b, 2017b.

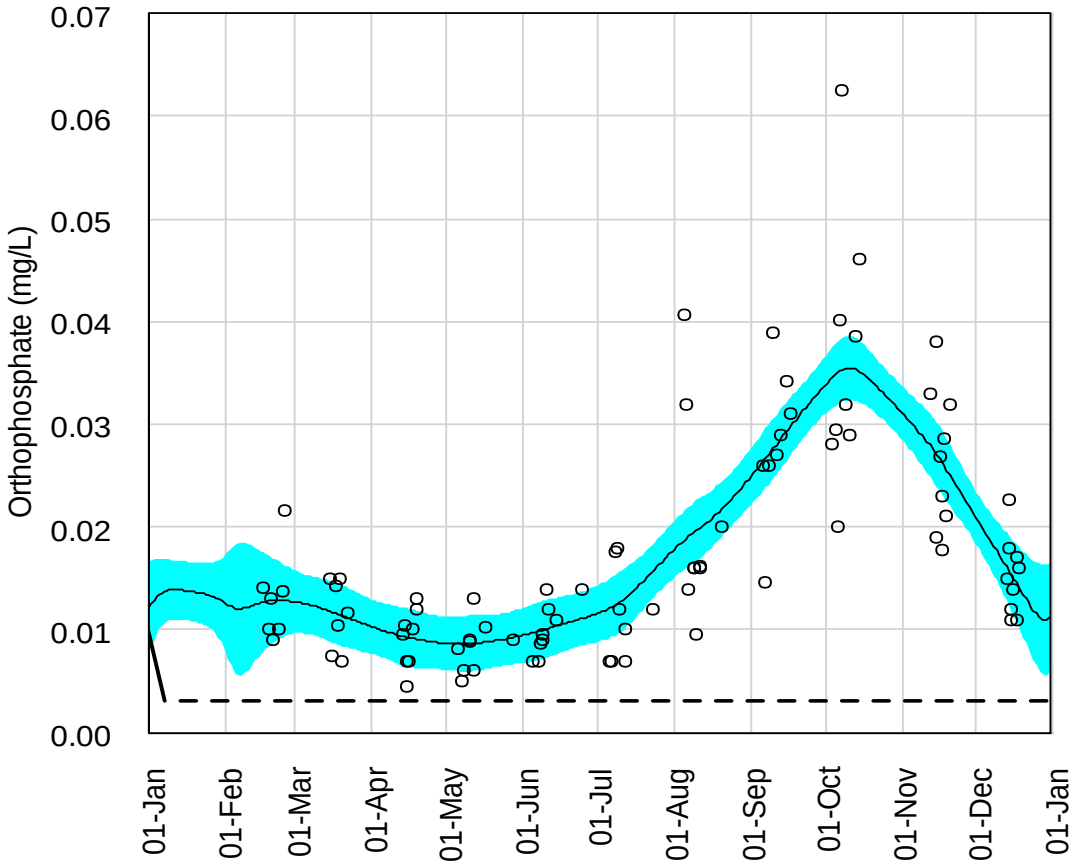


Figure ORG46-139-6. Orthophosphorus (i.e., Inorganic Phosphorus) Concentrations in the Klamath River at Klamath/Turwar (Approximately RM 6) from 2009 to 2017. Mean Orthophosphorus Concentration Plotted as a Solid Black Line, While the 95 percent Confidence Bands Around the Mean Shown in Cyan. Inorganic Phosphorus Half-Saturation Concentration (i.e., 0.003 mg/L) is Shown as a Dashed Horizontal Line. Non-detect Values of Orthophosphorus (i.e., Less Than the Method Detection Limit [MDL] or Between the MDL and the Method Reporting Limit [MRL]) Are Plotted as Gray Circles at Half the MDL/MRL. Negative Orthophosphorus Concentrations Discarded. Source: PacifiCorp 2009, 2010, 2011, 2012a, 2013b, 2014c, 2015b, 2016b, 2017b.

Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality* and the final Appendix C *Water Quality Supporting Technical Information*.

Comment ORG46-140

The DEIR states "As described above in this potential impact analysis, Copco No. 1 and Iron Gate reservoirs currently intercept and retain suspended material behind the dams, including nutrients (TP and TN) associated with suspended material that originates upstream of the Hydroelectric Reach. Results of all the existing evaluations (FERC 2007; North Coast Regional Board 2010; Asarian et

al. 2010) recognize the trapping function of the reservoirs with respect to TP and TN, and they provide results indicating that ending this trapping by converting the reservoirs to free-flowing river reaches would, on an annual basis, result in a slight increase in annual TN and TP in the Middle and Lower Klamath River and the Klamath River Estuary." As explained in previous comments (see, for example, comment 3.2-53), the reservoir retention of nutrients is not "slight" and the discussion in the DEIR should be modified to reflect the actual quantified magnitude of reduction (expressed both in tons and percent of annual load at Iron Gate Dam) under existing conditions and the change under the Proposed Project.

The increased nutrient delivery to the Klamath River following the Proposed Project has the potential to increase biostimulatory conditions in the river and result in algal impacts in the river and the estuary. The DEIR does not acknowledge or attempt to evaluate these potential impacts from increased nutrient delivery to the Klamath River from upstream sources.

Response to Comment ORG46-140
Section 3.2.2.4 *Water Quality – Environmental Setting – Nutrients* has been revised using the most recent calculated annual nutrient retention amounts for the Lower Klamath Project reservoirs (Asarian et al. 2009) to clarify what is meant by the use of "slight" when describing nutrient retention and to provide quantification of the reductive effects of retention. Please refer to Volume III Attachment 1 Section 3.2.2.4 *Water Quality – Environmental Setting – Nutrients* for the revisions. Please refer to response to comment ORG46-98 for further details on the magnitude of the nutrient retention in the Lower Klamath Project reservoirs.

Please refer to Volume III Attachment 1 Section 3.2.5 *Water Quality – Potential Impacts and Mitigation -Nutrients* Potential Impact 3.2-8 and Volume I Section 3.4.5 *Phytoplankton and Periphyton – Potential Impacts and Mitigation* Potential Impacts 3.4-2, 3.4-4, and 3.4-5 for discussion of the nutrient increases due to dam removal under the Proposed Project and the potential impact on phytoplankton and periphyton growth conditions in the Hydroelectric Reach, the Middle and Lower Klamath River, the Klamath River Estuary, and the Pacific Ocean Nearshore Environment. The comment incorrectly asserts that the EIR does not acknowledge or attempt to evaluate these potential impacts from increased nutrient delivery to the Klamath River from upstream sources since these four impacts assess the potential biostimulatory effects of increased nutrients from upstream of the Lower Klamath Project dams on phytoplankton and periphyton.

Please also refer to response to comment ORG46-139 for additional details on the potential biostimulatory effects of nutrient increases due to dam removal under the Proposed Project, including explanation of the EIR's characterization of

potential increases in Total Phosphorus (TP) and Total Nitrogen (TN) under the Proposed Project.

Comment ORG46-141

The DEIR states "...results of the Klamath River TMDL model are in general agreement with PacifiCorp (FERC 2007) and Yurok Tribe (Asarian et al. 2010) analyses regarding dam removal impacts on nutrients, with very small annual increases in TP (0.01 to 0.015mg/L) and relatively larger annual increases in TN (0.1 to 0.125 mg/L) immediately downstream from Iron Gate Dam due to dam removal." The magnitude of these increases is clearly potentially biostimulatory (see comment 3.2-53). The DEIR needs to be revised to reflect that such increases are not "very small" in terms of supporting seasonal primary production.

Response to Comment ORG46-141

The EIR properly characterizes the magnitude of the nutrient increases downstream of Iron Gate Dam due to dam removal under the Proposed Project both numerically and with respect to the actual anticipated effects of the Proposed Project. The increases are not expected to be biostimulatory since measurements of nutrient concentrations in the Klamath River indicate there are sufficient nutrients to meet algal growth needs under existing conditions and additional nutrient inputs from upstream of the Hydroelectric Reach thus would not have a biostimulatory effect.

Please refer to response to comment ORG46-139 for additional discussion on the nutrient concentrations sufficient to meet algal growth needs, the nutrient concentrations in the Klamath River under existing conditions, and the potential biostimulatory effects of nutrient increases due to dam removal under the Proposed Project.

Comment ORG46-142

The DEIR states that "The Klamath River TMDL model does not include denitrification as a possible nitrogen removal term in river segments (Tetra Tech 2009), meaning that TN concentrations being transported in to the Middle Klamath River under the Proposed Project may be over-predicted." The DEIR describes no mechanism that would justify appreciable denitrification. The key nitrogen removal process would be plant uptake by periphyton and macrophytes. Further, the DEIR neglects nitrogen fixation as a key nitrogen input to the Klamath River. The DEIR must clearly present the potential effects the inaccuracies in the TMDL model have on the assumptions and effects analysis presented in the DEIR and present technically sound reasoning as to why incorporating those known inaccuracies into the DEIR analysis is appropriate.

Response to Comment ORG46-142

The influence of denitrification on nitrogen concentrations in the Klamath River has not been quantified, but because the majority of the riverbed is rocky and

there typically are high dissolved oxygen concentrations in the water column, the river is not considered to be a particularly favorable location for high rates of denitrification. Thus, denitrification was expected to have a minimal influence of nitrate/nitrite concentrations in the river and it was not simulated in the Klamath River Total Maximum Daily Load (TMDL) model (Tetra Tech 2009).

The potential for overpredicting total nitrogen concentrations was discussed in Potential Impact 3.2-8 to explain a TMDL model assumption and source of uncertainty that was considered when analyzing the model results.

Section 3.2.5.3 *Water Quality – Potential Impacts and Mitigation – Nutrients* Potential Impact 3.2-8 has been revised to clarify the anticipated relative influence of denitrification on Total Nitrogen (TN) concentrations in the Klamath River. Please refer to Volume III Attachment 1 Section 3.2.5.3 *Water Quality – Potential Impacts and Mitigation – Nutrients* Potential Impact 3.2-8 for the revisions.

The assertion that the EIR neglects nitrogen fixation is not accurate. Nitrogen fixation is considered in Potential Impact 3.2-8 and other nutrient analyses in the EIR because the Yurok Tribe nutrient analysis uses measured nitrogen concentrations at multiple locations in the Klamath River to estimate the net nitrogen retention along river reaches, including net losses from the water column resulting from sedimentation, atmospheric fixation and denitrification, net biologic uptake/release by periphyton and macrophytes, and nutrient releases from bottom sediments. All numeric models have some inherent assumptions, limitations, and uncertainties that potentially influence the model results. Multiple numeric models (e.g., Klamath River TMDL, Klamath River Water Quality Model (KRWQM), and Yurok Tribe) are used in the EIR to analyze the potential nutrient conditions under the Proposed Project and the alternatives because no individual existing numeric model captures all of the water quality conditions anticipated for and encompassed by the Proposed Project and the alternatives (see also Volume II Appendix D, Section D.1 [pages D-1 to D-9]). Variations between the Klamath River TMDL model and the Yurok Tribe model results are potentially due to the Klamath River TMDL model not including nitrogen fixation and denitrification and the Yurok Tribe analysis estimating the nitrogen fixation and denitrification in the Klamath River based on measured nitrogen concentrations. Please see Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Please also refer to Master Response WQ-4 for information on the Klamath River TMDL model.

Comment ORG46-143

The DEIR states "While there would be a slight increase in absolute nutrient concentrations entering the Middle Klamath River under the Proposed Project, phytoplankton, especially blue-green algae, would be limited in their ability to use those nutrients for growth and reproduction without calm reservoir habitat." As

explained in previous comments, the estimated increase in nutrients is not "slight" and the DEIR needs to be adjusted to reflect the actual quantified magnitude of nutrient load increase. Further, the Klamath River downstream of Iron Gate Dam contains areas of stagnant water conditions in which blue-green algae can and currently does proliferate. Blue-green algae have also been documented to be present and to bloom in riverine conditions without reservoirs (e.g., Trinity River, Eel River, Willamette River, etc.) and so the elimination of the reservoirs will not result in the elimination of blue-green algae from the lower Klamath River, especially in light of the increase in nutrient delivery to the river following potential dam removal (see comment 3.2-24).

Response to Comment ORG46-143
Please refer to Potential Impact 3.2-8 for quantification of the nutrient increases estimated by the Klamath River Total Maximum Daily Load (TMDL) model and the Yurok Tribe analysis downstream of Iron Gate Dam due to dam removal under the Proposed Project, especially Figure 3.2-18 and associated discussion. The magnitude of the nutrient increases downstream of Iron Gate Dam due to dam removal under the Proposed Project is described as "slight" because the nutrient increases are not expected to be biostimulatory. Measurements of nutrient concentrations in the Klamath River indicate there are sufficient nutrients to meet algal growth needs under existing conditions and additional nutrient inputs from upstream of the Hydroelectric Reach would not have a biostimulatory effect. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Please also refer to comment response ORG46-139 for additional discussion on the nutrient concentrations sufficient to meet algal growth needs, the nutrient concentrations in the Klamath River under existing conditions, and the potential biostimulatory effects of nutrient increases due to dam removal under the Proposed Project.

Please refer to Volume I Section 3.4 *Phytoplankton and Periphyton – Potential Impacts and Mitigation* Potential Impact 3.4-2 (pages 3-428 to 3-433) for analysis of the change in blue-green algae abundance in the Klamath River downstream of Iron Gate Dam under the Proposed Project. As discussed in Potential Impact 3.4-2 (pages 3-428 to 3-433), some blue-green algae growth may still occur after dam removal in calm, slow-moving habitats along the river margins during low-flow periods in the Middle and Lower Klamath River. Please also refer to Volume III Attachment 1 *Section 3.4.5.1 Phytoplankton and Periphyton – Potential Impacts and Mitigation – Phytoplankton* Potential Impact 3.4-2 for additional edits to clarify details about blue-green algae growth and reproduction downstream of Iron Gate Dam.

Analysis in the EIR does not state that elimination of the reservoirs would result in elimination of blue-green algae from the Klamath River downstream of Iron Gate Dam. Please also refer to comment responses ORG46-108, ORG46-268,

and TR20-29 for further discussion of blue-green algae growth in the Klamath River downstream of Iron Gate Dam.

While total nutrient transport into the Middle and Lower Klamath River after dam removal would increase under the Proposed Project, *Microcystis aeruginosa* cell density and microcystin concentrations in Middle and Lower Klamath River after dam removal are expected to decrease due to reduced transport of *Microcystis aeruginosa* and microcystin from the Hydroelectric Reach into the Middle and Lower Klamath River and nutrient increases are unlikely to produce a biostimulatory effect (see comment response ORG46-139 for additional discussion). Overall, elimination of the reservoirs, elimination of transport of *Microcystis aeruginosa* cells from the reservoirs, and transport of nutrients from upstream of the Hydroelectric Reach into the Middle and Lower Klamath River would not support nuisance phytoplankton growth or blooms that exceed current levels and it would be expected that the abundance of *Microcystis aeruginosa* would decrease in the Klamath River downstream of Iron Gate Dam.

Comment ORG46-144

The DEIR analysis should recognize that the travel time from Keno Dam downstream to Iron Gate Dam will be reduced dramatically under several of the alternatives presented in the DEIR. Currently, few algae survive the high water pressures experienced through J.C. Boyle penstock and powerhouse, which conveys over 90 percent of the Klamath River now from J.C. Boyle Dam through the powerhouse to the river downstream. Without J.C. Boyle and other dams, toxic algae from upstream sources (e.g., Keno reservoir) could readily be transported through the river reaches to downstream locations. Currently, algae released from Iron Gate Dam have been observed flowing into the estuary 185 miles downstream (Otten et al. 2015). This is sufficient evidence to suggest that algae released from Keno Dam would similarly be transported downstream to Klamath River reaches under the Proposed Project. This will be a long-term impact and unavoidable condition because Upper Klamath Lake is a hypereutrophic system that produces high levels of nutrients and algae.

Response to Comment ORG46-144

Please refer to Master Response PAP-1.

Comment ORG46-145

The DEIR states that "Overall, the slight increase in annual nutrient concentrations would not result in significant biostimulatory impacts on phytoplankton growth under the Proposed Project relative to existing conditions, and the elimination of potential seasonal releases of dissolved nutrients from the reservoir bottom waters would be beneficial." However, as explained in previous comments, the analysis included in the DEIR does not support this finding (see comment 3.2-55 and 3.2-57).

Response to Comment ORG46-145
The comment does not provide substantial evidence that analysis in the EIR does not support the finding that increases in annual nutrient concentrations would not result in significant biostimulatory impacts on phytoplankton growth under the Proposed Project relative to existing conditions. The comment also does not provide substantial evidence that the EIR analysis does not support the finding that elimination of potential seasonal releases of dissolved nutrients from the reservoir bottom waters would be beneficial nor does the comment provide evidence that this finding is inaccurate.

Substantial evidence supports the EIR's finding that increases in annual nutrient concentrations would not result in significant biostimulatory impacts on phytoplankton growth under the Proposed Project relative to existing conditions. As analyzed in Potential Impact 3.2-8, specifically Figure 3.2-18 and the associated discussion, measurements of nutrient concentrations in the Klamath River (summarized in Volume III Attachment 1 Section 3.2.2.4 *Water Quality – Environmental Setting – Nutrients* and Volume III Attachment 1 Appendix C, Section C.3 *Nutrients*) indicate there are sufficient nutrients to meet algal growth needs under existing conditions, so additional nutrient inputs from upstream of the Hydroelectric Reach would not have a biostimulatory effect. Please refer to response to comment ORG46-139 for a discussion of the nutrient concentrations sufficient to meet algal growth needs, the nutrient concentrations in the Klamath River under existing conditions, and the potential biostimulatory effects of nutrient increases due to dam removal under the Proposed Project.

Additionally, Section 3.2.2.4 *Water Quality – Environmental Setting – Nutrients* and Appendix C, Section C.3 *Nutrients* summarize the nutrient data documenting seasonal export of dissolved nutrients from reservoir bottom waters. While nutrients in the Klamath River under the Proposed Project would be expected to remain above nutrient concentrations sufficient to meet algal growth needs similar to existing conditions, the elimination of seasonal releases of dissolved nutrients from reservoir bottom sediments during anoxic conditions in summer and fall would reduce the available nutrients for phytoplankton and periphyton growth during this period. This would be a beneficial effect since it would reduce nutrient availability and move the nutrient concentrations closer to attainment of monthly numeric Total Maximum Daily Load (TMDL) targets during summer and fall. The comment's disagreement regarding the beneficial effects of the project is noted but this does not constitute evidence that calls into question the conclusions of the EIR.

Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality* and the final Appendix C *Water Quality Supporting Technical Information*.

Please also refer to Volume I Section 3.4.5 *Phytoplankton and Periphyton – Potential Impacts and Mitigation* Potential Impacts 3.4-2, 3.4-4, and 3.4-5 for further analysis of the nutrient increases due to dam removal under the Proposed

Project and the potential impact on phytoplankton and periphyton growth conditions in the Hydroelectric Reach, the Middle and Lower Klamath River, the Klamath River Estuary, and the Pacific Ocean Nearshore Environment.

Comment ORG46-146

The DEIR states "However, concentrations of both nutrients are high enough in the Klamath River from Iron Gate Dam to approximately Seiad Valley (RM 132.7) (and potentially further downstream) that nutrients are not likely to be limiting primary productivity (e.g., periphyton growth) in this more upstream portion of the Middle Klamath River." The DEIR does not adequately acknowledge and account for the fact that periphyton and macrophytes will uptake nutrients in currently inundated reservoir reaches and in the J.C. Boyle peaking reach where periphyton and macrophytes growth is currently limited by hydropower peaking operations. The DEIR fails to acknowledge the extension of macrophyte and periphyton growth into about 30 miles of existing inundated reservoir and riverine habitat and the impacts this could have on water quality.

Response to Comment ORG46-146

Section 3.2.5.3 *Water Quality – Potential Impacts and Mitigation – Nutrients* Potential Impact 3.2-8 provides a discussion of the nutrient uptake (or release) from periphyton and macrophyte growth within the Hydroelectric Reach under the Proposed Project. As summarized in Section 3.2.4.3 *Water Quality – Impact Analysis Approach– Nutrients* and analyzed in Potential Impact 3.2-8, the Yurok Tribe analysis used a nutrient budget approach and measured nutrient data at multiple sites along the Klamath River to estimate the net nutrient retention/release from all the processes occurring within reaches of the Klamath River or Copco No. 1 and Iron Gate reservoirs under existing conditions, including uptake or release of nutrients by periphyton and macrophytes (Asarian et al. 2009, 2010). The Yurok Tribe analysis used the results of this nutrient budget of existing conditions to estimate the potential magnitude of long-term nutrient uptake and release by conversion of the reservoir areas to free-flowing rivers under the Proposed Project by multiplying the length of the reservoir areas by the various estimates of the per-mile relative retention (or release) rates from free-flowing river reaches. As explained in Potential Impact 3.2-8, the Yurok Tribe analysis implicitly includes nutrient recycling processes such as assimilative uptake for seasonal phytoplankton and periphyton growth and subsequent downstream release, as these processes were ongoing and inherently included in the empirical retention estimates determined for existing conditions. Similarly, nutrient uptake (or release) by macrophytes would also be inherently included in this empirical analysis since it would be part of the nutrient recycling processes occurring in the river. Thus, Potential Impact 3.2-8 implicitly considers the potential impact of nutrient uptake (or release) due to periphyton and macrophyte growth within the Hydroelectric Reach under the Proposed Project through the Yurok Tribe analysis results.

The potential impacts to other water quality parameters resulting from periphyton colonization within the Hydroelectric Reach under the Proposed Project are discussed under their respective sub-sections in Section 3.2.5 *Water Quality – Potential Impacts and Mitigation*. Please refer to Section 3.2.5.4 *Water Quality – Potential Impacts and Mitigation* Potential Impact 3.2-10 for a discussion of dissolved oxygen; Potential Impact 3.2-11 for a discussion of pH; and Potential Impact 3.2-12 for a discussion of chlorophyll-*a* and algal toxins, due to periphyton growth in the Hydroelectric Reach under the Proposed Project. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Please also refer to Volume I Section 3.4.5 *Phytoplankton and Periphyton – Potential Impacts and Mitigation* Potential Impact 3.4-4 (pages 3-435 to 3-427) for further discussion of likely seasonal increases in periphyton within the Hydroelectric Reach under the Proposed Project due to the conversion of the reservoir areas to a free-flowing river. Please refer to response to comment ORG46-136 for a discussion of potential macrophyte abundance in the Hydroelectric Reach under the Proposed Project. Please also refer to response to comment ORG46-34 for a discussion of the potential impacts of sediment transport on macrophytes, ORG46-146 for a discussion of potential impacts from periphyton and macrophyte growth on nutrients, and ORG46-149 for a discussion of the potential impacts of periphyton and macrophytes on pH in the Klamath River.

Comment ORG46-147

The DEIR states "However, the KRWQM does not include nutrient retention in the mainstem river downstream from Iron Gate Dam and assumes relatively high nutrient contributions from tributaries (Asarian and Kann 2006b). These input assumptions lead to a likely overestimate of the increase in periphyton growth, and therefore a likely overestimate of modeled predicted daily variations in dissolved oxygen." Regarding this statement, the DEIR should clarify how "nutrient retention" is being defined because contrary to this statement, the current version of KRWQM model does include the two most prevalent forms of seasonal nutrient retention in the Klamath River downstream of Iron Gate Dam: (1) aquatic vegetation growth and the concomitant nutrient uptake; and (2) senescence and contribution to organic matter (and the associated nitrogen and phosphorus fractions). These characterizations have provided key insight into nutrient cycling dynamics in the riverine portions of the Klamath River. Because there appears to be a misunderstanding in the DEIR regarding the mechanisms at work in the Klamath River regarding nutrient retention, the statement that the model over-predicts daily diurnal variation in dissolved oxygen is not adequately supported and fails to recognize that the KRWQM calibration reproduces hourly observed diurnal variation in dissolved oxygen.

Response to Comment ORG46-147

Asarian and Kann (2006b) compared the measured and 2004/2005 Klamath River Water Quality Model (KRWQM) modeled nutrients, total organic carbon,

and chlorophyll-*a* to assess the performance and potential bias associated with 2004/2005 KRWQM estimates of these water quality parameters. The cause of differences between the measured and modeled water quality parameters was not determined, but potential sources of differences were identified. The Draft EIR incorrectly attributed the differences between the measured and 2004/2005 KRWQM modeled nutrients to a lack of nutrient retention in the KRWQM. The comment is correct that the 2004/2005 KRWQM does likely include nutrient retention since it has parameters related to uptake of nitrogen and phosphorus and the fraction of biomass composed of nitrogen and phosphorus. The documentation for RMA-11 is not available (i.e., proprietary), so it is not possible to verify the specifics of nutrient retention in the stream reaches.

However, the Draft EIR correctly interpreted the comparison between the measured and 2004/2005 KRWQM modeled nutrient and chlorophyll-*a* concentrations by Asarian and Kann (2006b) that indicated the chlorophyll-*a* concentrations were consistently overpredicted by the 2004/2005 KRWQM, so 2004/2005 KRWQM results likely overestimated algal growth in the Klamath River and associated oxygen production and respiration. Thus, 2004/2005 KRWQM dissolved oxygen results would likely overestimate the daily variations in dissolved oxygen. More recent 2019 KRWQM documentation (PacifiCorp 2019a) suggests that the updated version of the model exhibits better agreement with measured chlorophyll-*a* concentrations than the 2004/2005 KRWQM. However, PacifiCorp (2019a) does not present comparisons of dam removal scenarios, so the previous 2004/2005 KRWQM results cannot be replaced with newer 2019 model results in the EIR analyses.

Section 3.2.5.4 *Water Quality – Potential Impacts and Mitigation – Dissolved Oxygen* Potential Impact 3.2-10 for the Middle and Lower Klamath River, Klamath River Estuary, and Pacific Ocean Nearshore Environment, has been revised to clarify that comparison of modeled and measured water quality parameters indicates that the 2004/2005 KRWQM overpredicts chlorophyll-*a* (i.e., a surrogate for algal growth) in the Klamath River and the additional oxygen production and respiration from an overestimate of algal growth in 2004/2005 KRWQM outputs likely results in an overprediction of daily variations in dissolved oxygen concentrations. The revisions to Potential Impact 3.2-10 do not change the significance determination. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Comment ORG46-148

The DEIR states "Klamath River TMDL model results indicate that under the "TMDL dams-out" scenario for Oregon reaches (TOD2RN), pH at the Oregon-California state line would exhibit less daily variability during spring (March to May) and fall (October to November) (see Figure 3.2-24) than the "TMDL dams-in" scenario (T4BSRN)." The DEIR analysis should recognize TMDL modeling flaws (see comment 3.2-9 and 3.2-34). Specifically, the nutrient boundary conditions assumed in the Oregon Klamath River TMDL (ODEQ 2002) at Upper

Klamath Lake are infeasibly low and result in almost no primary production in the Klamath River between Keno Dam and J.C. Boyle Reservoir (such a reduction in nutrients and associated primary production, if it were ever able to be achieved, would have detrimental effects on aquatic food webs in the Klamath River). This condition carries on downstream, resulting in low diurnal variation in dissolved oxygen at the California-Oregon state line (see comment 3.2-39). This erroneous TMDL assumption and the subsequent result is apparently the basis for the DEIR statement above. Further, under the Proposed Project the J. C. Boyle Peaking Reach would be colonized by aquatic vegetation (currently absent because of the variable flow regime associated with hydropower peaking operations), which would yield a notably higher diurnal pH in this weakly buffered system.

Response to Comment ORG46-148

Please refer to Master Response WQ-5 for a discussion of the appropriateness of using Klamath River Total Maximum Daily Load (TMDL) model results in the EIR analysis. Please also refer to responses to comment ORG46-119 for further discussion of the parts of the EIR analysis that specifically examine the implications of assuming full implementation of the TMDLs with respect to using the TMDL model results in the analysis. Section 3.2.5.4 *Water Quality – Potential Impacts and Mitigation – Dissolved Oxygen* Potential Impact 3.2-10 discusses long-term dissolved oxygen conditions under the Proposed Project and lower diurnal dissolved oxygen variations at the Oregon-California state line are attributed to elimination of hydropower peaking operations that produce large dissolved oxygen variations under existing conditions. Please refer to ORG46-101 for further discussion of the dissolved oxygen variations under existing conditions and under dam removal conditions. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*, including Potential Impact 3.2-10. Please also refer to response to comment ORG46-149 for a discussion of the potential periphyton and macrophyte growth in the Hydroelectric Reach and their influence on pH.

Comment ORG46-149

The DEIR states "The Proposed Project also would be expected to eliminate the occurrence of high pH (greater than 8.5 s.u. [standard units]) and large daily fluctuations (0.5- 1.5 s.u.) that occur in the surface waters of Copco No. 1 and Iron Gate reservoirs under existing conditions during periods of intense phytoplankton blooms (see Section 3.2.2.6 pH)." The DEIR further states "The pH in the free-flowing reaches of the river replacing these reservoirs would not be likely to exhibit such extremes in daily pH and would not result in a failure to meet the existing instantaneous maximum pH objective at the levels currently supported and would be beneficial." The DEIR fails to acknowledge that while pH values may not attain the same magnitude values of reservoir surface waters, colonization of this reach and upstream reaches by periphyton and macropyhtes under the Proposed Project will lead to pH values in excess of 9 s.u. and potentially allow ammonia toxicity to develop. Toxicity concerns are greater at

the more upstream locations because these locations are closer to the source of organic matter (e.g., Keno Reservoir and Upper Klamath Lake) and thus would have a greater propensity to experience higher organic matter concentrations and the associated nitrogen fraction of organic matter that mineralizes to ammonia. Daily maximum pH values in excess of 9 would most likely occur frequently during summer and early fall months.

Response to Comment ORG46-149
Please refer to Volume I Section 3.4.5.2 *Phytoplankton and Periphyton – Potential Impacts and Mitigation – Periphyton* Potential Impact 3.4-4 (pages 3-435 to 3-437) for analysis of changes in periphyton growth in the Hydroelectric Reach from the conversion of the reservoir areas to a free-flowing river and the elimination of hydropower peaking operations under the Proposed Project. Section 3.2.5.5 *Water Quality – Potential Impacts and Mitigation – pH* Potential Impact 3.2-11 provides analysis of the pH under the Proposed Project, including the potential pH variations associated with periphyton colonization and growth in the Hydroelectric Reach. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

As discussed in the introduction of Volume I Section 3.4.2 *Phytoplankton and Periphyton – Environmental Setting* (page 3-392), there is also no known quantitative or species-specific information on aquatic plants (i.e., submerged and/or floating macrophytes) in the Hydroelectric Reach or the Middle and Lower Klamath River. Sullivan et al. (2013) sampled macrophytes in the Klamath River between Link River and Keno Dam. However, the primarily calm, slow-moving reservoir habitat of the Lake Ewuana/Keno Impoundment that dominates conditions between Link River and Keno Dam is different from the turbulent, fast-moving river habitat in the Hydroelectric Reach and the Middle and Lower Klamath River under the Proposed Project, so estimates of macrophytes in the slow-moving reservoir habitat between Link River and Keno Dam likely would significantly overestimate macrophytes in downstream reaches. Prior studies (City of Klamath Falls 1986, 1989) documented that macrophytes in the Hydroelectric Reach between J.C. Boyle Dam and Copco No. 1 Reservoir were typically found only along the margins or pools and low gradient areas of the Klamath River due to the steep gradient, associated high water velocities, and lack of fine sediment substrate within this reach. There have been observations of macrophytes in the main channel in the Middle Klamath River from Iron Gate Dam to the Scott River (RM 145.1) and in the quiet backwater areas of the Klamath River downstream of the Scott River confluence, but there are no reports of excessive aquatic macrophyte biomass in the available data record (PacifiCorp 2005; Stillwater Sciences 2009). Thus, macrophytes have typically been assumed to play a minor role in primary productivity or nutrient cycling in the Middle or Lower Klamath River (Stillwater Sciences 2009). The comment does not support its assertion that potential macrophyte and periphyton colonization and growth in the Hydroelectric Reach would result in pH exceeding 9 standard units (s.u.) or potentially allowing ammonia toxicity to develop.

Additionally, the periphyton and macrophyte colonization and growth in the Hydroelectric Reach under the Proposed Project is expected to be similar or slightly less than conditions in the Klamath River reach from Keno Dam to upstream of J.C. Boyle Reservoir under existing conditions since the water quality conditions entering the Hydroelectric Reach under the Proposed Project would be similar to existing conditions, and the Hydroelectric Reach has a similar or steeper slope than the Keno Dam to upstream of J.C. Boyle Reservoir Reach. As such, pH variations in the Hydroelectric Reach under the Proposed Project due to periphyton and macrophyte growth would not be expected to exceed the pH measured upstream of J.C. Boyle Reservoir under existing conditions. Klamath Hydropower Settlement Agreement (KHSA) Interim Measure 15 (IM15) monitoring data that includes summer through early fall (i.e., May to October) indicate that pH upstream of J.C. Boyle Reservoir did not exceed 9.0 s.u. from 2002 through 2017, with the exception of four pH measurements in May 2002 that were greater than 9.0 s.u. and approximately 1.0 s.u. greater than the pH measured approximately 30 minutes before or after the elevated pH measurement (Figure ORG46-149-1). The four pH measurements in May 2002 greater than 9.0 s.u. have been excluded from this analysis because a 1.0 s.u. swing within approximately 30 minutes is inconsistent with measured variations in pH during 2002 and is unlikely to occur naturally. Furthermore, pH upstream of J.C. Boyle Reservoir infrequently exceeded 8.5 s.u. from 2002 through 2017, with only approximately eleven days of exceedances in the fifteen years between 2002 and 2017. Thus, the measured pH dataset for the Klamath River upstream of J.C. Boyle Reservoir indicates that periphyton and potential macrophyte growth in the Hydroelectric Reach under the Proposed Project would be extremely unlikely to result in pH greater than 9.0 s.u. and unlikely to result in pH greater than 8.5 s.u. in any individual year. The comment also does not provide any ammonia (i.e., NH_3) data to support the assertion that ammonia toxicity would occur under existing conditions or under the Proposed Project.

The issue raised by the comment does not constitute substantial evidence regarding the potential physical impacts of the Proposed Project on the environment (CEQA Guidelines section 15384).

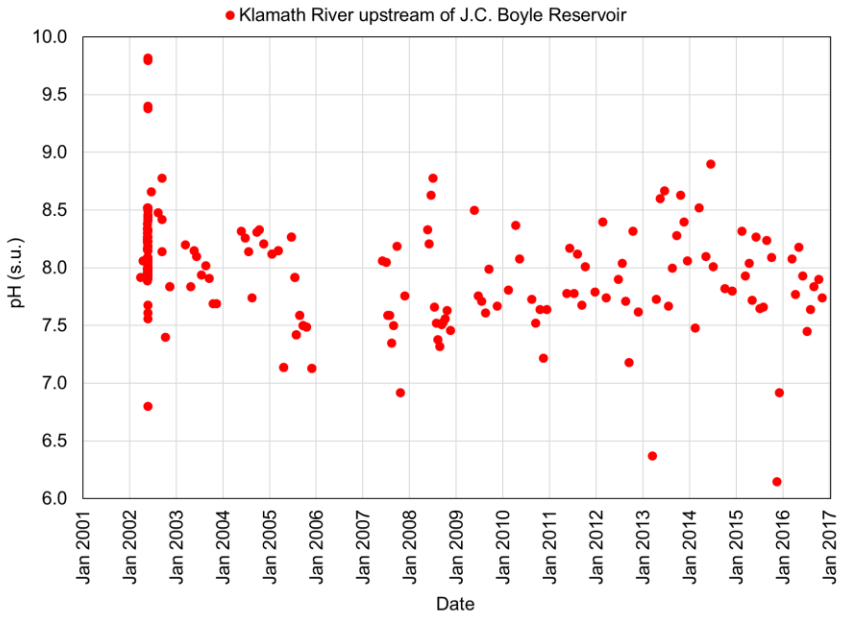


Figure ORG46-149-1. pH in the Klamath River upstream of J.C. Boyle Reservoir from 2002 to 2017. Source: PacifiCorp 2003a, 2004b, 2005b, 2007, 2008b, 2009, 2010, 2011, 2012, 2013, 2014c, 2015b, 2016b, 2017b.

Comment ORG46-150

In this paragraph, the DEIR discusses the use of the Klamath River TMDL model for assessing impacts of the Proposed Project and other alternatives. The DEIR correctly points out that "...the full TMDL compliance modeling assumption does not reflect the existing conditions, and it would be speculative at this point to identify either the mechanisms necessary to implement the TMDLs or the timing required to achieve full compliance." After this acknowledgement of the speculative nature and uncertainty of TMDL-driven nutrient load reductions, the DEIR goes on to state that "However, the nutrient retention mechanism modeled in the Klamath River TMDL would be the same even if model inputs for nutrients were increased to concentrations under existing conditions, such that the general trend indicated by the Klamath River TMDL model output (i.e., dam removal would slightly increase downstream transport of total nutrients) is still informative for conditions where full TMDL compliance has not occurred." In effect, the DEIR rationalizes use of the TMDL model by assuming general trends would be representative of existing "slight" nutrient retention; however, it is quite plausible that this assumption is incorrect. Under the substantial reductions in nutrient loadings in the Klamath River that are assumed in the TMDL, the nutrient retention "mechanisms" could be quite different in kind and quantity. For example, as nutrient loads are systematically reduced, the relative amount of nutrients that move downstream in soluble form through the water could be reduced in comparison to the amount moving via biotic transformations between the periphyton and flocculent detrital components (i.e., nutrient spiraling) (e.g., Gaiser et al. 2005). For this reason, the DEIR's assumption that "nutrient

retention mechanisms" modeled under full TMDL compliance would be applicable to existing conditions may not be valid. In addition, the assumptions made in the TMDL model for the full compliance simulations, including boundary conditions, temperature conditions, and other factors also are questionable (see comment 3.2-34).

Response to Comment ORG46-150
Regarding the EIR's use of Total Maximum Daily Loads (TMDLs), please refer to Master Response WQ-5.

With respect to nutrient spiraling (i.e., nutrient uptake, retention, and release), this trend would apply to riverine reaches whereas the statement in the EIR was intended to refer to the reservoir reaches. Section 3.2.5.3 *Water Quality – Potential Impacts and Mitigation – Nutrients* Potential Impact 3.2-8 has been revised to clarify that reservoir reaches are the focus of this sentence. Please refer to Volume III Attachment 1 Section 3.2.5.3 *Water Quality – Potential Impacts and Mitigation – Nutrients* for the revisions.

Comment ORG46-151
The DEIR states "As discussed above, the Proposed Project also would be expected to eliminate the occurrence of high pH (greater than 8.5 s.u.) and large daily fluctuations (0.5- 1.5 s.u.) that occur in the surface waters of Copco No. 1 and Iron Gate reservoirs under existing conditions during periods of intense phytoplankton blooms, where the blooms can be transported downstream into the Middle Klamath River and adversely affect pH (see Section 3.2.2.6 pH)." While seasonal phytoplankton blooms would be less frequent without the Project reservoirs, the DEIR does not acknowledge that colonization by periphyton and macropyhtes into the hydroelectric reach will lead to pH values in excess of 9 during summer and early fall at least down to the Scott River (see comment 3.2-62).

Response to Comment ORG46-151
Regarding colonization and growth of periphyton and macrophytes in the Hydroelectric Reach and their potential seasonal influence on pH in the Klamath River, please refer to response to comment ORG46-149.

Comment ORG46-152
The DEIR states "While algal toxins and chlorophyll-a produced in Upper Klamath Lake may still be transported downstream after dam removal, existing data indicate that microcystin concentrations in the Klamath River decrease to below California water quality objectives (see Section 3.2.3.1 Thresholds of Significance) by the upstream end of J.C. Boyle Reservoir, regardless of the microcystin concentration measured leaving the Upper Klamath Lake (Watercourse Engineering, Inc. 2011, 2012, 2013, 2014, 2015, 2016)." The DEIR analysis does not recognize that the travel time from Keno Dam downstream to Iron Gate Dam will be reduced substantially under the Proposed

Project (and several of the alternatives) and that delivery of algal toxins and chlorophyll-a would continue from Keno Reservoir. Currently, few algae survive the high water pressures generated by the J.C. Boyle Powerhouse, which conveys over 90 percent of the Klamath River flow at J.C. Boyle Dam through the powerhouse and into the river downstream. Without J.C. Boyle Dam and other dams, toxic algae from upstream sources (e.g., Keno reservoir) could readily be transported through the river reaches to downstream locations. In addition, the flow regime would further stabilize flows through much of what is now the Klamath Hydroelectric Project. Meeting USBR' s 2013 Biological Opinion (2013 BiOp) flows that are currently measured downstream of Iron Gate Dam with operations at Keno Dam under the Proposed Project would change the hydrologic regime for the entire river downstream of Keno Dam. Currently, operations at Keno Dam are focused largely on maintaining a stable water surface in Keno Reservoir to support agricultural diversions. Given the fluctuation in inflow that occurs at Keno Dam and the resultant changes in releases from Keno Dam, J.C. Boyle Reservoir can be viewed as a sort of reregulating reservoir that stores this water before it is eventually metered out to the J.C. Boyle Powerhouse and points downstream. Thus, under current conditions, flows in the Keno Reach are quite variable. However, to meet 2013 BiOp flows in the future, Keno Dam releases will likely be far more stable (especially during the summer and fall months) only varying at most on a daily time-step. The analysis in the DEIR should assess potential implications of reduced travel time, the elimination of J.C. Boyle Powerhouse pressure-related destruction of entrained algae, and a more stable flow regime on transport of algae and algae toxins through this upstream reach (as well as the implication on other water quality parameters).

Response to Comment ORG46-152

Regarding the transport of upstream blue-green algae and associated algal toxins into the Hydroelectric Reach and downstream reaches of the Klamath River under the Proposed Project, please refer to Master Response PAP-1.

Comment ORG46-153

The DEIR suggests that, while algal toxins produced in Upper Klamath Lake may still be transported downstream after dam removal, algal toxins produced upstream of J.C. Boyle Dam would not be transported into California and result in concentrations that would cause water quality standards exceedances. This is misleading. Rather, the DEIR should describe that the presence of microcystin can occur throughout the Klamath River system, including where conditions, such as nutrients, light, and slow-moving water environments (i.e., pools, backwater eddies, or the estuary), are present to support Microcystis growth or growth of other toxin-producing species. The DEIR should provide a more balanced discussion that includes acknowledgement that Microcystis is a common cyanobacteria in lakes, rivers, and estuaries around the world, where conditions are suitable to support Microcystis growth. In addition, Microcystis is not the only species found in the Klamath River that is capable of producing

toxins (e.g., Dolichospermum and Phormidium which both produce anatoxin-a). The DEIR needs to provide a complete and accurate discussion of the cyanobacterial species present, their potential to produce toxins, their growth mechanisms (benthic versus planktonic), and how those populations could change as a result of the Proposed Project. It is overly simplistic to portray that Microcystis in the Klamath River is purely the result of delivery from upstream lakes and reservoirs and that Microcystis is the only blue-green algae worth considering.

Response to Comment ORG46-153

Regarding the transport of upstream blue-green algae and associated algal toxins into the Hydroelectric Reach and downstream reaches of the Klamath River under the Proposed Project, please refer to Master Response PAP-1. Please also refer to response to comment TR20-24 for discussion of revisions to Potential Impact 3.2-12 to clarify localized *Microcystis aeruginosa* growth and elevated algal toxin concentrations in J.C. Boyle Reservoir would be eliminated under the Proposed Project.

Please also refer to Volume I Section 3.4.2 *Phytoplankton and Periphyton – Environmental Setting* (pages 3-392 to 3-422) for discussion of the three main algal toxin producing blue-green algae species present in the Klamath River, the potential algal toxins produced by these species, the suitable habitats for their growth, and their abundance in the various reaches of the Klamath River under existing conditions. Volume I Section 3.4.2.1 *Phytoplankton and Periphyton – Environmental Setting – Phytoplankton* (pages 3-392 to 3-403) specifically acknowledges that *Aphanizomenon flos-aquae, Anabaena flos-aquae,* and *Microcystis aeruginosa* are a natural part of aquatic systems in California, including the Klamath River, but environmental conditions that favor the growth and bloom of these blue-green algae species have been created by human modifications to the Klamath River (e.g., dams on the Klamath River that form slow-moving or stagnant water that increase the suitable habitat for blue-green algae species and additional inputs of nutrients above natural conditions). Additionally, please refer to Volume I Section 3.4.5 *Phytoplankton and Periphyton – Potential Impacts and Mitigation* –Potential Impacts 3.4-1 through 3.4-5 (pages 3-426 to 3-440) for analysis of how the abundance of these blue-green algae species would change under the Proposed Project, including the potential for phytoplankton growth after dam removal in calm, slow-moving habitats along shorelines and protected coves and backwaters during low-flow periods in the Middle and Lower Klamath River.

Section 3.2.5 *Water Quality – Potential Impacts and Mitigation* Potential Impact 3.2-12 referred to in the comment analyzes the potential impact of the Proposed Project on “toxin-producing nuisance blue-green algae” and “algal toxins” which would include the three species of toxin-producing nuisance blue-green algae that primarily compose nuisance and/or noxious algal blooms in the Area of Analysis (i.e., *Aphanizomenon flos-aquae, Anabaena flos-aquae,* and *Microcystis*

aeruginosa) and their associated algal toxins. However, the analysis in Potential Impact 3.2-12 focuses on changes in *Microcystis aeruginosa* abundance and microcystin concentrations under the Proposed Project since a) Klamath River monitoring data indicate that microcystin is the algal toxin that most frequently exceeds algal toxin numeric thresholds; b) exceedances of microcystin numeric thresholds in the Klamath River would decrease relatively more than other algal toxins under the Proposed Project; and c) alterations in algal toxins due to conversion of the reservoir areas to a free-flowing river under the Proposed Project would have similar potential impacts for *Microcystis aeruginosa* abundance and microcystin concentrations and the other two species of toxin-producing blue-green algae that primarily compose nuisance and/or noxious algal blooms in the Area of Analysis and their associated algal toxin concentrations in the Klamath River, since elimination of the slow-moving reservoir conditions would similarly eliminate suitable habitat for all three species of toxin-producing blue-green algae and associated potential algal toxin production. The comment does not provide evidence that the analysis of potential impacts to *Microcystis aeruginosa* abundance and microcystin concentrations due to elimination of suitable slow-moving reservoir habitat would fail to also characterize the potential impacts to other toxin-producing blue-green algae and their associated algal toxins in the Klamath River.

Section 3.2.5 *Water Quality – Potential Impacts and Mitigation* Potential Impact 3.2-12 has been revised to clarify the occurrence of blue-green algae and associated algal toxins in slow-moving shoreline habitats along the margins of the Middle and Klamath River under the Proposed Project. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*, including the revisions to Potential Impact 3.2-12.

Comment ORG46-154

The DEIR states that the screening values for inorganic and organic contaminants are "conservatively protective of human health" but does not explain why these values are considered conservative. Similar explanations should be provided at other places in this section where the term "conservative" is used to describe a screening value for a particular contaminant.

Response to Comment ORG46-154

Section 3.2.5.7 *Water Quality – Potential Impacts and Mitigation – Inorganic and Organic Contaminants* Potential Impact 3.2-13 provides additional details on the United States Environmental Protection Agency (USEPA) and California Environmental Protection Agency (CalEPA) screening levels and why they are considered conservatively protective of human health.

Potential Impact 3.2-13 has been revised to summarize why the USEPA and CalEPA screening levels are conservatively protective of human health. Please refer to Volume III Attachment 1 Section 3.2.5.7 *Water Quality – Potential Impacts and Mitigation – Inorganic and Organic Contaminants* for the revisions.

Comment ORG46-155

The DEIR discusses the 2009 and 2010 sediment sample results and indicates that 19 compounds were not detected in these samples but that the laboratory reporting limits for those compounds were above the human health screening values. While this is not an uncommon situation, the DEIR discussion needs to include the details about which analytes are involved and should also provide the laboratory reporting limits relative to the screening values so the reader understands the differences between these values. Additionally, because the laboratory limits of detection were higher than the human health screening values, there needs to be a cohesive logical process to support the conclusion that these substances would not affect human health, this is currently missing from the DEIR.

Response to Comment ORG46-155

Appendix C, Section C.7.1.1 *Inorganic and Organic Contaminants – Hydroelectric Reach*, specifically Table C-7, provides a list of all the compounds that had laboratory reporting limits greater than applicable human health screening levels, including the range of laboratory method reporting limits (MRLs) for non-detects (i.e., compounds that were not detected in reservoir sediments).

The comment asserts that a cohesive logical process to support the conclusion that compounds with laboratory MRLs greater than the applicable screening levels is missing from the EIR. The comparison of the relative duration of exposure under the U.S. Environmental Protection Agency (USEPA) screening levels and the California Environmental Protection Agency (CalEPA) California Human Health Screening Levels (CHHSLs) with those that would occur in the short term and long term under the Proposed Project in Section 3.2.5.7 *Water Quality – Potential Impacts and Mitigation Measures – Inorganic and Organic Contaminants* Potential Impact 3.2-13 does provide cohesive, logical support for the conclusion that compounds with laboratory MRLs greater than the applicable screening levels would be unlikely to result in a substantial adverse impact on human health. As explained in Potential Impact 3.2-13, potential human exposure to reservoir sediment deposits under the Proposed Project, in both the short term and long term, would involve limited, short duration, non-residential exposure patterns that are much less than the residential or commercial exposure patterns assumed by the USEPA and CHHSL screening levels. Construction/restoration worker exposure of 100 days per year for 5 years would result in only 4.8 percent of the CalEPA CHHSL residential exposure and only 4.5 percent of the USEPA residential exposure. Recreational exposure of 10 to 90 days per year, every year for 30 years would result in only 3 to 26 percent of the CalEPA CHHSL residential exposure and only 3 to 25 percent of the USEPA residential exposure. Additionally, the USEPA and CHHSL screening levels are based on ingesting 100 to 200 milligrams (mg) of soil per day for each day of exposure, which is unlikely to occur during typical recreational exposure. Thus, the potential exposure to analytes below levels of laboratory detection would be

less than the residential levels of exposure duration and magnitude in both the short-term and long-term.

Twenty compounds had laboratory MRLs that were greater than the applicable screening levels, so it is not possible to directly confirm that these analytes were above or below the applicable human health screening levels in reservoir sediments, as discussed in Potential Impact 3.2-13. However, these compounds would be unlikely to result in substantial adverse impacts on human health since the potential exposure in the short and long-term to these compounds would be limited (e.g., less than the long-term residential levels of exposure considered in the human health screening levels).

Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality* and Appendix C.

Comment ORG46-156

The DEIR states "Elutriate concentration results (characterizing the water between the grains of sediment, which can be referred to as pore water)." This is an inaccurate statement. Elutriate tests measure what may be released from sediment during resuspension. This includes sediment porewater, which would only be a small fraction of what may be released. For this reason, the elutriate test needs to be more accurately defined.

Response to Comment ORG46-156

Section 3.2.5.7 *Water Quality – Potential Impacts and Mitigation – Inorganic and Organic Contaminants* Potential Impact 3.2-13 has been revised to clarify the definition of elutriate concentration results. Please refer to Volume III Attachment 1 Section 3.2.5.7 *Water Quality – Potential Impacts and Mitigation – Inorganic and Organic Contaminants* for the revisions.

Comment ORG46-157

The DEIR states "...sample results at concentrations above Basin Plan, national priority, and national non-priority fresh water quality criteria..." but does not define what these criteria are.

Response to Comment ORG46-157

Please refer to Volume II Appendix W *Additional Information Incorporated by Reference*, Table B-6 (pages B-18 to B-23) for a complete list of the Basin Plan, national priority, and national non-priority freshwater quality criteria for human health.

Section 3.2.5.7 *Water Quality – Potential Impacts and Mitigation – Inorganic and Organic Contaminants* Potential Impact 3.2-13 has been revised to clarify that human health water quality criteria are available in Volume II Appendix W *Additional Information Incorporated by Reference*, Table B-6. Please refer to

Volume III Attachment 1 Section 3.2.5.7 *Water Quality – Potential Impacts and Mitigation – Inorganic and Organic Contaminants* for the revisions.

Comment ORG46-158

The DEIR describes that the analysis area includes most of the Trinity River, but then states that the lower 0.25-0.5 mile of the Trinity River is also included in the analysis. On DEIR page 3-192, only the lower portion of the Trinity River (which is not defined) is included in the definition of the middle and lower Klamath River area of analysis. The DEIR should clearly define the geographic extent of the Trinity River included in the analysis area and that is shown in Figure 3.3-1 of the DEIR.

Response to Comment ORG46-158

Section 3.3.1 *Aquatic Resources – Area of Analysis* has been revised to clarify that the lower 0.5 miles of the Trinity River is included within the Area of Analysis. Figure 3.3-1 has also been clarified to indicate that 0.5 miles of the lower Trinity River are included in the Area of Analysis. Please refer to Volume III Attachment 1 Section 3.3.1 *Aquatic Resources – Area of Analysis* for the revisions.

Comment ORG46-159

This table has a variety of issues, many of which relate to the availability of more recent data not shown in the table or inconsistent use of data presented in the table. The data in the DEIR should be consistently updated to reflect what is actually known about these fish populations. Specifically:

1. Table 3.3-2 of the DEIR should more clearly define the origin of the adult spawners as well as the definition used for wild and hatchery fish. Chinook, Coho, and Steelhead spawning in the wild, and at the hatchery, consist of both hatchery origin and natural origin fish. Although the table notes that Chinook and Steelhead run size includes hatchery fish, the table should also note that this applies to Coho as well. No data are provided for fall-run Steelhead. The footnotes should also be checked for accuracy.

2. Recent run size for Steelhead at Iron Gate Hatchery should be less than 10 not less than 100

3. Coho run size estimates do not take into account that data are available through the 2017/2018 spawning season and spawning surveys of major tributaries downstream of Iron Gate Dam that have been conducted annually since the 2012 spawning season (see MKWC 2016, 2017, 2018).

4. For all salmon on this table, is the subtext (spawners) in the location description supposed to indicate pairs of fish or just females?

5. CDFW publishes annual reports for Iron Gate Hatchery and Bogus Creek Coho returns that are not apparently used in this discussion (e.g., Giudice and Knechtle 2018).

6. It does not appear that the Trinity River Hatchery population is included in the total yet there is no explanation provided for this.

7. Similar comments to the above113 through 115 but as apply to Chinook. There were only 2,587 total Chinook in the 2016-17 adult return year at Iron Gate Hatchery.

8. Counts of spring-run Chinook in the Salmon River should be updated through 2018.

9. Regarding the Green Sturgeon run size estimate, it would seem helpful to at least provide the harvest estimate so the reader can understand how large that segment of the population is.

10. Regarding Cutthroat Trout it is not clear how the population can be listed in the table as "stable to increasing" when there is no data upon which to base this conclusion.

11. Eulachon are anadromous and yet are completely missing from this table.

Response to Comment ORG46-159
With respect to defining the origin of adult spawners, the lack of data for fall-run steelhead, and the accuracy of the footnotes, Section 3.3.2 *Aquatic Resources – Environmental Setting – Aquatic Species – Anadromous Fish Species* Table 3.3-2 has been revised to clarify the term "spawners."

Additionally, a new footnote has been added to Table 3.3.2 to define the term "Naturally Produced" and "Hatchery Produced. Table 3.3.2 footnotes have also been checked for accuracy.

With respect to the recent run size for steelhead at Iron Gate Hatchery, Section 3.3.2 *Aquatic Resources – Environmental Setting – Aquatic Species – Anadromous Fish Species* Table 3.3-2 has been clarified to include the comment's data on recent steelhead returns at Iron Gate Hatchery.

With respect to the coho salmon run size estimates from the 2017/2018 spawning season, and annual spawning surveys of major tributaries downstream of Iron Gate Dam which began in 2015, Section 3.3.2 *Aquatic Resources – Environmental Setting – Aquatic Species – Anadromous Fish Species* Table 3.3-2 has been revised to include coho salmon data through 2017 for most locations, with the exception of the Scott River which includes data through 2015, and the Shasta River which includes data through 2016.

With respect to the number of fish the subtext “spawners” is referring to (pairs versus individual females), Section 3.3.2 *Aquatic Resources – Environmental Setting – Aquatic Species – Anadromous Fish Species* Table 3.3-2 has been clarified and no longer includes the term “spawners.”

With respect to California Department of Fish and Wildlife (CDFW) annual coho returns for Iron Gate Hatchery and Bogus Creek reports, Section 3.3.2 *Aquatic Resources – Environmental Setting – Aquatic Species – Anadromous Fish Species* Table 3.3-2 has been clarified to include Iron Gate Hatchery and Bogus Creek returns through 2017 including data reported in Giudice and Knechtle (2018).

With respect to inclusion of the Trinity River Hatchery population in the total (Coho Basin Wide), Section 3.3.2 *Aquatic Resources – Environmental Setting – Aquatic Species – Anadromous Fish Species* Table 3.3-2 has been clarified to include a footnote that the estimate does not include hatchery fish.

With respect to Chinook salmon run-size data, Section 3.3.2 *Aquatic Resources – Environmental Setting – Aquatic Species – Anadromous Fish Species* Table 3.3-2 has been clarified to include Chinook salmon run-size data through 2018. With respect to spring-run Chinook salmon counts through 2018 from the Salmon River, Section 3.3.2 *Aquatic Resources – Environmental Setting – Aquatic Species – Anadromous Fish Species* Table 3.3-2 has been updated to include data through 2017. Although data for 2018 are available for the Salmon River, data for other monitoring locations for spring-run Chinook salmon only include the period of record through 2017. To allow for better comparison between spring-run Chinook salmon populations, the table uses the same 2008 through 2017 date range for each location.

With respect to harvest data for green sturgeon, Section 3.3.2 *Aquatic Resources – Environmental Setting – Aquatic Species – Anadromous Fish Species* Table 3.3-2 has been clarified to include harvest data for green sturgeon.

With respect to the typographical error regarding characterization of the recent run-size of cutthroat trout, Section 3.3.2 *Aquatic Resources – Environmental Setting – Aquatic Species – Anadromous Fish Species* Table 3.3-2 has been corrected.

With respect to eulachon, Section 3.3.2 *Aquatic Resources – Environmental Setting – Aquatic Species – Anadromous Fish Species* Table 3.3-2 has been clarified to include eulachon since they are anadromous.

For all of the above comments please refer to Volume III Attachment 1 Section 3.3.2 *Aquatic Resources – Environmental Setting – Aquatic Species – Anadromous Fish Species* Table 3.3-2 for the revisions.

Comment ORG46-160
Chinook and Steelhead redds can contain substantially more than 3,000 eggs with the number usually correlated with the size of the fish.

Response to Comment ORG46-160
Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species – Fish – Anadromous Salmonids* has been revised to clarify the range of eggs deposited by a female anadromous salmonid. Please refer to Volume III Attachment 1 Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species – Fish – Anadromous Salmonids* for the revisions.

Comment ORG46-161
The smolt-to-adult ratio (SAR) for Trinity River Hatchery fall Chinook should be replaced with data from Iron Gate Hatchery. The Iron Gate Hatchery would be affected by the Proposed Project while Trinity River Hatchery would not. Also, the SAR data should be updated through 2017 and separated by smolt/yearling release type to clearly understand how the different ages of released juvenile Chinook affects return rates. The yearling Chinook released from Iron Gate Hatchery usually return at substantially higher rates than those released as smolts.

Response to Comment ORG46-161
Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species – Anadromous Salmonids* has been revised to provide information regarding the recent smolt-to-adult ratio (SAR) of Iron Gate Hatchery fall Chinook. Please refer to Volume III Attachment 1 Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species – Fish – Anadromous Salmonids* for the revisions.

Comment ORG46-162
This section of the DEIR discusses Chinook abundance information as cited to documents produced in 1998 and 2011. Yet, the DEIR then states that spawner abundance has not declined from 1970 to 2016. Beyond the obvious need to provide the population data for more recent years, this section could be strengthened by clearly separating the proportion of the populations that consist of hatchery origin versus natural origin spawners. This information can be found in the rebuilding plan for the Klamath River fall-run Chinook (Pacific Fishery Management Council 2018).

Response to Comment ORG46-162
EIR Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species – Anadromous Salmonids* has been revised to clarify a typographical error. Please refer to Volume III Attachment 1 Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species – Fish – Anadromous Salmonids* for the revisions.

The comment asserts that the Section 3.3.2.1 1 *Aquatic Resources – Environmental Setting – Aquatic Species – Anadromous Salmonids* should include more recent population data for Chinook salmon, and notes that this section could be strengthened by clearly separating the proportion of hatchery origin versus natural origin spawners. Please note that the paragraph referenced in the comment is intended to provide a summary of the 2011 Biological Review Team's assessment based on review of information provided in a petition to list Chinook salmon in the Upper Klamath Trinity River Basin. The data and information included in this paragraph accomplish this intention. More recent population data for Chinook salmon (through 2017 for spring-run and through 2018 for fall-run) are summarized in Table 3.3-2 of the Final EIR. Table 3.3-2 also separates hatchery origin versus natural origin fish. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment ORG46-163

Microcystis is listed as a stressor to upstream migrating Chinook, yet the DEIR provides no information to support this assertion.

Response to Comment ORG46-163

Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species* does not list *Microcystis aeruginosa* as a stressor to upstream migrating fall-run Chinook salmon; rather this section states that "occasional blooms of *Microcystis aeruginosa* (a blue-green algae species that is potentially toxic to fish…)." Please refer to Volume I Section 3.4.2.1 *Phytoplankton and Periphyton – Phytoplankton – Microcystis aeruginosa* for further detail on the toxicity of *Microcystis aeruginosa* in the Klamath River. Please see Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment ORG46-164

The statement in the DEIR that "Coho salmon are widely distributed in the Klamath River downstream of Iron Gate Dam..." is not supported with a citation and probably not supportable given recent tributary spawning surveys. Work conducted since 2015 to survey tributaries downstream of Iron Gate Dam to Portuguese Creek has reliably found Coho only in Bogus, Horse, and Seiad creeks (MKWC 2016, 2017, 2018). Other Coho populations exist in the Shasta and Scott rivers.

The statements regarding PacifiCorp's Coho Enhancement Fund (CEF) are significantly out of date. The DEIR presents a myopic view of projects funded under the CEF and needs to be updated to reflect that as of January 2018, PacifiCorp has provided funding of over $4,900,000 into the CEF. Starting in 2009 and running through the 2017 grant cycle, 42 projects have been funded (with a value of about $4.3 million) that benefit Coho downstream of Iron Gate Dam. Selection of projects to fund is made by PacifiCorp with the assistance of a technical advisory team comprised of staff from the National Marine Fisheries Service (NMFS) and CDFW.

PacifiCorp has developed a partnership with the National Fish and Wildlife Foundation to administer the fund. This partnership allows CEF grant recipients to be eligible for additional funding through other grant programs, further enhancing the conservation benefit of the fund. Using this process, grantees have leveraged an additional $7.7 million in matching funds for Coho restoration projects as of 2017.

Funded projects have resulted in a substantial benefit to Coho downstream of Iron Gate Dam. When the projects are considered collectively, the CEF has resulted in:

- *Over 2, 300 linear feet of channel restoration*
- *Creation of over 163,000 square feet of off-channel ponds*
- *Installation of three fish screens*
- *Removal of 73 passage barriers*
- *Improved access to over 71 miles of Coho habitat*
- *Installation of over 7 miles of riparian fencing*
- *Implementation of 29 separate water leases providing improved flows in almost 36 miles of stream*
- *Implementation of 71,000 square feet of other types of habitat enhancement projects.*

Response to Comment ORG46-164
As discussed in Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species – Fish – Anadromous Salmonids – Coho salmon*, and in Appendix E, Section E.3.1.3 *Coho Salmon*, coho salmon are widely distributed in the Klamath River downstream of Iron Gate Dam. In recent years (2016 and 2017), coho salmon spawning has been observed in at least Bogus Creek, Cottonwood Creek, West Beaver Creek, Horse Creek, Middle Creek, Seiad Creek, Grider Creek, West Grider Creek, Shasta River, Scott River, mainstem Klamath River (in small numbers), and within the Trinity River and its tributaries.

With respect to the comment's assertion that the EIR contains an unsupported statement regarding coho, Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species – Fish – Anadromous Salmonids – Coho salmon* has been clarified to include a citation supporting the coho salmon distribution in the Klamath River.

With respect to EIR statements regarding PacifiCorp's Coho Enhancement Fund (CEF), Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species – Fish – Anadromous Salmonids – Coho salmon*, has been clarified to include information from the most recent PacifiCorp Interim Measures report (2018).

Please refer to Volume III Attachment 1 Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species – Fish – Anadromous Salmonids – Coho salmon* for the above revisions.

Comment ORG46-165

The last sentence in this paragraph refers to Chinook when it should refer to Coho; both the species and table reference should be updated.

Response to Comment ORG46-165

Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species – Fish – Anadromous Salmonids – Coho Salmon* has been clarified to address a typographical error. Please refer to Volume III Attachment 1 Section 3.3.2.1 Aquatic Resources – *Aquatic Species – Fish – Anadromous Salmonids – Coho Salmon* for the revisions.

Comment ORG46-166

The DEIR states that "The flushing and emergency dilution flows are detailed in Section 4.2.1.1 [Alternative Description] Summary of Available Hydrology Information for the No Project Alternative as part of the No Project Alternative because they would likely only apply if Iron Gate Dam were to remain in place or the disease nidus remains." It is unreasonable and unsupported to assume that flushing flows would not be required after implementation of the Proposed Project. The USBR's current proposed action (USBR 2018a) is supposed to span the period through dam removal and into the post-dam operational period and includes a surface flushing flow (6,030 cfs for 72 hours) as part of the proposed action. The existing disease flushing flows have been prescribed pursuant to a court decision regarding USBR's biological opinion and its operation of its irrigation project. Impacts to Klamath River flows as a result of USBR operations are part of the existing conditions and will persist following the Proposed Project.

Response to Comment ORG46-166

The sentence just prior to the sentence quoted in the comment provides the reasonable explanation for why the 2017 court-ordered flushing flows were not generally included in the analysis of the Proposed Project (i.e., "The court-ordered flushing flows and emergency dilution flows are not part of existing conditions for the Proposed Project, because they went into effect after the Notice of Preparation was filed by the State Water Board in December 2016, and because the data evaluating the effectiveness of the flows and their potential impacts is not yet robust."). Additionally, Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project* states, "The flow-related analyses in this EIR acknowledge the re-initiation of consultation on the 2013 BiOp Flows by considering the 2017 court-ordered flushing and emergency dilution flow requirements downstream of Iron Gate Dam as interim flow requirements until formal consultation is completed. The 2017 court-ordered flushing flows were not modeled as part of existing conditions hydrology for the

Proposed Project, because they went into effect in February 2017 after the December 2016 Notice of Preparation was filed. The 2017 court-ordered flushing and emergency dilution flows are analyzed in several locations in this EIR, including, but not limited to, Section 3.24 *Cumulative Effects*…", where the latter includes consideration of the flushing flows during and immediately following dam removal.

Further, Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites* considers the potential for flushing flows under the Proposed Project, stating the following: "Under the Proposed Project, if a nidus were to remain in the vicinity of Iron Gate Hatchery, or theoretically were to form within newly accessible upstream habitat (however unlikely), flushing and emergency dilution flow releases (as previously required by the 2017 court order) and flushing flows and the potential for dilution flows and/or enhanced spring flows (as currently required by the 2019 BiOp Flows) may be required from a new upstream location to achieve the same ecological benefits (i.e., disruption of nidus)." Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Please also refer to Master Response HYD-1 for further discussion of how the EIR considers Klamath River flows under the 2019 BiOp Operations Criteria for the Klamath Irrigation Project, which do not include the 2017 court-ordered flushing or emergency dilution flows.

Comment ORG46-167

Not all Redband Trout need to migrate to complete their life histories. There is documentation of spawning in the J. C. Boyle Bypass and Peaking reaches (PacifiCorp 2004b; Jacobs et al. 2008)

Response to Comment ORG46-167

Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species – Fish – Resident Riverine Fish Species – Rainbow and Redband Trout*, has been slightly modified as requested. Please refer to Volume III Attachment 1 Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species – Fish – Resident Riverine Fish Species – Rainbow and Redband Trout* for the revisions.

Comment ORG46-168

Suckers are also fully protected under the California Fish and Game Code Section 5515 which prohibits any action which can result in take. The reference in the DEIR to Fish and Game Code Section 2081.11 and the allowance of take, does not appear valid, that section does not exist in the Fish and Game Code (https://codes.findlaw.com/ca/fish-and-game-code/#!tid=NFD41684158B4E90941FD12BBC90E6E5).

Response to Comment ORG46-168
Section 3.3.2.1 Aquatic Resources – Environmental Setting – *Aquatic Species Resident Riverine Fish Species – Lost River and Shortnose Suckers*, has been revised to clarify the Fish and Game Code related to the take of Lost River and Shortnose Suckers. Please refer to Volume III Attachment 1 Section 3.3.2.1 Aquatic Resources – Environmental Setting – *Aquatic Species Resident Riverine Fish species – Lost River and Shortnose Suckers* for the revisions.

Comment ORG46-169
Smallscale Suckers spawn in relatively fast-moving water and Moyle (2002) indicates that tributaries to the Klamath River are the primary spawning habitat. Although little is known about their specific spawning ecology, the assertion in the DEIR that Smallscale Suckers are adversely affected by operations of J.C. Boyle Powerhouse is not supported. Smallscale Suckers are fecund broadcast spawners likely releasing 15,000 to 20,000 eggs depending on the size and age of the female (Moyle et al. 2002; Pirrello 2011). Eggs from broadcast spawners are intended to wash downstream into suitable incubation habitat.

Dunsmoor (2006) presents results of fish stranding observations in the J. C. Boyle Peaking Reach on July 5-7, 2006. Dunsmoor (2006) observed considerable stranding of fish, crayfish, and macroinvertebrates on July 5, 2006. However, July 5, 2006, was the first down-ramp event of the season that followed several months of relatively stable flow. This down-ramp was also a two-unit ramp, meaning that flows changed from approximately 3,000 cfs to 350 cfs. Therefore, it is important to recognize that these observations of stranding pertained only to the atypical circumstance s of that day and they do not reflect the potential for stranding under current normal project operations (under which PacifiCorp does not conduct two-unit peaking, or likely future project operations under a new license given prescribed ramp rates that would eliminate two-unit peaking).

Dunsmoor's (2006) stranding observations on July 5, 2006, were made at a site near the downstream end of the relatively wide Frain Ranch part of the J.C. Boyle peaking reach. The next day (July,6 2006), following the second two-unit down-ramp, he observed no fish stranded at sites downstream of Shovel Creek in the California section of the J.C. Boyle Peaking Reach. On the third day (July 7, 2006), Dunsmoor (2006) returned to the Frain Ranch area and observed no fish stranded at the same site where stranding was observed 2 days earlier following the first ramp event. Collectively these observations indicate that the first downramp after an extended period of stable flows is the event that poses the most risk to fish rather than the generic observation that down-ramping strands fish that is presented in the DEIR.

Response to Comment ORG46-169
Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species – Fish – Resident Riverine Fish Species* has been revised to clarify the

displacement of smallscale sucker eggs during peaking operations. Please refer to Volume III Attachment 1 Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species – Fish – Resident Riverine Fish Species* for the revisions.

Comment ORG46-170

In the benthic macroinvertebrate (BMI) discussion there should be a more complete discussion provided that includes other metrics related to the existing populations. The Index of Biologic Integrity (IBI) values (pg. 3-228, 3rd paragraph) are good information; but similar work related to species richness, taxonomic composition, and Ephemeroptera-Plecoptera-Tricoptera (EPT) metrics should also be presented along with a stronger link to the effects of the BMI population on fish production to inform the reader as to why these are being considered in the analysis.

Response to Comment ORG46-170

Section 3.3.2.1 *Aquatic Species – Environmental Setting – Benthic Macroinvertebrates* describes the link between benthic macroinvertebrates (BMI) production and the health of riverine fish populations, including supporting citations from the scientific literature. This discussion is consistent with CEQA Guidelines section 15125(a), which requires that, "The description of the environmental setting shall be no longer than is necessary to an understanding of the significant effects of the Proposed Project and its alternatives." Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment ORG46-171

The last sentence in this paragraph is misleading. While the mainstem Klamath River dams have disrupted sediment transport into the river from Iron Gate Dam upstream to Link River Dam, there are a large number of tributaries of varying sizes which all continue to provide bedload input into the Klamath River downstream of Iron Gate Dam.

Response to Comment ORG46-171

The referenced sentence notes the disruption of the described natural sediment movement since construction of the dams. It is not intended to imply that the dams have disrupted sediment movement on un-dammed tributaries downstream of the hydroelectric reach. The paragraph immediately following clarifies that the effect concerns below Iron Gate Dam.

Comment ORG46-172

A sentence is repeated in the middle of this paragraph that should be deleted: "Per the interim operations of the... (PacifiCorp 2014)." Also, "...interim operations of the Klamath Hydroelectric Project HCP..." is a meaningless statement and is unnecessary. Under the Habitat Conservation Plan (HCP) for Coho salmon, PacifiCorp agreed to place gravel down stream of Iron Gate Dam to augment spawning gravel; however, gravel monitoring was never part of the

proposed placement process. Consequently, the sentence that says "...details on the extent of downstream movement have not been reported," while being technically correct, misses the point that there was never any requirement to monitor or report on gravel movement.

Response to Comment ORG46-172
Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Bed Elevation and Grain Size Distribution* has been revised for clarity. Please refer to Volume III Attachment 1 Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Bed Elevation and Grain Size Distribution* for the revisions.

Comment ORG46-173
The DEIR states that "Water temperatures in the Klamath River are of special concern as they are elevated with greater frequency and remain elevated for longer periods of time than temperatures in adjacent coastal anadromous streams..." Ignoring the editorial issues (i.e., the fact that water temperatures cannot be elevated - as in higher in relation to something else - but can be warmer, and that the streams are not anadromous, but support anadromous species), the Klamath River is not a coastal stream. It is one of two rivers in the Pacific Northwest (the other being the Columbia River) that actually crosses both the Cascade and Coast Range mountains. The temperature regime in the Klamath River should not be compared to adjacent coastal streams. All of the 'adjacent streams' originate in the Coast Range and are substantially shorter, rainfall driven systems with some snowmelt contributions (e.g., Trinity River which isn't even adjacent). None of those streams originate in the high desert of southern Oregon, let alone have a 121 square-mile hypereutrophic lake as their headwaters. In this case, DEIR needs to recognize the unique nature of the Klamath River and provide an accurate discussion of how these geographical, physical, hydrologic, and anthropomorphic conditions affect water temperature. The comparison to coastal streams is meaningless and yet mistakenly makes the reader think that there is something abnormal in those elevated water temperatures.

Response to Comment ORG46-173
Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Water Temperature* has been clarified to better characterize water temperatures in the Klamath River. Please refer to Volume III Attachment 1 Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Water Temperature* for the revisions.

Comment ORG46-174
The DEIR indicates that warm water temperatures "have been associated with fish kills in the Klamath River downstream from Iron Gate Dam during low flow

periods in late summer." While water temperatures certainly play a role in fish kills, the DEIR is making an inaccurate association between the temperature of water released from Iron Gate Dam and the death of adult salmon in the lower Klamath River. The DEIR should clarify that fish kills have occurred in the Lower Klamath River rather than downstream of Iron Gate Dam because as it is currently written, the DEIR inaccurately port rays fish kills as having occurred disproportionately near Iron Gate Dam, or as a result of Iron Gate Dam operations. For example, the well-reported 2002 fish kill occurred in the lower 36 miles of river, over 150 miles downstream of Iron Gate Dam. Analysis on the 2002 fish kill does not specifically attribute effects from Klamath Hydroelectric Project facilities on the key factors considered to have caused the fish kill (i.e., low flows, warm water temperatures, high fish returns resulting in crowding of available habitat, and proliferation of the pathogens Ich and Columnaris) that far downstream (CDFG 2004).

The DEIR needs to be revised to accurately reflect the distance downstream of Iron Gate Dam that modeling has shown water temperatures could be affected by releases from Iron Gate Dam. As was mentioned previously (see comment 3.2-42), this downstream extent of this effect is the confluence with Clear Creek at RM 95, about 50 miles upstream of where the 2002 fish kill was concentrated. Thus, the DEIR' s portrayal of temperature effects of Iron Gate Dam playing a role in the 2002 fish kill is misleading and presents a false portrait to the public that the Proposed Project will ameliorate conditions such as those that led to the 2002 fish kill.

Response to Comment ORG46-174

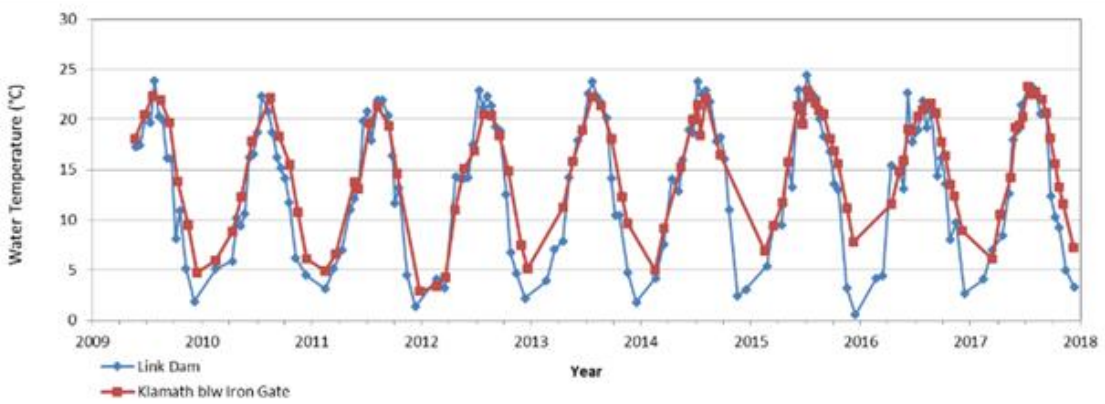
Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Water Temperature* has been clarified to more accurately characterize the cause of high-water temperatures and their association with fish kills in the Klamath River. Please refer to Volume III Attachment 1 Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Water Temperature* for the revisions.

Comment ORG46-175

The DEIR states that "Temperatures in Upper Klamath Lake are cooler than those in the Klamath River downstream from Iron Gate Dam in the late summer and early fall when fall-run Chinook are migrating." This statement is made without a citation, data, or any other form of support. Upper Klamath Lake is at over 4,140 feet in elevation, is extremely shallow and would be expected to cool off faster in the fall than lower elevation reservoirs and the lower river. While it may be true that Upper Klamath Lake is cooler in the fall, a discussion about the biological significance of the difference in water temperatures is absent in the DEIR. If the temperatures in both locations are all cooler than some threshold that would impair Chinook migration or spawning, as it would appear from the spot KHSA Interim Measure 15 data (see graph below), then it is there may be

no biological significance with water temperatures downstream of Iron Gate Dam being warmer relative to those in Upper Klamath Lake.

To address this, the DEIR should present a set of biologically-based criteria and review the readily available water temperature data for the different locations and present a biologically-based discussion of the differences along with the significance (if any) of those differences.



Response to Comment ORG46-175
Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Water Temperature* has been revised to remove the referenced statement that was not associated with a specific citation. The deletion does not result in changes to the analysis in the EIR. Please refer to Volume III Attachment 1 Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Water Temperature* for the revisions.

With respect to the comment's concern regarding the application of consistent biologically-based temperature criteria in the EIR, please refer to response to comment ORG46-180.

Comment ORG46-176
This paragraph of the DEIR notes that fast growing Redband Trout can take refuge in cool thermal refugia around Pelican Bay when Upper Klamath Lake water temperatures are very warm. It states that juvenile Chinook can use wetlands in these areas for rearing. The DEIR should then describe that juvenile Chinook using these areas would be highly susceptible to predation from trout residing in the same area and present an analysis of this predation on the rearing Chinook as it relates to the success of reintroduction.

Response to Comment ORG46-176
Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Water Temperature* is describing the environmental setting and is not intended to provide an analysis of

the Proposed Project. Therefore, this section has been clarified to remove reference to juvenile rearing. Please refer to Volume III Attachment 1 Section 3.3 Aquatic Resources Potential Impact 3.3-18 for a discussion of the effects of redband trout on the reintroduction of Chinook salmon upstream of Iron Gate Dam under the Proposed Project. Please refer to Volume III Attachment 1 Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Water Temperature* for the revisions.

Comment ORG46-177

This paragraph grossly oversimplifies the water quality issues in Lake Ewauna and Keno Reservoir. If the DEIR is going to discuss water quality in Keno Reservoir, it should be revised following a complete review of at the available water quality data for this location as it relates to aquatic resources.

Response to Comment ORG46-177

Section 3.3.2.3 *Aquatic Resources – Habitat Attributes Expected to be Affected by the Proposed Project – Water Temperature* is intended to provide a brief, overarching summary of water temperature data in Lake Ewauna and Keno Reservoir. It is not intended to provide an overview of water quality in Lake Ewauna and Keno Reservoir, or exhaustive detail.

Section 3.3.2.3 *Aquatic Resources – Habitat Attributes Expected to be Affected by the Proposed Project – Water Temperature* has been revised in Volume III Attachment 1 to focus on water temperature. Please refer to Volume III Attachment 1 Section 3.3.2.3 *[Aquatic Resources] – Habitat Attributes Expected to be Affected by the Proposed Project – Water Temperature* for the revisions.

Comment ORG46-178

The DEIR should be consistent when describing effects for different reaches. For example, previously in the DEIR, temperatures of 71.6 to 77 degrees Fahrenheit (°F) are defined as still being within the preferred range for warm and some coldwater species. However, this same conclusion is not presented for the upper Klamath River Hydroelectric Reach. The DEIR emphasizes small areas of thermal refugia having great value for fish in Upper Klamath Lake (see pg. 3-236), but there is comparatively little discussion of the thermal refuge benefits to fish of the 220 to 250 cfs of groundwater in the J.C. Boyle bypass reach. The bypass reach is 4.6 miles in length and exhibits stable stream temperatures (51.8° to 53.6°F) ideally suited for resident and anadromous salmonids.

The temperature effects that the Proposed Project and the different alternatives would have on the bypass reach vary substantially but these differences are hardly discussed in the DEIR. For example, the removal of J.C. Boyle Dam results in a large increase in stream temperature and diminished water quality as a result of mixing spring water with Klamath River water that is currently diverted around the J.C. Boyle Bypass Reach (see comment 3.2-8).

Response to Comment ORG46-178
The EIR consistently describes the effects of water temperature on aquatic resources among river reaches, as summarized in Section 3.3.2.3 *Aquatic Resources – Habitat Attributes Expected to be Affected by the Proposed Project – Water Temperature*, including a discussion of thermal refuge habitat in the J.C. Boyle Bypass Reach. The potential effects of the Proposed Project on water temperatures in the J.C. Boyle Bypass Reach as related to aquatic resources are discussed in Section 3.3.5.4 *Aquatic Resources Water Temperature*. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

The potential different effects of alternatives to the Proposed Project on water temperatures in the J.C. Boyle Bypass Reach as they relate to aquatic resources are discussed in Volume I Section 4.2.3.1 *Alternatives – No Project Alternative – Aquatic Resources – Water Temperature;* Volume I Section 4.4.3.3 *Alternatives – Continued Operations with Fish Passage Alternative – Aquatic Resources – Water Quality;* Volume I Section 4.5.3.3 *Alternatives – Two Dam Removal – Aquatic Resources – Water Quality;* and Volume I Section 4.6.3.3 *Alternatives – Three Dam Removal Alternative – Aquatic Resources – Water Quality*.

With respect to the comment's assertion that the EIR is not consistent when describing the effects of water temperature, please refer to response to comment ORG46-180, and also note that Section 3.3.4.4 *Aquatic Resources – Impact Analysis Approach – Water Temperature* has been revised to clarify the water temperature criteria used to evaluate potential impacts of the Proposed Project. Please refer to Volume III Attachment 1 Section 3.3.4.4 *Aquatic Resources – Impact Analysis Approach – Water Temperature* for the revisions.

Regarding existing water temperatures in the J.C. Boyle Bypass Reach, and the potential effects of the Proposed Project on water temperatures in the Bypass Reach, please also refer to responses to comments ORG46-90, ORG46-209, and ORG46-211.

Comment ORG46-179
The DEIR states "In addition, numerous cold-water springs contribute flows to both Copco No. 1 and Iron Gate reservoirs." This statement is unsupported and PacifiCorp is not aware of substantial cold-water springs other than the springs in the J.C. Boyle Bypass Reach that contribute approximately 220 to 250 cfs of inflow. Spring Creek does have a spring water source as its headwaters, but this contribution comes to Iron Gate Reservoir from Jenny Creek and from diversions of Spring Creek into Fall Creek for hydroelectric generation purposes. The DEIR should correct this statement.

Response to Comment ORG46-179
The referenced text from Section 3.3.2.3 *Aquatic Resources – Habitat Attributes Expected to be Affected by the Proposed Project – Water Temperature* makes

the general and accurate statement that cold-water springs contribute flows to the reservoirs. Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Water Temperature* has been clarified to specify that there are several springs in the California portion of the Hydroelectric Reach, located along the edges of Copco No. 1 and Iron Gate reservoirs, that contribute an unquantified amount of flow to the reservoirs. Please refer to Volume III Attachment 1 Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Water Temperature* for the revisions.

Comment ORG46-180

The DEIR states that water temperatures within the hydroelectric reach are within the tolerance ranges of the species observed there. However, these temperatures regularly exceed the range of chronic effects temperature thresholds (55 to 68°F) for full salmonid support. This and previous sections in the DEIR should consistently discuss if and when chronic effects thresholds are reached for the Proposed Project. The DEIR does not evaluate the relative change between the existing conditions that are cooler in the spring and presumably delay when chronic effects thresholds are exceeded compared to the Proposed Project under which water temperatures would warm sooner in the spring perhaps exceeding these thresholds earlier in the year and for a longer period of time than under existing conditions. Also, the DEIR should mention that the tributary streams in this reach provide thermal refugia for fish. Overall, the description of stream temperature in the DEIR is unbalanced because the discussion of the hydroelectric reaches emphasizes warm water while coldwater is emphasized in other reaches.

Response to Comment ORG46-180

The comment references a discussion of the existing condition. It would not be appropriate to add additional discussion of temperature impacts of the Proposed Project to a discussion of the existing conditions. Section 3.3.4.4 *Aquatic Resources – Impact Analysis Approach – Water Temperature* has been revised to amplify the discussion on the life-stage chronic effects water temperature thresholds considered in the analysis. Please refer to Volume III Attachment 1 Section 3.3.4.4 *Aquatic Resources – Impact Analysis Approach – Water Temperature* for the revisions.

With respect to the comment's assertion that the EIR does not evaluate the relative change between existing water temperature conditions and the Proposed Project, and the extended length of time that fish may be exposed to elevated water temperatures, please refer to Section 3.2.5.1 *Water Quality – Potential Impacts and Mitigation – Water Temperature* and Potential Impact 3.2-1, for an analysis of the water temperature effects of converting the reservoir areas to a free-flowing river. Volume III Attachment 1 presents the final Section 3.2 *Water Quality*.

In addition, Section 3.3.5.4 *Water Temperature*, provides an analysis of the effects of the thermal lag caused by water storage in Lower Klamath Project reservoirs and the associated increased thermal mass being eliminated in the Lower Klamath River under the Proposed Project. This analysis includes addressing the effects of elevated water temperatures occurring earlier in the spring than under existing conditions, and the duration of time during which the increased temperatures would occur. The elimination of the thermal lag would result in water temperatures to have natural patterns similar to what would have occurred historically in the Klamath River. Overall, these changes would result in water temperatures more favorable for salmonids in the mainstem Klamath River downstream from Iron Gate Dam.

Please note that Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Water Temperature* provides information on cool-water tributaries and cold-water springs. This section does not explicitly state that these are used for thermal refugia in the Hydroelectric Reach, since there is no specific evidence that this occurs. Please refer to Section 3.3.5.4 *Aquatic Resources – Potential Impacts and Mitigation – Habitat Attributes Expected to be Affected by the Proposed Project – Water Temperature* for a description of fish use of thermal refugia in the Hydroelectric Reach. Volume III Attachment 1 presents the final Section 3.3 *Aquatic Resources*.

With respect to the comment's assertion that the EIR discussion of stream temperature is unbalanced because the Hydroelectric Reach discussion emphasizes warm water while cold water is emphasized in the discussion of other reaches, note that Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Water Temperature* provides information on generally cooler tributaries, cold water springs, and the contribution of 200-250 cubic feet per second (cfs) of cool groundwater addition to the Klamath River in the upstream portion of the Hydroelectric Reach. Hot springs located in the Peaking Reach were found to inconsistently affect water temperature. A description of warm water from Iron Gate and Copco 1 is warranted because these reservoirs are point sources of increased water temperature. Please refer to Potential Impact 3.2-1 for further description of water temperature in the Hydroelectric Reach under the Proposed Project. Volume III Attachment 1 presents the final Section 3.2 *Water Quality* and the final Section 3.3 *Aquatic Resources*.

Comment ORG46-181

There are a few areas where the DEIR analysis related to water temperatures downstream of Iron Gate Dam with respect to the thermal lag. and how that may affect salmonids that should be clarified in the DEIR:

1. The DEIR uses monthly average temperatures which are not a good indicator of actual conditions experienced by fish. Fish exhibit complex behavioral

mechanisms to allow them to persist in areas where a monthly average temperature would characterize the habitat as unsuitable.

2. The DEIR analysis does not use data more recent than 2007 when there's over 10 years of specific temperature data available downstream of Iron Gate Dam and in the Klamath River in general.

3. Temperature effects of the Klamath Hydroelectric Project do not propagate all the way downstream to the Salmon River (see comment 3.2-42).

The DEIR should improve this analysis by using the 7-day average of the daily maximum (7DADMax) water temperature metric as is done by USEPA (2003).

Response to Comment ORG46-181
With respect to the comment's assertion regarding the EIR's use of monthly average water temperature to characterize salmonid habitat use, note that Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Water Temperature* uses historical monthly water temperatures to indicate when low or high-water temperatures are present in the Klamath River. No effects analysis is performed using monthly average water temperatures.

Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Water Temperature* has been revised to include the monthly average daily maximum water temperature. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

With respect to the comment's assertion regarding a need for more recent data, Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Water Temperature* directs readers to Section 3.2.2.2 *Water Quality – Environmental Setting – Water Temperature* for a more detailed discussion of water temperature under the Proposed Project, including data through 2017. Please also refer to Master Response WQ-4.

With respect to the comment's assertion that water temperature effects of the Lower Klamath Project do not propagate all the way downstream to the Salmon River, please refer to response to comment ORG46-127.

With respect to the comment's assertion that the EIR should use a 7-day average of the daily maximum water temperature as a metric, Section 3.3.4.4 *Aquatic Resources – Impact Analysis Approach – Water Temperature* has been revised to include a table of water temperature thresholds for salmonids using the maximum weekly maximum temperatures (MWMT), an equivalent metric to the 7-day average of the daily maximum, as well as an explanation of how average

daily water temperature values are compared to MWMT. Please refer to the detailed response to comment ORG46-180 for additional information.

Comment ORG46-182

The DEIR discusses actinospore temperature viability range, viability length of time (3 to 7 days), and distribution. However, the DEIR does not incorporate this information into the effects analysis for the Proposed Project and each alternative. The DEIR should describe the distance downstream an actinospore can travel under various flow regimes before it cannot infect susceptible salmonids. Similar information should be provided on myxospores because it is this C. shasta stage that infects the polychaete host and it is polychaete abundance that determines actinospore abundance.

The DEIR should incorporate the following information from Som et al. (2016) into the analysis: 1) There is no evidence to suggest that myxospore detection is associated with fish size (age), sex, spawning timing (death), or carcass site; and 2) Carcass removal is not a viable method for reducing myxospore levels, in addition to being contrary to ecological processes (see Foott et al. 2017). This second point is of special interest because it implies that reducing carcasses (spawners) has little effect on myxospore abundance. This is because billions of myxospores are released by a small percentage of the infected adults. Given this, the claims made later in the DEIR regarding the benefits of the Proposed Project through a reduction in spawner densities that in turn leads to decreased disease, is not correct and should be reconsidered. This impacts the DEIR conclusions that the Proposed Project will reduce fish disease in the Klamath River and that flushing flows will be unnecessary following the Proposed Project.

The DEIR states that spore concentration and water temperature are more important determinants of the infectious rate than river flow. However, as noted in the DEIR, spore concentration is measured as spores per liter of water sampled. Thus, given the same number of spores, spore concentration would be higher at lower flows and lower at higher flows so it is unclear how spore concentration is not directly linked to flow. Given this conflict, the DEIR needs to be revised to clearly present the logic relating to spore concentrations and infectious rates.

Additionally, the DEIR does not evaluate the impacts of modifying the existing temperature regime, in which the thermal lag produced by the hydroelectric reservoirs results in locally reduced river temperatures downstream of Iron Gate Dam during the spring. Removal of the hydroelectric reservoir s could increase disease infection as a result of higher river temperatures. This is not evaluated in the DEIR.

Response to Comment ORG46-182

Please refer to Master Response AQF-6, with additional clarifications below.

With respect to the comment's concern that the EIR does not incorporate actinospore and myxospore viability information (e.g., viability distance downstream) into the effects analyses for the Proposed Project and the alternatives, please refer to Volume III Attachment 1 Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation Fish Disease and Parasites*, which includes a discussion of the effects of the Proposed Project on viability of actinospores and myxospores, as well as implications for infections of salmonids. Similar discussions are included for each alternative, including the following sections in Volume I: Section 4.2.3.1 *Alternatives – No Project Alternative – Aquatic Resources – Key Ecological Attributes – Fish Disease and Parasites* (page 4-40), Section 4.4.3.4 *Alternatives – Continued Operations with Fish Passage Alternative – Aquatic Resources – Fish Disease and Parasites* (page 4-128), Section 4.5.3.4 *Alternatives – Two Dam Removal Alternative – Aquatic Resources – Fish Disease and Parasites* (pages 4-206 to 4-207), Section 4.6.3.4 *Alternatives – Three Dam Removal Alternative – Aquatic Resources – Fish Disease and Parasites* (pages 4-268 to 4-270), and Section 4.7.3 *Alternatives – No Hatchery Alternative – Aquatic Resources* (pages 4-304 to 4-305). The effects of the Partial Removal Alternative on fish disease and parasites would be indistinguishable from those analyzed for the Proposed Project. State Water Board is not aware of additional data to precisely assess actinospore or myxospore survival and dispersal in relation to minor differences in flow regimes under the Proposed Project or alternatives beyond the general relationships between flow and actinospore and myxospore viability discussed in the EIR. This information is not required to develop determinations on the effects of the Proposed Project or the alternatives.

The comment asserts that the EIR should incorporate data from Som and Hetrick (2016) into the analysis in the referenced paragraph, including the idea that reducing carcass density under the Proposed Project would not reduce disease risk, the results of Som and Hetrick (2016) are included in Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Disease and Parasites*. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*. Please also refer to Master Responses AQF-5 and 6 for a discussion of the effects of reducing carcass density on disease risk.

With respect to the EIR conclusions that the Proposed Project would reduce fish disease in the Klamath River and that flushing flows would likely be less necessary following the Proposed Project, please refer to Master Response AQF-6 for additional discussion of the potential effects of the Proposed Project on disease risk, including the potential for flushing flows to continue under the Proposed Project.

With respect to spore concentration, flow, and infectious rates noted in the comment, Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Disease and*

Parasites cites the work of Ray et al. (2014), who found that spore concentration and water temperature were more important determinants of exposure and mortality of juvenile Chinook and coho salmon, than was river flow as an independent variable. The commenter notes that flow can affect spore concentration – the EIR discloses that it is the concentration of spores that matters more than the flow itself. Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Disease and Parasites* has been clarified to include a minor addition of text noting that Ray and Bartholomew (2013) found that increased flow and velocity does affect transmission rates. Please refer to Volume III Attachment 1 Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Attributes Expected to be Affected by the Proposed Project – Disease and Parasites* for the revisions.

Please also refer to Master Responses AQF-5 and 6 for a discussion of the potential effects of the Proposed Project on spore concentration and disease risk.

In response to evaluating the impacts of modifying the existing temperature regime on disease infection, please refer to Master Response AQF-6 for a discussion of the potential effects of water temperature on disease risk under the Proposed Project.

Comment ORG46-183

The word "atypically" should be deleted from "abundant polychaete populations that are found in atypically stable habitats." Polychaetes are found in stable and unstable stream habitat. If polychaete abundance is higher in "atypical" stable habitat, then the DEIR should provide the level of increase over stable habitat and provide definitions for each. This paragraph also states that parasite densities are as high in the Williamson River as downstream of Iron Gate Dam. Since the C. shasta relies on polychaetes to complete its life cycle, if follows that large numbers of polychaetes must be present in this river. The DEIR should provide examples of "atypical" habitat in the Williamson River.

The sources supporting the conclusion that the movement of anadromous fish upstream of Iron Gate Dam would present a low risk of introducing C. shasta is out of date. While the resident fish might not suffer increased rates of infection following the Proposed Project, there is no reason to assume the same would be true of anadromous fish recolonizing the area. Because the work of Foott et al. (2016) indicates that most myxospore loading comes from relatively few adults and polychaetes are abundant in the Williamson, Sprague, and Klamath rivers as discussed in the DEIR, then asserting that disease would not spread upstream is unfounded.

Response to Comment ORG46-183

With respect to polychaete abundance, Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the*

Proposed Project – Disease and Parasites has been clarified to remove reference to atypical. With respect to providing examples of high parasite densities, Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Disease and Parasites* has been revised to include reference to polychaete densities and habitat in the lower Williamson River. Please refer to Volume III Attachment 1 Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Disease and Parasites* for the revisions.

Comment ORG46-184

The DEIR cites an incomplete set of prevalence of infection (POI) rate data that only extends to 2012. POI data are readily available for every year since 2013 because the data were required monitoring for USBR as part of their 2013 BiOp compliance (see reports available here: https://microbiology.science.oregonstate.edu/content/monitoring-studies).

Response to Comment ORG46-184

Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Disease and Parasites* has been revised to incorporate the following more recent studies: True et al. (2017), Voss et al. (2018), and USFWS(2019b). The addition of the more recent data does not change any significance determinations. Please refer to Volume III Attachment 1 Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Disease and Parasites* for the revisions.

Please refer to Volume III Attachment 1 Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Disease and Parasites* for the revisions. Please also refer to Master Response AQF-6.

Comment ORG46-185

The DEIR does not accurately portray the complexities surrounding infection of Coho and Chinook in the Klamath River for the following reasons.

1. The paragraph links high disease infection rates to high mortality of outmigrating juvenile Coho and uses the results of Coho survival studies conducted by Beeman et al. (2008) to support the claim. However, Beeman et al. (2008) does not reach any conclusions as to the effect disease may have played in Coho juvenile migration survival rates in the Klamath River. Beeman et al. (2008) stated that overall survival from Iron Gate Hatchery to river kilometer (km) 33 was similar to survival in other rivers. The survival rate over this 276 km distance was 0.857 per 100 km. They note that survival rates for Coho in the Yakima River for example ranged from 0.79 to 0.913 per 100 km.

2. The DEIR does not use the most current and best available information in this discussion that shows the shifts in the infectious zone through the years. The DEIR should be use the results of the fish exposure studies conducted by Oregon State University with funding provided by USBR and available for 2008 through 2017 online at: https://microbiology.science.oregonstate.edu/content/monitoring-studies.

3. Even though release of myxospores by upstream spawning salmon drives infection of polychaete hosts, this more recent information indicates that the disease infectious zone has moved downstream from Iron Gate Dam in recent years to locations much further downstream (e.g., Orleans) (see True et al 2017; Voss et al. 2018). This conflicts with the DEIR conclusions that the Proposed Project will ameliorate disease effects in the Klamath River.

4. All adult Chinook that enter Iron Gate Hatchery are removed from the river. The only way the hatchery contributes to the density of infected carcasses is by producing fish that spawn naturally in the Klamath River.

5.Some of the data regarding the highest rates of infection as presented in the DEIR are out of date and it is unclear if the authors are discussing the infection rate of fish or polychaetes.

Response to Comment ORG46-185

Section 3.3.2.3 *Aquatic Resources – Environmental Setting –Habitat Attributes Expected to be Affected by the Proposed Project – Disease and Parasites* provides a summary of the mortality rates reported by Beeman et al. (2008) and does not claim that the mortality reported by Beeman is attributable only to disease. However, based on the work of Bartholomew and Foott (2010) and others cited in the same section, infection rates among juvenile salmonids (including coho salmon) in the mainstem Klamath River are very high (greater than 50 percent). The commenter notes that portions of the Klamath River have similar mortality rates to portions of other rivers (e.g., Yakima River). This information is added to the record and illustrates that high rates of mortality for juvenile salmonids are not unique to the Klamath River, but does not otherwise affect the analysis presented in the EIR. As discussed, fish disease is documented to result in mortality of juvenile salmonids in the Klamath River. For example, Fujiwara et al. (2011) found that *C. shasta* reduces the survival of the fall-run Chinook salmon juveniles that migrate through the location where parasite densities are highest and that the mortality effect is also detectable in spawning abundance estimates. Bartholomew and Foott (2010) report that mortality of both coho and Chinook salmon juveniles varies between years as a result of differences in water temperature and infectious dose, with three-day exposures resulting in mortality in both species as high as 98 percent. Therefore, it is reasonable to link the mortality rates of juvenile coho salmon reported by Beeman et al. (2008) with disease as a potential source of mortality. In addition, in seeking to explain the higher mortality rates of juvenile coho

salmon released at Tree of Life Campground, Beeman et al. (2008) suggest that the high prevalence of parasites at that location could explain the higher mortality observed among fish released at that location. As a clarification, Section 3.3.2.3 *Aquatic Resources – Environmental Setting –Habitat Attributes Expected to be Affected by the Proposed Project – Disease and Parasites* has been modified to incorporate the Bartholomew and Foott reference. Please refer to Volume III Attachment 1 Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Disease and Parasites* for the revision.

As noted above in response to ORG46-184, Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Disease and Parasites* has been revised to incorporate the following more recent studies: True et al. (2017), Voss et al. (2018), and USFWS (2019b). The addition of the more recent data is consistent with the analysis in the EIR and does not change any significance determinations. Please refer to Volume III Attachment 1 Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Disease and Parasites* for these revisions.

Please also refer to Master Response AQF-6 for a discussion of the analysis of the locations and shifts in infectious zone, and implications for disease risk under the Proposed Project. With respect to the concentration of myxospores near Iron Gate Dam, Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites* has been revised to clarify parasite concentrations. Please refer to Volume III Attachment 1 Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites* for the revisions.

Adult Chinook salmon returns from Iron Gate Hatchery are a substantial portion of fall-run Chinook salmon spawners in Bogus Creek. California Department of Fish and Wildlife (CDFW) has estimated the contribution of hatchery-origin fall-Chinook salmon in Bogus Creek ranges from 7.5 to 61.6 percent (Knechtle and Chesney 2011, 2016a, 2017). In addition, it appears that PacifiCorp is not considering adult fall-run Chinook salmon that perish prior to reaching Iron Gate Hatchery (pre-spawn mortality), which has been estimated to range from 4 to 10 percent in the Klamath River (Gough and Som 2017).

Please note that the infection rates in the paragraphs cited refer to fish.

Comment ORG46-186

The DEIR does not provide any information that defines spawning densities that result in increased disease levels. This information is needed to determine if the expected increase in adult fall-run Chinook production upstream of Iron Gate Dam is likely to exceed this same density level. As written, this paragraph in the DEIR is in conflict with Som et al. (2016) a as cited in DEIR stating that reducing carcasses (i.e., spawners) from the stream has little effect on spore load.

Response to Comment ORG46-186
Please refer to Master Responses AQF-5 and 6. Please also refer to response to comment ORG46-185 and Volume III Attachment 1 Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites* for revisions to incorporate Som and Hetrick (2016). The addition of the Som and Hetrick (2016) data is consistent with the analysis in the EIR and does not change any significance determinations.

Comment ORG46-187
There has been a great deal of fluctuation in adult return numbers and fish production at Iron Gate Hatchery over the years. This paragraph does not consistently present the information that is readily available for this facility. Specifically, the DEIR should consider that:

- *There are annual reports available from CDFW through the 2017 return year that document returns and releases (e.g., CDFW 2018). The DEIR obviously did not include any of this information.*
- *There is data on Coho returns to Iron Gate Hatchery since the facility was completed in 1962. Choosing to describe the declines in Coho since a 'peak return year' in 2001-2002 is misleading. If one reviews the entire data set it is obvious that the actual peak was in the 1996/97 year when 4,097 Coho returned. The lowest year(s) were not 2015/16, but 1964-65, 1965-66, and 1966-67 when 0, 2, and 4 Coho were trapped respectively. These years are the flood of record in 1964 and the following 2 years which likely explains the low numbers of fish trapped.*
- *The long-term average release of yearling Coho is almost 95,000 fish.*

The DEIR presents a similarly fragmented data set for Chinook to that discussed above for Coho. It is not clear why there are only Chinook data presented starting in 2005 or 1978, for adult returns and juvenile releases, respectively, with adult return data possibly extending through 2017.

Response to Comment ORG46-187
The EIR uses best available data to report recent trends in coho salmon returns and production (e.g., last 10 years). Using older data in averages or highlighting the data from the 1960's in the section describing the environmental setting would not improve the understanding of the current baseline. With respect to coho salmon return and production data, Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Aquatic Species – Habitat Attributes Expected to be Affected by the Proposed Project – Fish Hatcheries* has been revised to include recent California Department of Fish and Wildlife (CDFW) data noted by the commenter. These slight revisions to incorporate more recent data do not change the analysis in the EIR, or the significance determinations.

As noted above for the coho salmon, the EIR uses the best available data to report recent trends in Chinook salmon returns and production (e.g., last 10

years). With respect to Chinook Salmon return and production data, Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Aquatic Species – Habitat Attributes Expected to be Affected by the Proposed Project – Fish Hatcheries* has been revised to include recent CDFW data noted by the commenter. These slight revisions to incorporate more recent data do not change the analysis in the EIR, or the significance determinations.

Please refer to Volume III Attachment 1 Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Aquatic Species – Habitat Attributes Expected to be Affected by the Proposed Project – Fish Hatcheries* for the revisions.

Comment ORG46-188

Similar to the data issues presented in the previous comment for Coho and Chinook (see comment 3.3-30), there are adult return data for Steelhead since 1963/64. The real break in the number of returning adults appears to have happened in the 1989-90 year when only 759 adults returned compared to over 3,000 the year before. The long-term average return to Iron Gate Hatchery is 1,105 fish (range 0-4,411).

In the last sentence of this paragraph, the DEIR needs to clarify the last release year for Steelhead. The last brood year released was 2012, which was released in 2013.

Response to Comment ORG46-188

Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Fish Hatcheries* has been revised in Volume III to include a minor modification to CDFW cited steelhead data. Please refer to Volume III Attachment 1 Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Aquatic Species – Habitat Attributes Expected to be Affected by the Proposed Project – Fish Hatcheries* for the revision.

Comment ORG46-189

This paragraph should be clarified to reflect implications for Chinook compared to those for Coho. For example, the sentence referencing CDFW (2014) relating adverse hatchery-related effects from hatchery-origin adults mixing with the natural populations and straying (Ackerman et al. 2006) is not true for Coho found in most tributaries downstream of Iron Gate Dam except Bogus Creek and the Shasta River. In 4 years of Coho spawning surveys (through January 2019) only one hatchery Coho carcass has been found in tributaries downstream of Iron Gate (not including the Scott and Shasta rivers) (MKWC 2016, 2017, 2018, unpublished 2019 data).

Response to Comment ORG46-189

Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project* emphasizes that the influence of fall-run Chinook salmon is of particular concern in Middle and Lower Klamath

River tributaries and identifies that straying of hatchery-origin fish is most pronounced in tributaries closest to Iron Gate Hatchery (i.e., Bogus Creek, Shasta River, Scott River) and decreases with increasing distance from the hatchery. The citation to CDFW and PacifiCorp (2014) is accurate, and no unsupported statements are made regarding hatchery returns of coho salmon. Detail is provided in Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Fish Hatcheries* to identify that hatchery-origin fall-run Chinook salmon have a greater influence on aquatic resources, including on naturally occurring stocks, as compared with coho salmon. The information cited from MKWC 2016, 2017, 2018, unpublished 2019, has been added to the record, and is consistent with the analysis in the EIR. Please note that the comment does not include stray rate data from the primary coho spawning tributaries downstream of Iron Gate Dam (Bogus Creek, Shasta River and Scott River). In addition, Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Aquatic Species – Habitat Attributes Expected to be Affected by the Proposed Project – Fish Hatcheries* has been revised with minor text modifications to clarify the relative effect of Chinook salmon straying as compared with coho salmon. Please refer to Volume III Attachment 1 Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Aquatic Species – Habitat Attributes Expected to be Affected by the Proposed Project – Fish Hatcheries* for the revisions.

Comment ORG46-190

The Hatchery Genetics Management Plan (HGMP) referenced in this sentence was prepared by CDFW and PacifiCorp and is typically referenced as such (e.g., CDFW and PacifiCorp 2014). The DEIR mentions in passing many of the topics covered in the HGMP, but does not explain how the HGMP is specifically designed to increase the genetic fitness of Coho used in the hatchery Coho program, evaluate the predation and competition aspects of these hatchery fish on the naturally-occurring Coho, or monitor spawning populations in tributaries downstream of Iron Gate Dam. All of this information feeds back into the HGMP and the Iron Gate Hatchery Coho program with the overall goal of increasing the genetic fitness of Coho in the upper Klamath River.

Response to Comment ORG46-190

The typographical error has been fixed in Section 3.3 *Aquatic Resources* to clarify the citation of the Hatchery Genetic Management Plan (HGMP) as "CDFW and PacifiCorp 2014" in all locations where the citation occurs. Please refer to Volume III Attachment 1 Section 3.3 *Aquatic Resources* for the revisions.

Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Fish Hatcheries* summarizes the goals, objectives, and monitoring and evaluation activities included in the HGMP in sufficient detail for the purposes of the analysis in the EIR.

Comment ORG46-191

The DEIR should evaluate the transport distance for a spore freshly released from a Chinook carcass that moves downstream for 3 days on standard 1,000 cfs flow. The DEIR statement that "Heavily infected...that congregate downstream of Iron Gate Dam and IGH [Iron Gate Hatchery]" misleads the reader to think that a high number of spawners is necessary to fully infect the polychaete population downstream. This is counter to the current scientific understanding that it only takes a few infected carcasses to fully load the system with spores (Foott et al. 2016); a situation that would happen regardless of the presence of Iron Gate Dam and Iron Gate Hatchery.

Response to Comment ORG46-191

The comment does not explain why conclusions in the EIR require evaluation of the transport distance for a spore freshly released from a Chinook carcass that moves downstream for 3 days on 1,000 cubic feet per second (cfs) of flow, and the State Water Board is not aware of available scientific data with which to conduct this evaluation. Please refer to Master Response AQF-6.

Comment ORG46-192

While PacifiCorp does not disagree that there can be negative effects of hatchery releases on natural salmonid populations, it is not clear that such a thing is happening in the Klamath River and the DEIR presents no information to indicate this competition is an issue. The hatchery releases are typically later than the outmigration timing for natural-origin fish which limits the overlap in space and time during which fish compete for the same resources. The Predation, Competition, and Disease (PCD) Risk modeling of hatchery releases conducted annually by PacifiCorp has not indicated a substantial effect on natural origin fish from hatchery releases, even using the most conservative spatial and temporal overlap and competition conclusions (PacifiCorp 2018a).

The two citations used as supporting information for the density-dependent impacts of hatchery operations (Kostow et al. 2003; Kostow and Zhou 2006) relate to a hatchery summer Steelhead program on the Clackamas River in northern Oregon. While the cited sources do indicate that the presence of hatchery summer Steelhead depressed the production of winter-run Steelhead, caution needs to be used when extrapolating this finding to the Klamath River. For example, Courter et al. (2018) concluded that hatchery summer Steelhead did not affect winter-run Steelhead abundance in the Clackamas River.

There is no discussion in either of these sources or the DEIR about the relative availability of habitat and food supplies between these two rivers. These differences would influence the ability to accurately relate the conclusions of work on the Clackamas River to fish interactions on the Klamath River. The DEIR does not include the information necessary to understand if the comparison of these two streams is accurate.

Response to Comment ORG46-192
Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project* uses the best available scientific data to describe the potential for Chinook salmon hatchery releases to adversely affect natural spawning populations through competitive pressures and limited space and resources, which are well documented (Flagg et al. 2000, McMichael et al. 1997). Little scientific data have been collected directly in the Klamath River to assess the potential impacts of Chinook salmon releases on the wild population. Available data on outmigration timing, including data cited by CDFW and PacifiCorp (2014), demonstrate overlap in both time and space between naturally produced and hatchery released coho salmon and Chinook salmon; the degree to which varies among years. We did not find Predation, Competition, and Disease (PCD) Risk modeling results in PacifiCorp 2018b, as referenced in the comment. PCD modeling results for coho are included in the Hatchery Genetics Management Plan (HGMP) for the Iron Gate Hatchery (CDFW and PacifiCorp 2014); however, the effects of Chinook salmon hatchery releases are not considered. Due to a lack of available data from the Klamath River, the EIR cites studies on the Clackamas River (i.e., Kostow et al. 2003 and Kostow and Zhou 2006) as examples to demonstrate that hatchery releases have the potential to adversely affect natural populations through density-dependent mechanisms.

Comment ORG46-193
The DEIR notes that algae are produced in Upper Klamath Lake but fails to note that algal toxins are also produced by Microcystis from Upper Klamath Lake and Keno Reservoir and that these sources would remain if the Proposed Project is implemented and Copco and Iron Gate reservoirs are removed.

Response to Comment ORG46-193
The text directly following the referenced statement reads: “While the Proposed Project would not affect the occurrence of algal toxins in Upper Klamath Lake,” Further, Section 3.4.2.3 *Phytoplankton and Periphyton – Environmental Setting – Hydroelectric Reach* describes phytoplankton patterns from the Link River downstream to Keno Dam, which are driven by blooms that originate in Upper Klamath Lake and are transported into this reach (see also Section 3.4.2.3 *Phytoplankton and Periphyton – Environmental Setting – Hydroelectric Reach* Figure 3.4-10 [page 3-406]), with the phytoplankton community varying seasonally and reflecting the community present in the Upper Klamath Lake. Please also refer to Master Response PAP-1.

Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Algal Toxins* has been clarified to note that algal toxins produced by *Microcystis aeruginosa* are prevalent in Upper Klamath Lake and the Keno Reservoir and these sources would remain under the Proposed Project. Please refer to Volume III Attachment

1 Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Algal Toxins* for the revisions.

Comment ORG46-194
The DEIR needs to be revised to clarify this paragraph:

1. This paragraph is out of place. There has been no discussion of suckers up to this point in Section 3.3 and mixing them into the middle of the salmonid discussion only confuses the reader and leads to false analogies between sucker health and salmon health.

2. There has been a substantial amount of work on sucker disease and survival issues since the one study by VanderKooi et al. (2010) that is cited in this paragraph. The DEIR needs provide an up to date discussion that reflects the best available information relating to the effects of algal toxins on suckers in Upper Klamath Lake.

3. Once the DEIR has presented a comprehensive review of this more recent research, it will be apparent that the link between algal toxins and sucker survival has not been demonstrated.

Response to Comment ORG46-194
Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Algal Toxins* has been revised to clarify the relationship between algal toxins and fish health, including suckers Please refer to Volume III Attachment 1 Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Algal Toxins* for the revisions.

In the Hydroelectric Reach and the Klamath River downstream from Iron Gate Dam, the occurrence of microcystin toxin in fish and mussel tissue has been reported in multiple studies with variable results depending on season, location, and fish species (Fetcho 2006, Kann 2008, CH2M Hill 2009a,b; Prendergast and Foster 2010, Kann et al. 2010a,b; Kann et al. 2013, Fetcho 2011)."

Comment ORG46-195
It is to be expected that fish living in waters with high levels of microcystin would in turn have high levels of microcystin in their tissues. Variations in toxin loading are likely related to the time of year, life-stage collected, and algal bloom conditions in any given year. While the DEIR acknowledges most of these limitations, it does nothing to help the reader understand what may be influencing the results. It is also unclear in the DEIR, what effect toxin loading in fish tissue may have on those fish. The DEIR indicates that the link between toxin accumulation and fish health is unclear, but goes on for multiple paragraphs expounding on the amount of toxin loading. If this were a public health section, then the discussion would be pertinent, but since the scientific evidence

supporting an effect on fish health from microcystin is lacking, the discussion is extraneous and simply confuses the reader.

Response to Comment ORG46-195
Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Algal Toxins* has been revised to improve clarity regarding microcystin in fish tissue. Please refer to Volume III Attachment 1 Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Algal Toxins* for the revisions.

Comment ORG46-196
The DEIR states that "These fluctuations in this reach can also result in rapid temperature changes between 5 and 59°F during the summer months (ODEQ 2010)." The ODEQ (2010) source is the Klamath River TMDL that ODEQ developed but which has since been withdrawn, in part because of issues with the modeling (see comment 3.2-34).

See also comment #3.3-12.

The last sentence in this paragraph states that "…in the trial-type hearing...it was found that this reach had lower macroinvertebrate drift rates...suggesting a reduced food base for fish." While the trail type hearing may in fact have reached this conclusion, this is contrary to the fish populations observed in the peaking reach. This area supports spawning Redband Trout and a high-quality recreational fishery (PacifiCorp 2004b). It is managed by ODFW for the production of wild fish and is a designated conservation population (IRCT2016). It is not plausible for this area to support a robust trout population along with documented spawning and migration in the mainstem Klamath River and into nearby tributaries if food were limiting. Condition factor data collected by PacifiCorp (2004b) did not indicate that Redband Trout in the bypass and peaking reaches were in poor condition, in fact, they were generally in better condition than fish from the reach downstream of Keno Dam (see table below). Condition factors over 1 are generally considered to be indicative of fish in good condition.

Reach-specific Seasonal Condition Factors of Redband Trout caught in 2002
Number of Fish Used in Calculations in Parentheses.

Season	Reach		
	Keno (#)	Bypass (#)	Peaking (#)
Spring	1.16 (25)	1.43 (28)	1.19 (39)
Summer	1.13 (27)	1.18 (48)	1.26 (31)
Fall	1.24 (105)	1.24 (225)	1.15 (101)
Average	1.18 (157)	1.28 (301)	1.20 (171)

Note: Only fish larger than 50 millimeters.
Source: PacifiCorp 2004b

Response to Comment ORG46-196
With respect to the comment regarding the Oregon Total Maximum Daily Load (TMDL), please see response to comment ORG46-119 and Master Response WQ-5.

Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Aquatic Habitat and Instream Flows* has been revised to remove the reference to a reduced food base for fish. Please refer to Volume III Attachment 1 Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Aquatic Habitat and Instream Flows* for the revisions.

Comment ORG46-197
The historic loss of fish from power peaking operations in the Klamath River resulting from the operations of Copco 1 and Copco 2 was the reason that Iron Gate Dam was built. Iron Gate Dam reregulates the peaking operations of the two Copco powerhouses and releases a stable flow into the Klamath River. This entire paragraph has nothing to do with the Proposed Project and should be removed.

Response to Comment ORG46-197
Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Aquatic Habitat and Instream Flows* has been clarified as requested. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources.* Please also refer to Section 3.3 *Aquatic Resources* for additional revisions.

Comment ORG46-198
There is no critical habitat for Green Sturgeon in the Klamath River and this entire discussion should be removed.

Response to Comment ORG46-198
Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project* provides a brief description of critical habitat for green sturgeon to clarify where the critical habitat boundary is in relation to the aquatic resources Area of Analysis, and to acknowledge that National Marine Fisheries Service (NMFS) specifically excluded the estuary portion of the Klamath/Trinity River from the critical habitat designation (NMFS 2009b). Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources.*

Comment ORG46-199
PacifiCorp appreciates the effort to attach a quantitative change value to each of the significance criterion; however, the approach presented in the DEIR is fatally flawed and does not describe a criterion that allows for an accurate evaluation of impacts of the Proposed Project on salmonids, especially Coho and Chinook salmon for the following reasons.

1. Because fish use of the river is affected by water quality (including sediment transport analysis) there is a substantial amount of references with in the Section 3.3 Aquatic Resources imp act analysis to the analysis in Section 3.2 Water Quality. In general, this approach is appropriate; however, "short-term" is inconsistently defined which makes this cross-referenced inaccurate at best and completely wrong at worst. For example, for analyses of water quality, dam-released sediment, and sediment resupply, short-term is defined as 2 years following dam removal (e.g., DEIR pgs. ES-6, 3-44, 3-760, 3-775). For aquatic resources impact analysis, short-term is defined as less than 5 years following dam removal (e.g., DEIR pg. 3-258). Correspondingly, long-term is defined as occurring more than 2 years after dam removal for water quality and sediment resources (DEIR pg. 3-44) and more than 5 years after dam removal for aquatic resources (DEIR pg. 3-258). These variable definitions create a dilemma where long-term water quality and sediment impacts overlap with short-term impacts to fish and other aquatic biota. In the case of water quality and sediment impacts on fish, this overlap creates a situation where the DEIR grossly underestimates the potential severity of short-term impacts as they pertain to fish. The DEIR does not account for this disparity when evaluating the severity and significance of short-term impacts.

2. Regarding the aquatic resources impact analysis, the DEIR states that "A period of five years was selected as short-term, because for most aquatic resources this represents one to two generations." The DEIR fails to provide a rationale for why "one to two generations" is used and how this particular definition was determined.

3. The DEIR notes that there are nine population units of Coho in the Klamath River and that the analysis considers the impacts and benefits for each of the populations separately. However, the DEIR makes significance determinations

for all populations in the Klamath Basin combined. This approach to significance determination is inappropriate for Coho because more than 50 percent of the Coho produced in the basin come from the Trinity River hatchery and natural spawning areas in the Trinity River basin (Naman and Perkins 2016; Kier et al. 2018). Because the Trinity River would be unaffected by the Proposed Project, it would be impossible for any element of the Proposed Project to reach the level of significance for Coho as assumed in the DEIR. Given the small numbers of Coho present in the Upper Klamath subpopulation (see #5 below and Major Issue 2.1) the loss of 50 percent of a year-class of the upper Klamath River Coho population could be biologically devastating and yet not be considered a significant impact.

4. The DEIR fails to provide a biologically-based justification for the selection of the 50 percent criterion for the population as a whole versus the individual subpopulations. The DEIR states that resiliency of the population was considered when evaluating potential impacts, yet the use of a single value for all aquatic species would lead the reader to mistakenly believe that all species were equally resilient. For example, the DEIR assumes that a 50 percent loss of a single-year class of federally-threatened Coho is the same as the loss of 50 percent of a year class of unlisted Chinook. Complicating this, Coho have a 3-year life cycle which exposes more of the population to adverse effects of the Proposed Project at one time when compared to Chinook with a variable 4- to 5-year life cycle. Ignoring the fact that the Coho population is extremely small when compared to the Chinook population, using the DEIR's logic, the 50 percent loss of a year class would seem to have a proportionately higher impact to Coho than Chinook.

5. The DEIR analysis of Proposed Project potential impacts to Coho must reflect the relative abundance of this federally-threatened species in the upper Klamath River. There are very few Coho in the upper Klamath River geographic area (Iron Gate Dam downstream to Portuguese Creek) with most populations at or below depensation thresholds (see Major Issue 2.1). Given the extremely small number of fish in these populations, loss of half of the population alone would be an impact that this population could not sustain, possibly leading to extirpation of Coho in the upper Klamath River. Use of a threshold like the one proposed in the DEIR would allow a reduction in fish, without it being characterized as a significant impact, to the extent that Coho would not be abundant enough to colonize areas upstream of Iron Gate Dam following implementation of the Proposed Project.

6. Recent case law supports the need to define this impact as significant even if it technically may not align with the State Water Board's significance criteria Specifically, "[A] threshold of significance cannot be applied in a way that would foreclose the consideration of other substantial evidence tending to show the environmental effect to which the threshold relates might be significant"

(Communities for a Better Environment v. California Resources Agency (supra, 103 Cal. App. 4th 98).

7. Given the challenges to basin agriculture and water supplies related of avoiding jeopardy under the Endangered Species Act with respect to operation of USBR's Klamath Project, a 50 percent loss of a year-class of Coho salmon could impact the listing status of Coho and result in additional impacts to agricultural water supply if further irrigations restrictions are required to support flow conditions necessary to avoid jeopardy to a reduced abundance of threatened Coho. Given the minimal benefits to Coho described by the Klamath Expert Panel (Dunne et al. 2011) with respect to the Proposed Project, recovery from this impact could be challenging if not impossible.

8. Similar to the issues discussed above for Coho, loss of 50 percent of a year class of Chinook could dramatically impact the adult return, subsequent generations, commercial and tribal fisheries, success of reintroduction, recreational fishing, etc.

9. Regardless of the threshold issues, the analysis in the DEIR fails to establish an accurate baseline population to clearly establish a value against which losses attributable to the Proposed Project are compared. Related to this, the DEIR needs to discuss how the shot-term effects which can happen within a 5-yeartime span line-up with the 50 percent threshold for a year-class.

Response to Comment ORG46-199

Regarding Item 1 of the comment, as noted in the comment, the EIR defines short-term impacts to aquatic resources using a different time period than short-term impacts to water quality. Rather than representing an inconsistency in the analyses, the difference in the assessment period for short-term and long-term impacts is appropriate under CEQA, which requires due consideration of short-term and long-term impacts, and these can vary by resource. As described in Section 3.2.3 *Water Quality – Significance Criteria*, the water quality assessment is based on exceedances of water quality standards that are tied to specific designated beneficial uses. For water quality parameters, exceedances that occur for days or weeks would be significant in relation to thresholds that are set to protect the most sensitive designated beneficial use, or for thresholds that are developed with broader consideration of multiple beneficial uses, even if the water quality exceedances would not result in significant impacts for a particular aquatic resource. Water quality parameters are expected to be different in dam removal year 1 and dam removal year 2 because of impacts due to elevated suspended sediments, and so it is appropriate to use this timeframe to separately consider short-term and long-term water quality impacts of the Proposed Project. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

For aquatic resources, on the other hand, the impact on the species as a whole is of primary concern. Therefore, the life-history of several focal fish species

considered for the Lower Klamath Project EIR aquatic resource impacts assessment necessitate the consideration of short-term impacts that extend for longer than two years. A period of five years following dam removal was selected as the short term for aquatic resources, because for most focal species present in the Klamath River this time period represents one to two - at least one complete – generation. Long term for aquatic resources is defined in the EIR as occurring more than five years following dam removal (unless otherwise indicated), which in most cases is more than two generations for the focal species Predicting the long-term effects after more than one generation is appropriate to assess the combined population effect from the sediment impact, other water quality changes (after these parameters adjust to their long-term condition), and habitat availability changes, and therefore long-term is more appropriate at least five years following dam removal. For water quality parameters, however, the long-term effects of the Proposed Project would be evident after only three years, and thus the selected duration is appropriate. The different duration of impacts analysis among water quality and biological parameters is explicitly referenced in the aquatics impacts analysis. Please note that a short-term impact can be found to be significant based on an occurrence lasting for a time period shorter than the short-term timeframe itself. (See e.g. Potential Impact 3.3-1 *Effects on coho salmon critical habitat quality and quantity due to short-term sediment releases and long-term changes in habitat quality and quantity due to dam removal*.

Regarding Item 3 of the comment, CEQA Guidelines section 15126.2 requires due consideration of short-term and long-term impacts, which are defined for aquatic resources in Section 3.3.3 *Aquatic Resources – Significance Criteria*. As noted, the rationale for selecting a period of time (five years) that, for most of the selected focal species, is a long enough period to capture one to two generation – and at least one full generation. Generations are relevant because the results of environmental changes which could occur during or immediately following dam removal – and then cease – may not be evident for some species until later in their life history, which could be several years later. For example, short-term suspended sediment impacts on spawning fall-run Chinook salmon within days of dam removal in dam removal year 1 could result in an observed reduction in adult returns four years later (dam removal year 5). The impact resulting in reduced adult returns four years after dam removal would therefore be a short-term impact. Volume III Attachment 1 presents the final Section 3.3 *Aquatic Resources*.

Regarding Item 3, 4, 5, and 6 of the comment, please refer to Master Response AQF-9 for a discussion of the appropriateness of establishing a 50 percent reduction in abundance of a year-class of coho salmon as a significant impact. As described in Master Response AQF-9 and response to ORG46-04, the significance criteria used in the EIR are protective of coho salmon. The EIR's analysis includes consideration of the various population size and life-histories of the various focal species in the Klamath River. Please note clarifications to the

significance criteria in Volume III Attachment 1 Section 3.3.3 *Aquatic Resources – Significance Criteria.*

The commenter suggests assessing impacts on coho salmon based on the nine "historical" populations within the Klamath River Basin described by Williams et al. (2006), and, in particular, on the historic Upper Klamath River Population that spawns upstream of Portuguese Creek. Please refer to response to comment ORG46-04 for a discussion of the use of the nine historical population units. As described, the EIR appropriately discusses the relevant population dynamics in making a determination of significance.

Regarding Item 4 and 7 of the comment, please refer to Master Response AQF-9 for a discussion of how the EIR addresses significance at levels of impact below 50 percent loss of a year-class of coho salmon.

Analysis of coho salmon and other focal species in the EIR considers any impact that substantially reduces the abundance of a year class to be a significant impact. This analysis includes consideration of the various population size and life-histories of the various focal species in the Klamath River to the extent possible based on available data. There is not a requirement under CEQA guidelines to establish a quantitative threshold for "substantial." However, in the EIR a numeric threshold of 50 percent was adopted as the upper limit of what might be considered an acceptable impact for aquatic species.

The EIR does not find a 50% loss of a year class of coho salmon. Potential Impact 3.3-9 concludes that the anticipated short-term negative effects of implementing the Proposed Project do not rise to the level of significance, that coho salmon would recover from such effects, and that the species would benefit in the long-term from increased habitat access and suitability. Volume III Attachment 1 presents the final Section 3.3 *Aquatic Resources*.

Regarding Item 8 of the comment, the issues discussed for coho salmon regarding signficance criteria in Master Response AQF-9 for coho salmon apply for Chinook salmon as well. Analysis of Chinook salmon in the EIR considers any impact that substantially reduces the abundance of a year class to be a significant impact. There is not a requirement under CEQA guidelines to establish a quantitative threshold for "substantial." However, in the EIR a numeric threshold of 50 percent was adopted as the upper limit of what might be considered an acceptable impact for Chinook salmon. Potential Impact 3.3-7 considers all available data and predicted impacts to adult returns, subsequent generations, and success of reintroduction to historical habitat upstream of Iron Gate Dam in finding no significant impact for fall-run Chinook salmon in the short term, and a beneficial effect in the long term. Potential Impact 3.12-9 considers the predicted impacts to fall-run Chinook salmon adult returns on tribal harvest, and concludes no significant impact in the short term, and a beneficial in the long term. Potential Impact 3.20-6 considers the predicted impacts to fall-run Chinook

salmon adult returns on the recreational fishery and finds no significant impact for the Middle Klamath River between Iron Gate Dam (river mile [RM] 193.1) and Humbug Creek (RM 174.3) and a beneficial effect for the Hydroelectric Reach, the Middle Klamath River downstream of Humbug Creek (RM 174.3), and the Lower Klamath River. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*, Section 3.12 *Historical Resources and Tribal Cultural Resources*, and Section 3.20 *Recreation*.

Volume I Section 5.4.1.1 *Social and Economic Factors Under CEQA – Consideration of Economic Information for Resources Potentially Affected by Dam Removal – Commercial Fishing* (pages 5-5 to 5-7) considers available data on predicted adult salmon returns and finds that economic studies concluded that commercial troll fishery harvests of Southern Oregon/Northern California Coast (SONCC) coho and Klamath River fall- and spring-run Chinook salmon would increase over existing conditions due to an increased abundance of salmon resulting from dam removal.

Regarding Item 9 of the comment, as described in Section 3.3.3 *Aquatic Resources – Significance Criteria*, a substantial reduction in any single year class during the short-term (five years) would be considered significant. The baseline populations of all focal species evaluated in the EIR are described in Section 3.3.2.1 *Aquatic Species*, based on best available information. Volume III Attachment 1 presents the final Section 3.3 *Aquatic Resources*. Please also refer to Master Response AQF-9. Regarding short-term effects, please see above response to this comment, particularly items 1 and 2.

Comment ORG46-200

The DEIR classifies effects as significant if habitat (quality/quantity) of a native species is reduced by more than 50 percent. If this logic is consistently applied to the Proposed Project and the alternatives, then because reservoirs provide more juvenile salmonid rearing habitat per mile than a free-flowing river and water quality in the reservoirs is suitable for rearing through the spring months, the DEIR should conclude that the removal of dams results in a significant reduction in seasonal rearing habitat for Coho and Chinook (especially for the Existing Conditions with Fish Passage alternative).

Response to Comment ORG46-200

Anadromous salmonids do not currently have access to habitat usptream of Iron Gate Dam, since no fish passage is provided. Therefore, critical habitat is not designated for the Klamath River upstream of Iron Gate Dam and removal of the reservoirs would not reduce habitat for native anadromous salmonids.

Comment ORG46-201

The DEIR defines a long-term effect as the period starting 5 years after removal of all dams. Because no end date is set for the definition of long term, it is unclear when benefits would be realized or impacts cease. Because duration is

an import ant factor considered in determining effects, the DEIR should provide more information on what was assumed and used for establishing the end point for long-term effects. In doing this, the DEIR needs to acknowledge that the endpoint of construction or restoration may not be the actual end of the effects. For example, PacifiCorp and Portland General Electric continue to work on issues associated with Condit Dam and Marmot Dam removal 5 and 12 years respectively after the actual removal.

Response to Comment ORG46-201
CEQA Guidelines section 15126.2 requires due consideration of short-term and long-term impacts, which can vary by resource. The life-history of several focal species considered in the aquatic resource impacts assessment necessitate consideration of short-term impacts longer than two years. Long term for aquatic resources is defined as more than five years following dam removal (unless otherwise indicated), which in most cases is more than two generations. The extent of long-term impacts is relative to the source of potential impact and is evaluated separately, as appropriate. For example, the cessation of hatchery operations after eight years under the Proposed Project could result in effects to the abundance of adults up to 10 years after dam removal, while impacts resulting from elevated suspended sediment concentrations (SSCs) during reservoir drawdown would be much more limited in duration. The EIR appropriately evaluates impacts separately based on the predicted duration of the impact and does not apply an arbitrary end-date.

Comment ORG46-202
The DEIR references "...taking into account when the species and what percent of the population is likely to be present in the Klamath River mainstem..." Yet the DEIR fails to provide any information about how the percentage of the population present at any given point in time is known or predicted.

Response to Comment ORG46-202
Section 3.3.4.1 *Aquatic Resources – Impact Analaysis Approach – Suspended Sediment* indicates that details of the suspended sediment impact analysis, including details characterizing the percentage of the focal species population present at any given point in time, are presented in Appendix E. Volume III Attachment 1 presents the final Section 3.3 *Aquatic Resources*.

Comment ORG46-203
The DEIR should explain how it was determined that the use of historic hydrology in evaluating the fate of bedload was appropriate. There was a substantial shift in high-flow events in about 2000 (first graph A below from Shea et al. 2016) when USBR's operations changed as a result of the biological opinion under which they were operating which included a shift in the flood control curve in Upper Klamath Lake (second graph B below).

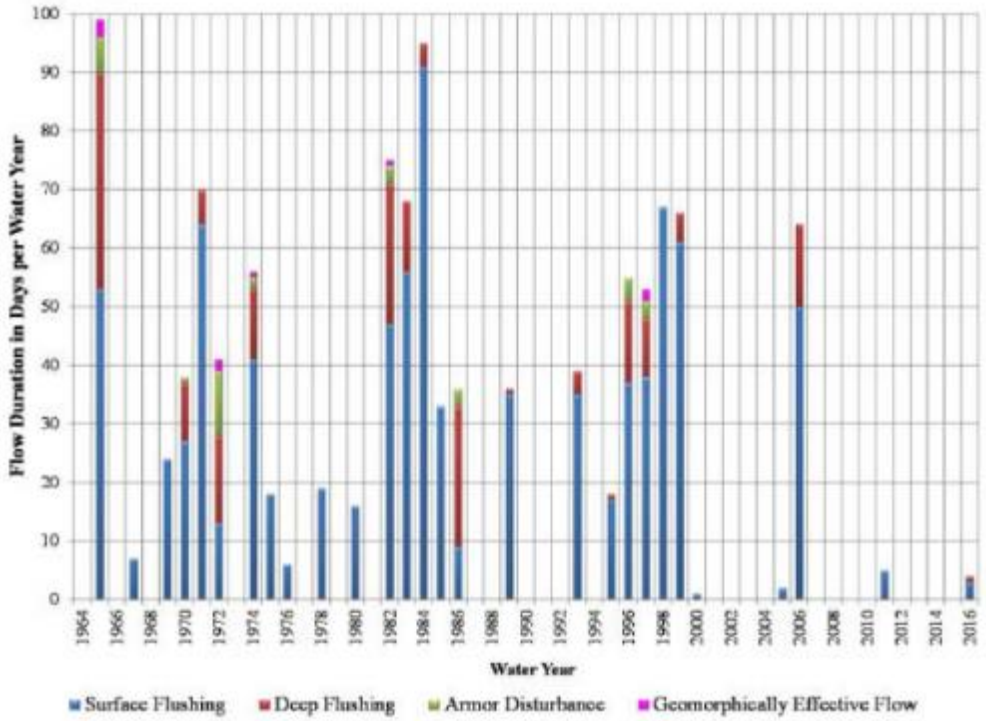
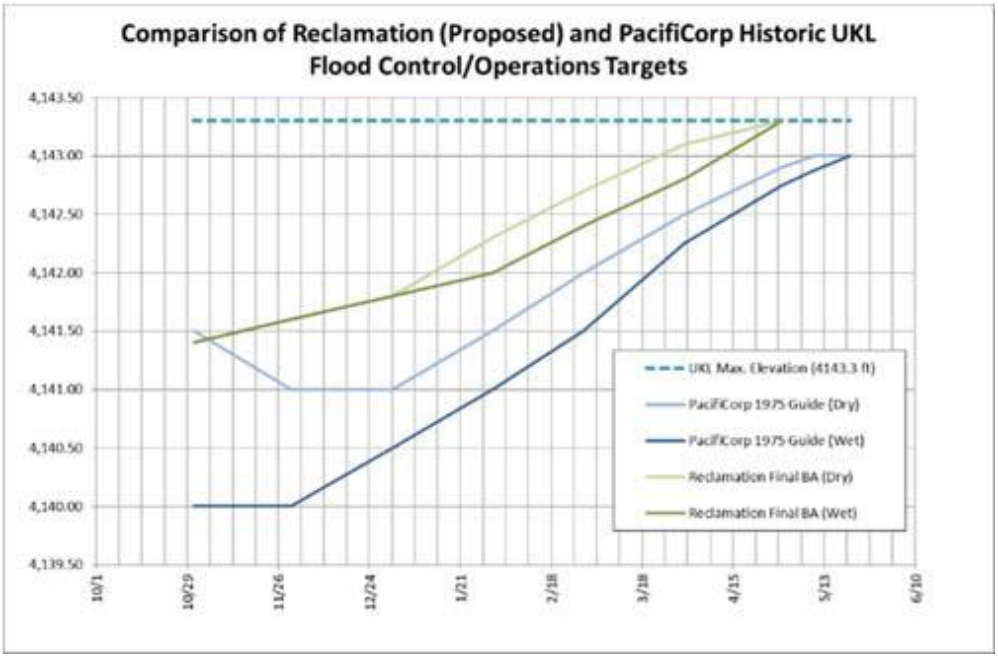


Figure 5: Duration of sediment mobilization flows in days per Water Year in the Klamath River below Iron Gate Dam Water for Water Years 1964-2016.

Graph A: Figure 5 from Shea et al. (2016)



Graph B: Comparison of Reclamation and PacifiCorp Upper Klamath Lake Flood Control Lake Elevations

Response to Comment ORG46-203
Detailed information regarding flow conditions for the 1961–2009 period, which was used as the basis for United States Bureau of Reclamation's (USBR's) coarse sediment (bedload) modeling effort (USBR 2012a) and the EIR impact analyses, is presented in Volume I Section 3.6.2.2 *Flood Hydrology – Environmental Setting – Basin Hydrology* (pages 3-590 to 3-621). USBR ran the SRH-1D sediment model using nearly five decades of hydrologic record that inherently accounts for flow variability within and between years; numerous instances of dry, medium, and wet water year types; and varying sequences of water year types (e.g., more than one wet year in a row, more than one dry year in a row, dry years followed by wet years, wet years followed by dry years, etc.). In general, allowance for a wide range of flow conditions that could reasonably occur in the future is appropriate for a model that is designed to predict the long-term evolution of the riverbed in response to a change such as dam removal. Furthermore, representing a broad range of flows that could reasonably occur in the future as part of model input inherently reduces uncertainty in the model output because it avoids constraining the model output to a narrow and potentially biased representation of future conditions.

USBR's sediment modeling assumed that future flow releases associated with the Klamath Irrigation Project would occur in accordance with either the Klamath Basin Restoration Agreement (KBRA) (dam removal scenario) or the 2010 BiOp Flows (dams in place scenario), and superimposed these minimum flow release criteria upon the forty-nine year historical hydrologic record for each scenario. As discussed in Volume III Attachment 1 Section 3.1.6 *Introduction – Summary of Available Hydrology Information for the Proposed Project*, flow conditions under the KBRA Flows (USBR 2012a) are sufficiently similar to the 2013 BiOp Flows, where the latter served as the operational flow requirements for the Klamath River at the time of the Notice of Preparation for the Lower Klamath Project EIR (i.e., December 22, 2016), and the 2019 BiOp Flows, which are the current operational flow requirement for the Klamath River. In particular, the range of 2019 BiOp Flows is within the range of modeled KBRA Flows approximately 99.9 percent of the time at Iron Gate Dam, indicating that the previously modeled USBR results are sufficiently representative of the range of flow conditions under 2019 BiOp Flows. Accordingly, USBR's sediment transport model would be likely to produce nearly identical results if it were run using either the 2013 BiOp Flows or the 2019 BiOp Flows as the basis for Klamath River flows.

Furthermore, USBR's riverbed evolution modeling incorporated the flow conditions described above across three fifty-year simulations, incorporating both natural sediment resupply and sediment supply from dam removal, with drawdown modeled for dry, median, and wet water year types (USBR 2012a), to represent a broad range of potential future conditions. Given that future hydrological conditions are difficult to forecast, including this broad range of potential hydrological conditions in the analysis means that the sediment erosion,

transport, and deposition predictions in the EIR are more likely to reflect the actual future sediment conditions when the dams are removed than if a single water year or narrow window of hydrological conditions were modeled and analyzed.

The 2000–2009 period is included in the EIR's expansive data set, and this data does indicate a downward trend in the magnitude, frequency, and duration of high flow events post-2000. However, this does not change the aforementioned statements that application of a broad historical record as the basis for future hydrology, combined with operational flow requirements for the Klamath Irrigation Project that include consideration of both the 2013 BiOp and the 2019 BiOp, appropriately accounts for likely flows under a future dam removal scenario and reduces uncertainty in the model output for sediment transport in the Klamath River. Please note that Volume I Potential Impact 3.11-5 (pages 3-765 to 3-775) considers both the minimum and maximum mass of potential sand erosion, depending on water year type, and it includes erosion estimates for the dry water year that occurred in 2001 (see Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Table 3.11-7 and Figure 3.11-11 [page 3-768]).

Comment ORG46-204

The 59°F water temperature criterion according to Bartholomew and Foott (2010 as cited in the DEIR) applies when infectious dose of C. shasta is small. Bartholomew and Foott (2010) state (on pg. 38) that when infectious dose is high, temperature is not a strong predictor of survival. The data in Table 6.1 in Bartholomew and Foott (2010) show substantial effects on salmonids at temperatures ranging from about 55°F to almost 70°F (13 degrees Celsius (°C) to 21°C). The DEIR does not accurately reflect the information available in the cited source. The DEIR needs to evaluate potential impacts that could occur over this wider range of temperatures and discuss the relative effects of C. shasta on salmonid populations at high dose levels.

Response to Comment ORG46-204

As discussed in Section 3.3.4.5 *Aquatic Resources – Impact Analysis Approach – Fish Disease and Parasites*, the use of 59ºF was one of several factors used to evaluate potential infection risk. Suitable (warm water) temperatures were selected as a factor based on the summaries of disease risk found in Bartholomew and Foott (2010). Thus, warm water temperatures are an appropriate consideration for the EIR analysis, and, more specifically, they are useful for considering disease infection risk in conjunction with the other factors considered, including physical habitat components that support the invertebrate host species (pools, eddies, sediment, mats of filamentous green algae [periphyton]), microhabitats with low velocity and stable flows, and proximity to salmon spawning areas.

Further, Section 3.3.5.5 *Aquatic Resources – Impact Analysis Approach – Fish Disease and Parasites* includes a complete discussion of the potential effects of the Proposed Project on water temperature dynamics and the other factors that affect disease infection risk (including spore density). Please refer to Volume III Attachment 1 for the final Section 3.3.4.5 *Aquatic Resources – Impact Analysis Approach – Fish Disease and Parasites.*

Comment ORG46-205

To evaluate the impact of the Proposed Project on Aquatic Habitat, the DEIR uses a qualitative evaluation but applies that evaluation to the 50 percent change criterion, a quantitative threshold, to determine significance. It is unclear how this qualitative comparison to a quantitative threshold is done in any way that results in a support able conclusion in the DEIR.

Response to Comment ORG46-205

Section 3.3.3 *Aquatic Resources – Significance Criteria* has been revised to clarify that any reduction in habitat area of 50 percent or greater would necessarily be a substantial reduction, otherwise the reduction in habitat area would be evaluated based upon a qualitative analysis. This clarification does not constitute a change in the approach to the analysis requiring further revision to the EIR. Please refer to Volume III Attachment 1 Section 3.3.3 *Aquatic Resources – Significance Criteria* for the revisions. Please also refer to Master Response AQF-9 for additional response to significance criteria comments.

Comment ORG46-206

Since they are not a sensitive resource or species, it is unclear why benthic macroinvertebrates are included in the analysis.

Response to Comment ORG46-206

Section 3.3.4.10 *Aquatic Resources – Impact Analysis Approach – Benthic Macroinvertebrates* has been revised to clarify why benthic macroinvertebrates are included in the Impact Analysis Approach section of the aquatic resources analysis. Please refer to Volume III Attachment 1 Section 3.3.4.10 *Aquatic Resources – Impact Analysis Approach – Benthic Macroinvertebrates* for the revisions.

Comment ORG46-207

The DEIR states that "Tributaries between the hydroelectric Reach and the estuary contribute a significant amount of both water and suspended sediments to the Klamath River mainstem." This statement should be supported with a citation and statistically supported in terms of the significance claim.

Response to Comment ORG46-207

Section 3.3.5.1 *Aquatic Resources – Potential Impacts and Mitigation – Suspended Sediment – Middle and Lower Klamath River* has been revised to provide a citation to USBR (2012) (note that this reference is cited as "USBR

2012a" in Volume III Section 3) that statistically supports that tributaries between the Hydroelectric Reach and the Klamath River Estuary contribute a significant amount of both water and suspended sediments to the Klamath River mainstem. Please refer to Volume III Attachment 1 Section 3.3.5.1 *Aquatic Resources – Potential Impacts and Mitigation – Suspended Sediment – Middle and Lower Klamath River* for the revisions.

Comment ORG46-208

This analysis does nothing to evaluate the effect of bedload movement on fish. Simply saying that natural processes would be restored, while true, does not explain the possible impacts to fish. Impacts to salmonids could occur though changes in channel morphology, conversion of habitat from pool to run or riffle habitat (or the other way around), burying or scour of redds, and so on. None of those appear to be discussed.

Response to Comment ORG46-208

The potential effects of increased bedload supply and transport on channel bed elevations and grain size under the Proposed Project are described in detail in *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 (pages 3-765 to 3-775) and Volume II Appendix F, including an explanation of the potential effects to fish. The potential impacts of sediment deposition are considered for aquatic resources within the entire area of analysis specified in Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts*. Impacts of sediment deposition were not found to result in short- or long-term significant impacts when considered on a reach-specific basis in Potential Impacts 3.3-1, 3.3-3, 3.3-4, 3.3-7, 3.3-8, 3.3-9, 3.3-10, 3.3-11, 3.3-12, 3.3-14, 3.3-15, and 3.3-20. Significant and unavoidable impacts for *Anodonta spp*. in the short and long term are predicted to occur from sediment deposition and are addressed in Potential Impact 3.3-19. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*. Impacts of sediment deposition were also considered for terrestrial resources in Volume I Section 3.5.5.1 *Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities* in Potential Impacts 3.5-3, 3.5-4 (with no significant impacts identified), and in Volume I Section 3.5.5.3 *Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities* in Potential Impacts 3.5-17 and 3.5-18 with no significant impacts identified.

Comment ORG46-209

Residence time in Copco and Iron Gate reservoirs is specifically known to be about 19 days in Copco and 26 days in Iron Gate under typical summer flow conditions. Perhaps these values were added together to get the several weeks' as indicated, but not supported, in the DEIR.

Response to Comment ORG46-209
Section 3.3.5.4 Aquatic Resources – Potential Impacts and Mitigation – *Water Temperature – Upper Klamath River – Hydroelectric Reach* has been slightly modified as requested. Please refer to Volume III Attachment 1 Section 3.3.5.4 *Aquatic Resources – Potential Impacts and Mitigation – Water Temperature – Upper Klamath River – Hydroelectric Reach* for the revisions.

Comment ORG46-210
The DEIR states that spring water temperatures are cooler with dam removal. However, in other sections of the DEIR states that spring water temperatures are warmer. The DEIR should correct this or indicate if cooling is specific to the reach (see comment 3.3-70 regarding water temperatures in the reach). Generally, previous water quality modeling results from PacifiCorp (2004, 2014) indicate that river temperatures downstream of Iron Gate Dam would increase in the spring in the absence of Project facilities (i.e., with dam removal).

Response to Comment ORG46-210
Section 3.3.5.4 *Aquatic Resources – Potential Impacts and Mitigation – Water Temperature – Upper Klamath River – Hydroelectric Reach* has been clarified as requested. Please refer to Volume III Attachment 1 Section 3.3.5.4 *Aquatic Resources – Potential Impacts and Mitigation – Water Temperature – Upper Klamath River – Hydroelectric Reach* for the revisions.

Comment ORG46-211
Two elements of this paragraph need to be addressed:

1. The discussion about how more water would be available is confusing and should be rewritten. An increase of 6,200 acre-feet/year sounds impressive, but even if this all occurs during the May-Sept period, that is only about an increase of 20 cfs per day. The DEIR asserts that because of evaporation losses from Copco and Iron Gate reservoirs would be removed, this extra 6,200 acre-feet water may be available to USBR for diversion. The loss of hydroelectric reservoir storage and the ability to manage flows from Iron Gate Dam through fairly precise releases from the hydropower complex will also mean that flow deliveries that are currently required of USBR, and that are likely to continue following proposed dam removal (such as flow releases for Tribal Cultural Ceremonies), will need to occur from Keno Dam, approximately 40 miles upstream of Iron Gate Dam. To achieve peak flows at locations downstream of Iron Gate Dam will require correspondingly larger peak flows and higher release volumes. The DEIR does not assess this impact, or the impact of the Proposed Project on USBR's operations (including Upper Klamath Lake elevations, water supply, or releases to the Klamath River). All of these could result in flow demands greater than the 6,200 acre-feet reduction in evaporative losses.

2. The statement about tributaries providing refuge habitat or warmer winter habitat should be supported by some actual water temperature data. The

assertion that Hamilton et al. (2011) indicates that these areas would be conducive to growth of salmonids is not correct. Hamilton et al. (2011) discusses the input of cooler water from the tributaries and speculates that these would create areas of thermal refuge and that this thermal diversity would "benefit a variety of aquatic biota..." (Hamilton et al. 2011 at p 32) but does not specifically discuss salmonids or growth rates.

Response to Comment ORG46-211
With respect to item no. 1, please refer to Volume I Section 3.8.4 *Water Supply/Water Rights – Impacts Analysis Approach* (pages 3-674 to 3-676) for a detailed discussion on how the 6,200 acre-feet/year increase under the Proposed Project would affect United States Bureau of Reclamation's (USBR's) operations. Please also refer to Volume I Section 3.8.4 *Water Supply/Water Rights – Impacts Analysis Approach* Potential Impact 3.8-1 (pages 3-676 to 3-678) for a discussion of the potential impacts of the Proposed Project on surface water flows available for diversion within the Hydroelectric Reach and downstream from Iron Gate Dam. Please also refer to Volume I Section 3.8.4 *Water Supply/Water Rights – Impacts Analysis Approach* Potential Impact 3.8-2 (pages 3-679 to 3-680) for a discussion of the potential impacts of the Proposed Project on USBR's current operations. Please also refer to response to comment ORG46-12. Lastly, please refer to Master Response HYD-1 for a discussion of the 2019 BiOp Flows for USBR's Klamath Irrigation Project.

With respect to item no. 2 in the comment, Section 3.3.5.4 *Aquatic Resources – Potential Impacts and Mitigation – Water Temperature* was written using the best available and most current information. Fall, Shovel, and Spencer Creeks and Big Springs have all been identified as providing thermal refugia and suitable spawning and rearing habitat for resident salmonids by both Hamilton et. al (2011) and Dunsmoor and Huntington (2006). Though data specifically predicting post-project fish growth rates in the tributaries are not available, the provision of additional suitable macroinvertebrate (i.e., food) and salmonid rearing habitat (where such habitat currently does not exist), would be conducive to the growth of individual salmonids.

Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*, including minor modifications to address attribution of the relationship between winter water temperatures and salmonids growth rates.

Comment ORG46-212
The DEIR puts forth a hypothesis regarding the effect that changes in river temperature from the Proposed Project would have on mainstem origin fall-run Chinook fry emergence timing and implications for juvenile growth, migration timing, and stress and disease. The DEIR does not present an accurate conclusion regarding the effects of water temperatures on fall-run Chinook egg development, emergence, or growth. A detailed comment on this hypothesis is provided in Major Issue 2.9.4, along with additional information. Given that the

DEIR presents some incorrect conclusions, the analysis in the DEIR is incorrect and needs to be reevaluated. In summary, a more "natural" temperature regime in which spring time flows would have higher temperatures, may not be as beneficial to salmonids as the existing temperature regime (PacifiCorp 2014).

Response to Comment ORG46-212
Please refer to Volume III Attachment 1 Potential Impact 3.2-1 for a discussion of the potential impacts of the Proposed Project on water temperature in the Klamath River. The EIR does not simply assume that a more natural temperature regime would be better for salmonids than existing conditions, but provides a thorough, evidence-based analysis of water temperature dynamics and effects on aquatic resources under existing conditions. Please refer to Volume III Attachment 1 Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Water Temperature*. Please refer to Volume III Attachment 1 Section 3.3.5.4 *Aquatic Resources – Potential Impacts and Mitigation – Water Temperature* for an analysis of the potential influence of warmer water on salmonids, including the potential for adverse impacts to aquatic resources due to increased water temperatures during spring under the Proposed Project. Please also refer to response to comment ORG46-19 for additional discussion of the EIR's analysis of temperature-related impacts to salmonids.

Please refer to Master Responses WQ-2 for a discussion of the Proposed Projects potential to cool Klamath River water during the summer and fall. Please also refer to Master Responses AQF-5 and AQF-6 for a discussion on disease risk (including risks related to temperature conditions) upstream and downstream of Iron Gate Dam.

Comment ORG46-213
The DEIR provides little support for, or connection between the water temperature regimes discussed in this paragraph and the effects on fish. Water temperatures in the absence of the Klamath Hydroelectric Project will still exceed the Basin Plan thermal targets for salmonids (see comment 3.3-61).

Similarly, the paragraph asserts that nutrient cycling and aeration process of a natural channel would be created by the Proposed Project but does not support this point. The paragraph goes on to assert that these changes moderate effects of climate-change-generated stream water temperature increases but does not explain the degree of moderation or what this means for aquatic resources. These conclusions are mostly speculation.

Response to Comment ORG46-213
With respect to the comment's assertion that Section 3.3.5.4 *Aquatic Resources – Potential Impacts and Mitigation – Water Temperature* provides little support for, or connection between, the water temperature regimes under the Proposed Project and the effects on fish, please refer to Volume III Attachment 1 Section

3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Water Temperature* for a thorough analysis of water temperature dynamics and effects on aquatic resources under existing conditions. Please also refer to responses to ORG46-17, ORG46-19, ORG46-127, ORG46-128, ORG46-129, ORG46-180 and ORG46-218. The EIR asserts that conditions under the Proposed Project would better align with the California Thermal Plan's prohibitions and move waters within the hydroelectric reach towards Total Maximum Daily Load (TMDL) compliance (see discussion under Volume III Attachment 1 Section 3.2.5.1 *Water Quality – Potential Impacts and Mitigation – Water Temperature* Potential Impact 3.2-1), but does not rely on a conclusion that implementation of the Proposed Project will result in temperatures that meet the Basin Plan's thermal targets for salmonids. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

With respect to the comment's assertion that Section 3.3.5.4 *Aquatic Resources – Potential Impacts and Mitigation – Water Temperature* does not support the statement that the Proposed Project would create nutrient cycling and aeration processes of a natural channel, and that EIR does not explain the degree of water temperature moderation or potential effects for aquatic resources, please refer to Volume III Attachment 1 Section 3.2.5.3 *Water Quality – Potential Impacts and Mitigation – Nutrients* Potential Impact 3.2-8 and Section 3.2.5.4 *Water Quality – Impact Analysis Approach – Dissolved Oxygen* and Potential Impact 3.2-10, which provide a detailed analysis of nutrient cycles and aeration under the Proposed Project. Please also refer to Volume III Attachment 1 Section 3.2.5.1 *Water Quality – Potential Impacts and Mitigation – Water Temperature* Potential Impact 3.2-1 for a discussion of the potential impacts of the Proposed Project on water temperature in the Klamath River. This section details water temperature decreases during summer and fall to more natural levels under the Proposed Project, producing a moderating effect for aquatic resources under climate change scenarios of increased summer and fall water temperatures. Use of phrase 'likely moderate' in Section 3.3.5.4 *Aquatic Resources – Potential Impacts and Mitigation – Water Temperature* is generally consistent with use of the phrase 'help to offset' in Potential Impact 3.2-1. However, Section 3.3.5.4 *Aquatic Resources – Potential Impacts and Mitigation – Water Temperature* has been clarified by replacing 'likely moderate' with 'help to offset' and by including specific reference to late summer/fall stream water temperature increases resulting from climate change. Please refer to Volume III Attachment 1 Section 3.3.5.4 *Aquatic Resources – Potential Impacts and Mitigation – Water Temperature* for the revisions.

Comment ORG46-214

The DEIR concludes that fall-run Chinook spawning in the mainstem will no longer be delayed with the Proposed Project, which would reduce prespawn mortality. The information in the DEIR does not support this nor is there any indication that prespawn mortality is an issue in most years. The DEIR states that water temperature downstream of the Salmon River (RM 66) would not be

altered with the Proposed Project. Because adult fall-run Chinook run timing is heavily influenced by water temperature (Strange 2010, 2012), the Proposed Project will have no effect on their migration timing.

Prespawn mortality data for fall-run Chinook in the main stem Klamath River show similar rates as those for the Trinity River. The Pacific Fisheries Management Council (2018) reported that prespawn mortality for mainstem Klamath River spawning fall-run Chinook averaged 8.3 percent from 2001-2016, while in the Trinity River prespawn mortality averaged 6.9 percent (Rupert et al. 2017). These percentages suggest that there would be little room for improvement in prespawn survival rates as a result of the Proposed Project. This is especially the case if Klamath River fall-run Chinook are more tolerant of warmer water as claimed in the DEIR. The fact that Bogus Creek, immediately downstream of Iron Gate Dam, is one of the most productive salmon streams in the Klamath Basin, and has a high prespawn survival rate, illustrates that temperature effects from Iron Gate Dam are not detrimental to fall-run Chinook.

Adult fall-run Chinook salmon migrate upstream within the Klamath River from August through October. During this period, Klamath Hydroelectric Project-related effects on water temperatures diminish as a function of distance downstream from Iron Gate Dam, with effects essentially absent for the lower reaches of the river downstream of the Scott River (RM 144). Thus, under current conditions, Project operations have no thermally-related effect on adult fall-run Chinook salmon migrating in the lower reaches of the Klamath River (PacifiCorp 2014).

Response to Comment ORG46-214

Please see response to comment ORG46-19, which summarizes the revisions that have been made to Section 3.3.5.4 *Aquatic Resources – Potential Impacts and Mitigation – Habitat Attributes Expected to be Affected by the Proposed Project – Water Temperature* to clarify the analysis. This includes minor modifications to the text to clarify that a reduced risk of delay in spawning timing would *potentially* result in reduced pre-spawn mortality. The comment's claim that high pre-spawn survival in Bogus Creek illustrates that there is no water temperature effect of Iron Gate Dam on the mainstem river is an over-simplification of the dynamic between water temperatures in the mainstem Klamath River, migration timing, spawning timing, and emergence timing, which are discussed and analyzed in detail in the EIR. In addition, the EIR analysis is clear that the water temperature effect is most pronounced downstream from Iron Gate Dam, declines with distance downstream, and by the confluence with the Salmon River (river mile [RM] 66) results in no difference between water temperatures under the Proposed Project and existing conditions. Please also refer to responses to comments ORG46-84 and ORG46-91 through ORG46-93. The EIR analysis is focused on fall-run Chinook salmon migration and spawning within the mainstem reach affected by documented alterations to water

temperature resulting from Iron Gate Dam. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment ORG46-215

The DEIR needs to explain the applicability of Perry et al, (2011 as cited in the DEIR) in terms of how applicable this modeling is to the Proposed Project. The Perry et al. (2011) work appears to have included the Klamath Basin Restoration Agreement as part of the modeled management alternative that included dam removal. The Klamath Basin Restoration Agreement expired at the end of 2015 and therefore, rest oration and water quality management measures contained in the Klamath Basin Restoration Agreement are no longer applicable to the Proposed Project. Because of this, it is not clear how applicable the Perry et al, (2011) results might be to the Proposed Project and the DEIR does not explain this.

Related to this, the Perry et al. (2011 as cited in the DEIR) report does not present any discussion of emergence timing as presented in DEIR Figure 3.3-4.

Response to Comment ORG46-215

Water temperature modeling conducted by Perry et al. (2011) uses the 2010 National Marine Fisheries Service (NMFS) Biological Opinion Flows (2010 BiOp Flows) to represent the Klamath River flows under existing conditions (i.e., "dams in") and the Klamath Basin Restoration Agreement (KBRA) flows (KBRA Flows) to represent the Klamath River flows under dam removal conditions (i.e., "dams out"). Separate and independent of the Proposed Project, flow requirements in the Klamath River have changed since the water temperature modeling was performed by Perry et al. (2011), including issuance of new operational flow requirements for USBR's Klamath Irrigation Project in 2013 (i.e., 2013 BiOp Flows) and 2019 (i.e., 2019 BiOp Flows). In contrast to the conditions modeled by Perry et al. (2011), the Proposed Project does not include any changes to the amount of flow released by the Klamath Irrigation Project and the applicable biological opinion(s), so the flow conditions under the Proposed Project would be similar under both a "dams in" and "dams out" scenario.

Variations in Klamath River flows between the 2010 BiOp Flows and the KBRA flows used in the modeling by Perry et al. (2011), would likely result in variations in the magnitude of water temperature changes between existing conditions and Proposed Project conditions, but these flow and associated water temperature variations would not alter the general water temperature trend estimated by Perry et al. (2011). Iron Gate Reservoir releases under existing conditions are consistently shown in modeling by Perry et al. (2011), PacifiCorp (2004a-1, 2005a, 2008a, 2014a), and the North Coast Regional Board (2010) to result in warmer Klamath River water temperatures during fall and cooler water temperatures during spring downstream of Iron Gate Dam (river mile [RM] 193.1) than would occur under dam removal conditions, regardless of the water year type and flow releases from Iron Gate Dam. However, the specific magnitude of

water temperature changes due to changes in flow conditions from 2010 BiOp and KBRA flows and 2013 BiOp Flows or 2019 BiOp flows cannot be quantified in the EIR analyses because to date there is no publicly available water temperature modeling results that use the 2013 BiOp flows or 2019 BiOp flows as the underlying hydrologic regime for existing conditions and dam removal scenarios. However, Klamath River water temperatures downstream of Iron Gate Dam (RM 193.1) are dominated by the water temperature of the releases from the reservoirs upstream and the heat exchange processes controlling water temperature in the reservoir (e.g., surface area of the reservoir, the amount of solar radiation warming the reservoir surface) would be unlikely to vary significantly with changes in Klamath River flows. Thus, conditions under the Proposed Project are expected to be similar to those modeled by Perry (2011).

With respect to the comment regarding Figure 3.3-4, please refer to response to comment ORG46-19, which summarizes the minor modifications made to Volume III Attachment 1 Section 3.3.5.4 *Aquatic Resources – Potential Impacts and Mitigation – Water Temperature* to clarify the analysis.

Comment ORG46-216

There is much more up to date information available on water temperatures both with and without the Klamath Hydroelectric Project than that presented in this figure. Nor does the DEIR indicate why this one figure out of the five available in the source was selected. PacifiCorp's installation of the Iron Gate Intake Barrier Curtain in 2015 has reduced the temperature of flow releases from Iron Gate Dam while also reducing algae entrainment in those releases as a result of drawing from deeper in the reservoir water column. The figure shown in the DEIR does not include these improvements and does not reflect current operations of the Klamath Hydroelectric Project.

Response to Comment ORG46-216

With respect to the comment's assertion that Section 3.3.5.4 *Aquatic Resources – Potential Impacts and Mitigation – Water Temperature* Figure 3.3-5 does not use current data, please refer to Master Response WQ-4 for a detailed description of how water temperature data from 2001-2012 are comparable to 2013−2015. Note that Volume III Attachment 1 Section 3.3.5.4 *Aquatic Resources – Potential Impacts and Mitigation – Water Temperature* Figure 3.3-5 uses the 2002 data to illustrate diel temperature fluctuations.

With respect to the comment's assertion that Section 3.3.5.4 *Aquatic Resources – Potential Impacts and Mitigation – Water Temperature* Figure 3.3-5 does not include data after installation of the Iron Gate Intake Barrier Curtain (2015), and therefore does not reflect current operations, note that the State Water Board is not aware of any available model simulations for existing conditions post-2015. Please also refer to response to comment ORG46-91 for additional discussion of the Iron Gate Intake Barrier Curtain on water temperature. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment ORG46-217

This paragraph asserts that larger diel fluctuations in water temperature would benefit salmonids rearing in thermal refuges. While PacifiCorp doesn't disagree with the cited sources or benefits of cooler temperatures, the DEIR has not supported the assertion that the Proposed Project would result in cooler temperatures or larger diel swings beyond the one year's worth of modeled data presented in DEIR Figure 3.3-5. There is no comparison of the modeled data to existing conditions, discussion of conditions under different flow regimes, or presentation of any metrics that would help the reader gauge the magnitude of change that could result from the Proposed Project or whether those changes would increase the amount of time that different salmonid life stages are exposed to temperatures that are viewed as suitable based on established criteria.

The reference in this paragraph of the DEIR to Figure 3.3-3 is incorrect.

Response to Comment ORG46-217

With respect to the comment's assertion that the EIR Figure 3.3-5 discussion does not compare modeled results to existing conditions or to multiple flow regimes, please refer to response to comments ORG46-19 and ORG46-219. Additionally, while Klamath River water temperatures vary between years due to meteorological (i.e., weather) variations that influence surface waters, data from 2016 and 2017 (after the installation of the intake barrier/thermal curtain in Iron Gate Reservoir) (Figure ORG46-217-1) are generally similar to data from 2002, which are presented in Volume III Attachment I Section 3.3.5.4 *Aquatic Resources – Potential Impacts and Mitigation – Water Temperature* Figure 3.3-5.

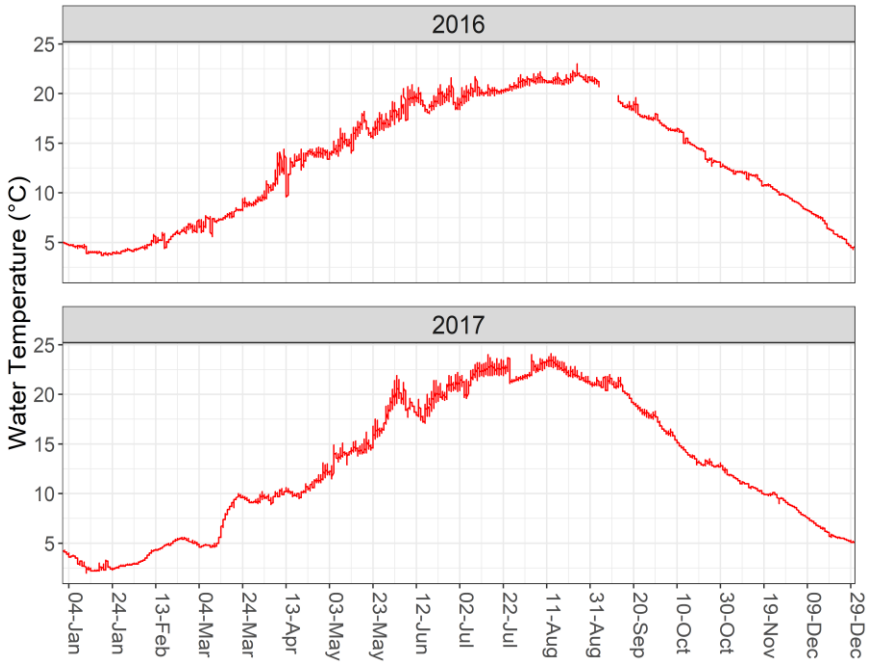


Figure ORG46-217-1. Observed water temperature below Iron Gate Dam in 2016 and 2017, as reported by PacifiCorp in 2019 (https://www.pacificorp.com/energy/hydro/klamath-river/water-quality.html)

With respect to the comment's assertion regarding Figure 3.3-5 and metrics to help the reader gauge the magnitude of change under the Proposed Project, please refer to Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.2-1 for a discussion of the potential impacts of the Proposed Project on water temperature in the Klamath River. Please also refer to response to comment ORG46-180. Please refer to the Section 3.3.4.4 *Aquatic Resources – Impact Analysis Approach – Water Temperature* for chronic effects thresholds. Volume III Attachment 1 presents the final Section 3.3 *Aquatic Resources*.

With respect to the mislabeled reference to Figure 3.3-3, Section 3.3.5.4 *Aquatic Resources – Potential Impacts and Mitigation – Water Temperature* has been revised to correct the mistake. Volume III Attachment 1 presents the final Section 3.3 *Aquatic Resources*.

Comment ORG46-218

General comment on water temperature analysis as it relates to fish:

1. The discussion is incomplete. Although the DEIR cites Hamilton et al. (2011), Bartholow et al. (2005), and others, it does not appear that these source materials were adequately reviewed. For example, Hamilton et al. (2011) does indicate that removal of Iron Gate Dam would eliminate the thermal lag and improve timing of water temperatures in relation to historical migration periods.

However, Hamilton et al. (2011, pg. 73-74) goes on to cite Bartholow et al. (2005) and state that "...maximum recommended temperatures for juvenile rearing fall Chinook salmon between February 1 and July 1, 1962-2001 were exceeded 49 days with dams and 60 days without dams..." This indicates that water temperatures without the dams could be warmer more frequently than with the dams in place, a possible outcome that is not presented in the DEIR.

2. The DEIR analysis does not present a clear connection between water temperatures and fish health.

3. Use of one year (WY 2002 in Figure 3.3-5) presents an overly simplified view of the system and its variability, and is not representative of average conditions given that 2002 was a drought year. By choosing a drought year, the DEIR analysis makes it appear that effects of the Klamath Hydroelectric Project are worse than if a balanced set of representative years were chosen and a more complete and balanced discussion presented. PacifiCorp does not disagree with using example years in the analysis, but years used need to be chosen for specific reasons based on specific water-year criteria that illustrate the range of potential environmental conditions faced by the resource being considered. Please consider using a range of water year types (wet, average, dry) in the analysis.

Response to Comment ORG46-218

With respect to the comment regarding the EIR citation of Hamilton et al. (2011), please refer to Volume III Attachment 1 Section 3.3.5.4 *Aquatic Resources – Potential Impacts and Mitigation – Water Temperature* for a discussion of increased water temperatures during spring under the Proposed Project. An increase in spring water temperatures would increase the number of days that juvenile fall Chinook salmon would be exposed to temperatures above their thermal tolerances. However, a difference of 11 days between "with dams" and "without dams" scenarios over a period of 4,810 days (February 1 through July 1, 1962–2001) would be negligible, with 1.2 percent of days exceeding the thermal tolerance with the dams in place, and 1.0 percent of days without the dams in place. Volume III Attachment 1 presents the final Section 3.3 *Aquatic Resources*.

With respect to the comment regarding the connection between water temperatures and fish health, please refer to Section 3.3.5.4 *Aquatic Resources – Potential Impacts and Mitigation – Water Temperature* for a discussion of water temperature effects on fish growth and migration. Please refer to Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites* for a detailed discussion regarding water temperature effects on fish health.

With respect to the comment regarding water temperature variability in different water year types, Section 3.3.5.4 *Aquatic Resources – Potential Impacts and*

Mitigation – Water Temperature – Middle and Lower Klamath River Figure 3.3-5 uses the data from 2002 to present diel temperature fluctuations. See Master Response WQ-4 for a detailed description of how water temperatures reported for the period 2001–2012 are comparable to those reported for the period 2013–2015. Only three different water year types occurred for the period 2000–2004: dry (D), below normal (BN), and above normal (AN) (Figure ORG46-218-1). No effect is apparent between water year types in this period, apart from diel water temperature swings that may be tempered in the dry year compared to the above normal and below normal years.

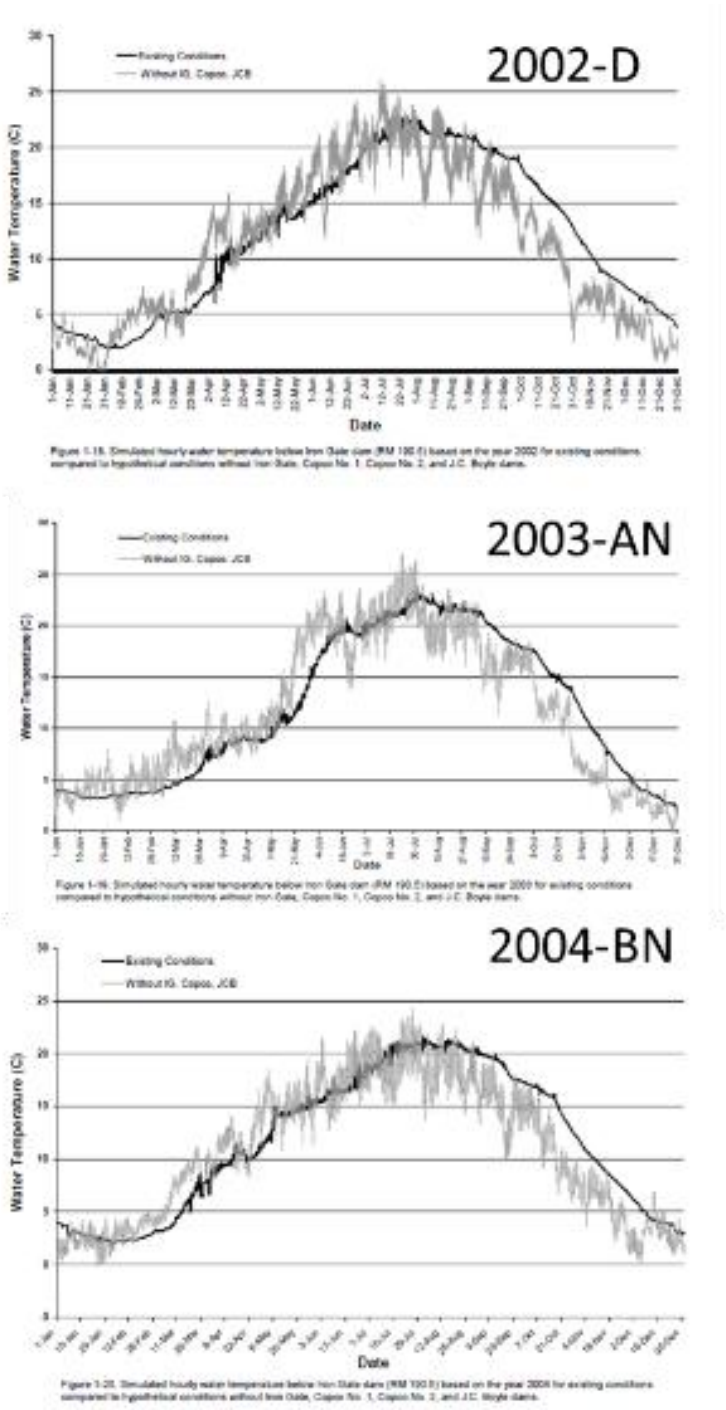


Figure ORG46-218-1. Simulated water temperature below Iron Gate with water year type included for 2002 (dry-D), 2003 (above normal-AN), and 2004 (below normal-BN).

Comment ORG46-219

Figure 3.3-5 in the DEIR provides simulated hourly water temperatures downstream of Iron Gate Dam for the Proposed Project with ranges of optimal temperature criteria for salmonid growth and migration. These criteria come from the U5EPA (2003). Instead of hourly water temperature data, the DEIR should plot and present the 7DADMax water temperature values because this is the metric that the U5EPA criteria presented in the DEIR are based on. It is misleading to present hourly water temperature data in relation to a metric that is based on the rolling 7-day average of maximum water temperatures. For example, the USEPA (2003) maximum 7DADMax value for salmonid migration is 20°C and for juvenile growth the criterion is a 7DADMax of 16°C. The 13°C to 20°C range for growth presented in the DEIR is based on an assumption of unlimited food availability; if food is limiting then the 7DADMax temperature range for optimal growth is reduced to 10°C to 16°C (USEPA 2003).

USEPA (2003) indicates that results from laboratory studies under food limited conditions is more reflective of environmental conditions that fish experience. Thus, the food assumption drives conclusions about which alternatives provide better growth conditions and should be explained as such in the DEIR. The DEIR should also note that if food is unlimited then competition for food between hatchery releases and natural-origin salmonids would be minimal.

The data in Figure 3.3-5 for July indicate s that river temperature for the Proposed Project does not drop below 23°C for about 10 days and existing conditions with dams in place moderate river temperature extremes. USEPA (2003) indicates that a 7-day exposure to water temperatures ranging from 23 to 26°C is lethal for salmonids; such conditions would persist following implementation of the Proposed Project.

The DEIR analysis indicates that variability in mainstem temperatures benefits feeding salmonids. Fish are expected to leave thermal refugia, migrate to the main river channel, feed, and return to the thermal refugia. Regarding fish movement and feeding, the DEIR speculates that the increase in maximum water temperatures for Proposed Project may be compensated for by lower temperatures at night. But this fish behavior already occurs under Existing Conditions as stated in the DEIR. Because the DEIR assumes that fish would reside in thermal refugia under both Existing Conditions and the Proposed Project, the amount of thermal refugia present under each is the more important factor than fish behavior. In reaches downstream of Iron Gate Dam, thermal refugia area would not increase under the Proposed Project. The DEIR should note that if thermal refugia is a limiting factor for successful rearing, then the elimination of hatchery juveniles may allow these refugia to support more natural-origin fish.

The DEIR does not acknowledge that whether fish growth is improved with higher water temperature, combined with more natural variation, depends upon

the assumption regarding food effects discussed previously. The DEIR states that "Foott et al. (2012) observed positive growth and no apparent effect of elevated temperature on immune function or fitness in Klamath River juvenile Chinook salmon held over a 23-day period under conditions in the laboratory that simulated fluctuating water temperature profiles similar to what would be observed in the Klamath River under the Proposed Project." (DEIR pg. 3-275). While this is basically correct, the details are important as they relate to late spring and summer water temperatures in the Klamath River. Review of Foott et al. (2012) as cited in the DEIR, shows significant differences in fork length (longer), sodium-potassium-ATPase (higher), and condition factor (higher) at the end of the 3-week study for a test group reared at average temperatures of 18°C compared to a group at 23°C (both groups held with variable daily temperature). Foott et al. (2012) fed fish at 2 percent of body weight per day, which is typical of hatchery-reared fish, so food was not limiting.

The DEIR is not consistent in describing the effects of decreased water temperatures on fish. In this section of the DEIR, the 1 to 2 degrees of variability in daily temperature is considered to have substantial benefits to fish, but these benefits are based on speculation, not the best available information. This is contrasted to elsewhere in the DEIR, where a 1- to 2-°C change in temperature of water released from Iron Gate Dam because of operations of the Iron Gate intake barrier curtain is considered modest at best.

In discussing water temperature effects, the DEIR should include information available in Appendix 5: Effects of Temperature, Dissolved Oxygen/Total Dissolved Gas, Ammonia and pH on salmonids (Carter and Kirk 2008), prepared for the California North Coast Regional Water Quality Control Board. Table 9 from Carter and Kirk (2008) illustrates the effects of water temperature on juvenile Chinook rearing and growth, and is provided below for convenience.

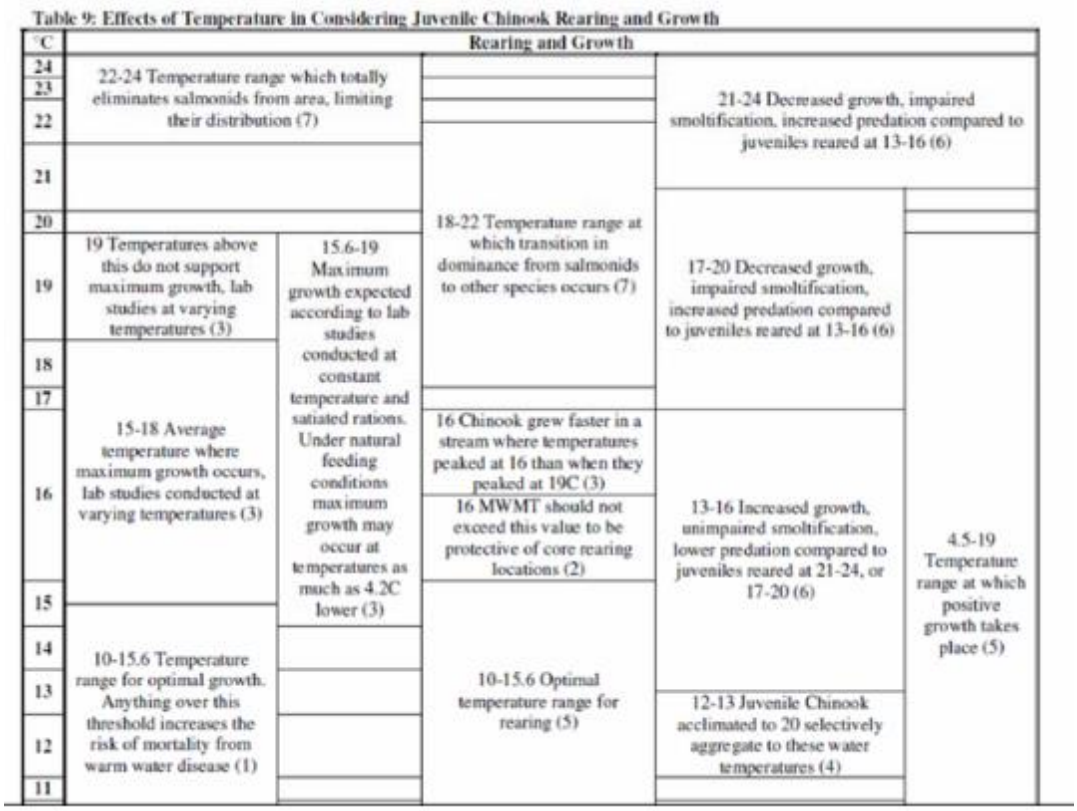


Table 9: Effects of Temperature in Considering Juvenile Chinook Rearing and Growth

°C	Rearing and Growth					
24	22-24 Temperature range which totally eliminates salmonids from area, limiting their distribution (7)			21-24 Decreased growth, impaired smoltification, increased predation compared to juveniles reared at 13-16 (6)		
23						
22						
21			18-22 Temperature range at which transition in dominance from salmonids to other species occurs (7)			
20						
19	19 Temperatures above this do not support maximum growth, lab studies at varying temperatures (3)	15.6-19 Maximum growth expected according to lab studies conducted at constant temperature and satiated rations. Under natural feeding conditions maximum growth may occur at temperatures as much as 4.2C lower (3)		17-20 Decreased growth, impaired smoltification, increased predation compared to juveniles reared at 13-16 (6)		4.5-19 Temperature range at which positive growth takes place (5)
18	15-18 Average temperature where maximum growth occurs, lab studies conducted at varying temperatures (3)					
17			16 Chinook grew faster in a stream where temperatures peaked at 16 than when they peaked at 19C (3)			
16			16 MWMT should not exceed this value to be protective of core rearing locations (2)	13-16 Increased growth, unimpaired smoltification, lower predation compared to juveniles reared at 21-24, or 17-20 (6)		
15						
14	10-15.6 Temperature range for optimal growth. Anything over this threshold increases the risk of mortality from warm water disease (1)		10-15.6 Optimal temperature range for rearing (5)			
13						
12				12-13 Juvenile Chinook acclimated to 20 selectively aggregate to these water temperatures (4)		
11						

Response to Comment ORG46-219

With respect to the comment regarding Figure 3.3-5, this figure includes simulated hourly data with U.S. Environmental Protection Agency (USEPA) temperature criteria to generally assess the patterns in water temperature predicted under the Proposed Project in relation to these criteria. The Section 3.3.5.4 *Aquatic Resources – Potential Impacts and Mitigation – Water Temperature* Figure 3.3-5 caption has been revised to clarify the metric associated with the USEPA criterion. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources.*

With respect to the comment regarding food availability and how it relates to water temperature, USEPA (2003) states “Generally, EPA believes that laboratory studies under limited food availability are most reflective of environmental conditions fish typically experience. However, there are likely situations where food is abundant, with the result that optimal growth temperatures would be higher. Thus, a particular [7-day average daily maximum] 7DADM numeric criteria will be more protective in situations where there is high diurnal variation and/or abundant food and will be less protective in situations where there is low diurnal variation and limited food.” The 7DADM is equivalent to the mean weekly maximum temperature (MWMT) used in the EIR. Figure 3.3-5 reflects a prediction of high diurnal water temperature variation during the late spring and summer under the Proposed Project.

Additionally, Volume I Section 4.2.3.2 *Alternatives – No Project Alternative – Aquatic Resources – Aquatic Resource Potential Impacts, Impacts, and Mitigation* Potential Impact 4.2.3-20 (page 4-58) discusses the potential effects on fish species from alterations to benthic macroinvertebrates due to continued operations of the Lower Klamath Project, and this section considers evidence of decreased macroinvertebrate drift within the Hydroelectric Reach due to current peaking operations. The comment notes that food may be unlimited (without citing any data), and thus competition among hatchery and native fish may be less acute. Based on existing information it is speculative as to whether or not food is limiting fish species under existing conditions. No detailed information on food availability, juvenile rearing densities, and fish bioenergetics have been collected for the Klamath River. Therefore, the analysis of the Proposed Project in the EIR does not rely on speculation regarding whether food is limiting or not, and instead relies on available information to support the impact analyses.

Competition between natural-origin and hatchery salmonids given unlimited food resources may be decreased compared to a condition of limited food availability; however, the assertion that competition would be minimal is unfounded. Please refer to Volume I Section 4.7.3 *Alternatives – No Hatchery Alternative – Aquatic Resources* (page 4-305) for a discussion of competition for thermal refugia between hatchery-derived and natural-origin rearing juvenile salmonids.

Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* describes the analysis of reduced hatchery production on the growth and survival of natural origin smolts. As explained above, based on existing information this analysis considers ecological impacts regardless of assumed food limitations. Rearing salmonids compete for resources of food and space, and the available information (e.g., McMichael et al. 1997) indicates that reduced competition with hatchery produced fish would support potential increased growth rates of naturally produced fish. Volume III Attachment 1 presents the final Section 3.3 *Aquatic Resources*.

With respect to the comment regarding Figure 3.3-5 and lethal water temperatures, note that Figure 3.3-5 is not presented as a comprehensive analysis of water temperatures under the Proposed Project. Please refer to Section 3.2.5.1 *Water Quality – Potential Impacts and Mitigation – Water Temperature* Potential Impact 3.2-1 for a more detailed discussion of water temperature under the Proposed Project. In addition, Section 3.3.5.4 *Aquatic Resources – Potential Impacts and Mitigation – Water Temperature* discusses the occurrence of cold-water tributaries and springs that act as thermal refugia when temperatures reach levels stressful to salmonids. Volume III Attachment 1 presents the final Section 3.2 *Water Quality* and the final Section 3.3 *Aquatic Resources*.

Please refer to Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Fish*

Hatcheries for a discussion of competition for thermal refugia between hatchery-derived and natural-origin rearing juvenile salmonids. Volume III Attachment 1 presents the final Section 3.3 *Aquatic Resources*.

With respect to the comment's assertion that higher water temperatures under the Proposed Project may decrease growth, condition factor, and potassium-ATPase if food is limited, Foott et al. 2012 states "Elevated water temperature did not exert an obvious effect on the immune functions or general health of juvenile Klamath R. Chinook salmon. Basal levels of plasma cortisol values in 23º mean daily temperatures (MDT) salmon sampled at week 2 and 3 suggest that they had acclimated to the elevated temperature. Additionally, 23ºMDT salmon had a positive (albeit slight) growth rate over the experiment." Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-20 discusses decreased macroinvertebrate drift within the hydroelectric reach due to current peaking operations, which would be eliminated under the Proposed Project. It is unknown if food is limiting or unlimited under current operations. Volume III Attachment 1 presents the final Section 3.3 *Aquatic Resources*.

With respect to the comment's assertion that the EIR is not consistent when describing the effects of decreased water temperature, as described in response to comment ORG46-180, Section 3.3.4.4 *Aquatic Resources – Impact Analysis Approach – Water Temperature* has been revised to clarify the water temperature criteria used to evaluate potential impacts of the Proposed Project. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

With respect to the comment's assertion that the EIR should include Table 9 from Carter and Kirk (2008), while this table provides a detailed summary of temperature criteria collected from various studies on juvenile chinook rearing and growth, the EIR presents a summary of the USEPA (2003) criteria that were appropriately applied to evaluate water temperature under the Proposed Project in Section 3.3.4.4 *Aquatic Resources – Impact Analysis Approach – Water Temperature*. Volume III Attachment 1 presents the final Section 3.3 *Aquatic Resources*.

Comment ORG46-220

The DEIR claims that there are lower minimum water temperatures in the spring under the Proposed Project; a statement that is difficult to reconcile with the data presented in Figure 3.3-5. Depending on the definition of spring, this claim is not supported by the data in Figure 3.3-5, which indicates temperatures with dams in place are generally cooler from February through June than would be experienced under the Proposed Project.

Response to Comment ORG46-220

Section 3.3.5.4 *Aquatic Resources – Potential Impacts and Mitigation – Water Temperature – Middle and Lower Klamath River* Figure 3.3-5 (shown below) depicts increased variability in daily water temperatures during spring and early- to mid- summer (April through July). The figure clearly shows that during the latter half of spring to mid-summer (June through July) daily minimums are predicted to be less than occurs under existing conditions, and therefore may provide increased thermal refugia at night. Volume III Attachment 1 presents the final Section 3.3 *Aquatic Resources*.

Comment ORG46-221

The DEIR relies upon a high degree of speculation and outdated analysis to conclude that the Proposed Project will reduce fish disease infection rates of salmonids in the Klamath River. The DEIR cites the conclusion of FERC (2007) that a greater distribution of salmonids would presumably reduce crowding and the concentration of disease pathogens released from adult carcasses. However, while removal of the dams may allow Chinook (and Coho) to migrate through a larger reach of the Klamath River (an outcome also achievable through the fish passage alternative), polychaetes are found throughout the river, not just downstream of Iron Gate Dam. Infection or polychaetes will continue to occur as adult Chinook and Coho become infected migrating upstream through the Klamath River. Once these infected salmon pass the current location of Iron Gate Dam, presumably to spawn and eventually die, those spores will be released into the water to be ingested by existing polychaetes. C. shasta will not somehow be limited to the river downstream of Iron Gate. Research by CDFW (Foott et al. 2016) has shown that relatively few very highly infected adult Chinook carcasses are capably of fully seeding the polychaete population.

Further, researchers from Oregon State University have routinely harvested polychaetes from the J.C. Boyle Bypass Reach (upstream of the large Copco and Iron Gate reservoirs, which are supposed to be an important planktonic food resource contributing to polychaete density downstream of Iron Gate Dam) because these populations are some of the densest anywhere in the river (Alexander et al. 2016b). This recent information contradicts the hypothesis advanced in the DEIR that planktonic food sources from the large Klamath Hydroelectric Project reservoirs contribute to higher polychaete densities downstream of Iron Gate Dam, and reducing or eliminating spawner density may play a determinant role in reducing fish disease transmission. To indicate that spreading out the Chinook population would reduce their proximity to polychaete populations and therefore somehow reduce disease rates is not supported in the DEIR and contrary to the most recent understanding of fish disease dynamics in the Klamath.

Related, while FERC's (2007) conclusion may have been valid based on the state of knowledge at that time, a great deal has been learned about C. shasta since then. The DEIR should assess the current state of the knowledge

regarding infectious zones, infection rates, polychaete dynamics, etc. before reaching conclusions because more recent scientific work does not support the conclusions reached by FERC (2007) with respect to the effect of the Klamath Hydroelectric Project dams on fish disease.

Response to Comment ORG46-221
The EIR's analysis of disease risk upstream of Iron Gate Dam considers available information, including FERC (2007) as well as more recently available publications and reports. Some conclusions of FERC (2007) continue to be affirmed by more recent information, whereas other conclusions have been revised based on more recent information that is cited and discussed in the EIR. Please also refer to Master Responses AQF-5 and AQF-6, which include descriptions of clarifications and minor modifications to the EIR analysis related to fisheries disease risk upstream and downstream of Iron Gate Dam. Volume III Attachment 1 presents the final Section 3.3 *Aquatic Resources.*

Please further note that the presence of dense periphyton growth upstream of Iron Gate and Copco reservoirs does not indicate that the reservoirs do not contribute nutrients to downstream periphyton concentrations, as indicated in the comment. As described in the EIR, a host of factors (e.g. flows, stability of substrate, and available nutrients) influence the density of periphyton growth in the Klamath River. See, e.g. Volume I Section 3.4.2.2 *Phytoplankton and Periphyton – Environmental Setting – Periphyton* (pages 403-404).

Comment ORG46-222
The DEIR states "For adult salmon, Ich and columnaris have occasionally resulted in substantial mortality, particularly when habitat conditions include exceptionally low flows, high water temperatures, and high densities of fish (such as adult Chinook salmon migrating upstream in the fall and holding at high densities in pools)." The DEIR does not acknowledge that the most severe documented outbreaks of these diseases, such as occurred during the 2002 fish kill, were not influenced by the Klamath Hydroelectric Project, which does not significantly impact river flows and which did not have temperature effects as far downriver as the location where fish succumbed to these diseases.

The DEIR should also note that because the Proposed Project is expected to increase fall-run Chinook abundance, but not alter river temperature downstream of the Salmon River, mortality to adult Chinook from disease could be higher under the Proposed Project if this increase in abundance actually occurs.

Response to Comment ORG46-222
Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites* states that, "For adult salmon, Ich and columnaris have occasionally resulted in substantial mortality, particularly when habitat conditions include exceptionally low flows, high water temperatures, and high densities of fish (such as adult Chinook salmon migrating upstream in the fall and holding at

high densities in pools)." The EIR does not indicate that the most severe documented disease outbreaks were caused by the Klamath Hydroelectric Project (KHP). In addition, please see response to comment ORG46-174 for a description of minor modifications made to the EIR that further clarify the generally understood causes of the 2002 fish kill.

The suggestion that increased fall-run Chinook salmon abundance could lead to increased mortality from disease outbreaks over-simplifies the causes of the 2002 fish kill that is not based on evidence provided by the comment or available in the scientific literature. Contrary to this suggestion, during the years with highest fall-run Chinook salmon returns, no fish kills have occurred. Environmental conditions in the Klamath River at the time of the 2002 fall-run Chinook salmon run were characterized by low flow rates and volume, and an apparent lack of migration cues to proceed upriver. The resultant migration delay, crowded conditions, and warm water temperatures provided an ideal environment for the proliferation of Ich and columnaris resulting in the observed high mortality. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment ORG46-223

The DEIR refers to abnormally large concentrations of spawners and carcasses downstream of Iron Gate Dam but never defines what is meant by 'large concentrations.' The DEIR needs to provide a specific numerical definition because it is important for determining whether expected fall-run Chinook spawning density in newly opened habitat would be substantially different. The DEIR uses the modeling results from Hendrix (2011), which indicate that without harvest occurring in ocean and freshwater fisheries an average of 23,000 adult fall-run Chinook would be produced in the river reach from Iron Gate Dam to Keno Dam (about 45 river miles) or roughly 511 fish per mile However, this fish per mile value would change depending on harvest rate, although the Hendrix (2011) modeling assumes no harvest. This fish per mile value would also change depending on the proportion of fish spawning in tributaries and tributary location in the reach. Adult returns can be two to three times higher in good survival years. Additionally, the fish per mile value in the Hendrix (2011) model assumes that fish are evenly distributed over the 45 river miles, which will not be the case given that fall-run Chinook spawning habitat is generally limited to a percentage of the riverine habitat and not all 45 river miles is suitable spawning habitat.

The DEIR should further present data reported by Romberger et al. (2017) and Gough and Som (2017), which show that spawner carcasses for the reach extending from the Shasta River (RM 177) to Indian Creek (RM 107) and Iron Gate (RM 190) to Carson Creek (RM 180) average from about 66 to 493 fish per mile, respectively. If the normal concentration of adults per mile is closer to 66 fish per mile, then this has consequences for the expected decrease in fish abundance from Iron Gate to Carson Creek and the expected production from

Iron Gate Dam to Keno Dam under the Proposed Project as well as other alternatives. These variations reflect on the uncertainty associated with the Proposed Project that is not discussed in the DEIR.

The DEIR does not acknowledge the complexities of the relationship between the numbers of adult fall-run Chinook and disease rates. Specifically, the DEIR should consider that Bartholomew and Foott (2010) reported that there does not appear to be a direct relationship between numbers of returning adults and disease severity in juvenile fish in the infectious zone during the following spring. This observation and further work by Foott et al. (2016) indicate that a low number of infected adult salmon, just over 7 percent in this study, were responsible for 76-95 percent of the total spore count in a given season; a spore load sufficient to maintain high infection prevalence in polychaetes. Thus, high spawner density does not appear to be a factor that, if reduced, would be likely to reduce the high infection prevalence.

Overall, the DEIR does not acknowledge that there is considerable uncertainty in future outcomes of each analysis alternative related to fish production and disease effects. The DEIR does not use consistent logic and assumptions in the analysis. If disease effects are expected to be reduced because of a decrease in spawners in one reach, then the expected increase in spawners to other reaches should not exceed the definition of an abnormally large spawner concentration. Because no criterion is established for abnormally large, the DEIR analysis may improperly claim benefits from both decreasing disease and increasing Chinook abundance while not clearly presenting the logic supporting such a counterintuitive conclusion and not recognizing that these factors may act against each other.

Response to Comment ORG46-223

With respect to the relationship between carcass density and disease risk, and as discussed in the EIR and in Master Responses AQF-5 and AQF-6, the current infectious zone and high parasite loads downstream of Iron Gate Dam are the result of a synergistic effect of numerous disease factors, of which carcass density is one. The set of factors is discussed in detail in Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites*, within the context of not only fluctuating carcass density and the implications for reduced carcasses downstream of Iron Gate Dam, but also with consideration for the numerous other risk factors. In light of the synergistic interaction of these factors, it would not be appropriate to develop a separate threshold for “large concentration.” Please note that increased run size abundance alone, unlike carcass concentration, is not a risk factor in development of a nidus.

In addition, please note that the carcass data cited in the comment are averaged for reach lengths of greater than 10 miles, which masks the carcass densities directly downstream of Iron Gate Dam in the vicinity of Iron Gate Hatchery. If a longer period of record (2000 through 2018) and more precise reach lengths are

considered, under current conditions adult salmon carcasses in the 5.6-mile (9.0-kilometer) reach downstream of Iron Gate Dam to the Shasta River average 5,127 carcasses per year, with an estimated average density of 916 carcasses per mile (mi) (570 carcasses per kilometer [km]) (S. Gough, USFWS, pers. comm., June 2019). Within the area directly downstream of Iron Gate Dam (within 0.3 miles [0.5 km]), carcass estimates have averaged 396 (ranging from a low of 17 to a high of 1,592); corresponding to a density averaging 1,321 carcasses/mile [3,183 carcasses/km], and ranging from 57 carcasses/mile (99 carcasses/km) to 5,307 carcasses/mile (3,184 carcasses/km). By considering a more precise reach length in the immediate vicinity of Iron Gate Dam and Iron Gate Hatchery, it is apparent that average carcass densities in this reach are much higher than the 66 to 493 fish per mile estimates cited in the comment from Romberger and Bell (2017) and Gough and Som (2017). These increases in density are relevant to the multi-factored consideration of disease risk. Therefore, the recent observations of lower carcass densities in the 10-mile reach downstream of Iron Gate Dam, and the fluctuations in carcass densities, do not result in a revision to the conclusions or significance calls in the EIR. As discussed in Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites*, access to a substantial amount of additional habitat within Klamath River tributaries and mainstem reaches upstream of Iron Gate Dam is anticipated to support greater dispersal of returning adult Chinook salmon, resulting in fewer congregations of carcasses than under existing conditions. With respect to the comment's citation of Hendrix (2011) predictions to express the concern that increased fall-run Chinook salmon abundance would increase disease risk upstream of Iron Gate Dam following dam removal, please note that the EIR analysis does not assume that there would be no harvest for fall-run Chinook salmon. As discussed in detail in Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-7, under the Proposed Project estimated Chinook salmon abundance in the reach upstream of Iron Gate Dam to Keno Dam is predicted to increase by a median of 10,000 Chinook salmon (Hendrix 2011) within an estimated 80 miles of suitable spawning habitat in Klamath River tributaries and the mainstem (DOI 2007, Cunanan 2009). Although Chinook salmon spawning is not expected to be evenly distributed, if it were, this could result in carcass density upstream of Iron Gate Dam of around 125 carcasses per mile (78 carcasses per km). Even if, as expected, spawning is unevenly distributed, a much lower carcass density than currently observed downstream of Iron Gate Dam is anticipated owing to access to substantial amounts of additional habitat, and environmental factors supporting large congregations of adult migrants. The addition of data describing carcass densities under current conditions is consistent with the analysis and conclusions in the EIR. Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites* has been revised accordingly. Please refer to Volume III Attachment 1 Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites* for the revisions. Please also refer to Master Responses AQF-5, AQF-6, and AQF-8.

Comment ORG46-224

The infectious zone has changed in the 8 plus years since the source cited in the DEIR and changes almost annually. In 2016, the infectious zone extended from the I-5 Bridge over the Klamath River to Orleans (about 120 river miles), in 2017 it contracted upstream from the I-5 Bridge to Seiad Valley (about 50 river miles) (Bartholomew et al. 2018).

Response to Comment ORG46-224

Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Disease and Parasites* has been revised to clarify the description of the infectious zone. Please refer to Volume III Attachment 1 Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Disease and Parasites* for the revisions. The EIR states that the precise location of the nidus downstream of Iron Gate Dam is related to numerous factors and therefore the zone of highest infectivity can vary on an annual basis. The revisions to Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Disease and Parasites* to further discuss the specific locations of the nidus in recent years are consistent with the analysis in the Draft EIR and do not change any significance determinations. Please also refer to Master Response AQF-6.

Comment ORG46-225

The DEIR states (in reference to bedload movement downstream of Iron Gate Dam) that "This increased movement and transport of sediment (sand, silt, and clay) is anticipated to disrupt polychaete habitat from the current location of Iron Gate Dam to downstream from Shasta River, resulting in reduced actinospore releases." Presumably this disruption would come in the form of scour of polychaetes, but the DEIR does not support this assertion. The DEIR tails to make use of recent studies relating polychaete reactions in response to flow changes including the observation that while polychaetes were removed from substrates by increasing flows (with specific dislodgment flows that varied depending on the substrate), polychaetes also exhibited a variety of behavioral reactions to flow changes and proved to have relatively high survival rates (Malakauskas et al. 2013).

Additionally, the DEIR fails to acknowledge that recent research indicates that the magnitude of high flows that may be necessary to induce scour that could disrupt polychaete habitat (see Shea et al. 2016) are above the thresholds of flows that are expected to be achieved from the Proposed Project. That is, removal of the Klamath Hydroelectric Project is not anticipated to increase peak flows above baseline conditions with the hydroelectric dams in place to result in significant scour effects. Thus, recent research indicates that scour may be ineffective at combating polychaete densities that contribute to high infectious rates in the Klamath River, and recent research also indicates that the expected

hydrologic changes from the Proposed Project are unlikely to result in flows that could accomplish scour anyway.

Response to Comment ORG46-225
PacifiCorp asserts that the Draft EIR fails to make use of the recent studies discussing polychaete reactions to river flow changes. Please refer to Master Response AQF-6 for a discussion of minor revisions to the EIR to include the recent research of Malakauskas et al. (2013) and for a discussion of the recent research on the magnitude of high flows that may be necessary to induce scour that could disrupt polychaete habitat.

Comment ORG46-226
General comments on the disease discussion:

- *This section of the DEIR is full of presumptions and lacking up-to-date data and information. Oregon State University has been monitoring infection rates, spore loading, fish mortality rates, and other factors on an annual basis for USBR and none of this information is used in the document.*
- *The connections between what could happen post-dam removal is speculation and is not supported in the DEIR with a reasonable analysis. There are an abundance of terms like "may disrupt," "is presumed to," "presumably," etc., all of which point to the uncertainty associated with the effects of dam removal on fish disease.*

The assertion that the removal of the Klamath Hydroelectric Project would disrupt microhabitats for polychaetes is not supported with current two- and three-dimensional modeling that is available (see Alexander et al. 2016a) to actually evaluate the changes in microhabitat resulting from flow changes.

Response to Comment ORG46-226
With respect to up-to-date data and information included in the fish disease discussion, please refer to response to comment ORG46 -184 and ORG46-185 for a summary of minor modifications to the EIR to incorporate recent data. The modifications do not change any significance determinations.

With respect to the EIR discussion of post-dam removal conditions, Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites* incorporates appropriate and available science to predict the potential effect of the Proposed Project on the risk of fish disease. The section discloses the scientific basis and areas of uncertainty associated with predictions.

With respect to the potential for polychaete microhabitat disruption by flow changes, Section 3.3.2.3 *Aquatic Resources – Environmental Settings – Habitat Attributes Expected to be Affected by the Proposed Project – Disease and Parasites* describes existing data supporting the prediction that increased flow variability, including increased water velocities, are likely to reduce habitat suitability for polychaetes under the Proposed Project. While the comment

asserts that the research of Alexander et al. (2016) does not support the EIR discussion regarding dam removal and reduced habitat for polychaetes, the research of Alexander et al. (2016) found that *M. speciosa* distribution is influenced by hydraulic and substrate suitability, and the factors identified in Alexander et al. (2016) that reduce polychaete populations (e.g., increased water velocities, decreased substrate size, and increased bedload mobility) are all related to dam removal. Alexander et al. (2016) conclude that investigating the potential utility of flow modification to reduce Klamath River *M. speciosa* populations has significant merit, and overall their findings are consistent with the analysis and conclusions in the EIR. Please also refer to Master Response AQF-6.

Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment ORG46-227

The DEIR states "Warm water temperatures increase risk of disease transmission. Dam removal would mean cooler temperatures in the late summer and fall, but slightly warmer temperatures during spring and early summer." The DEIR does not clearly describe the location of fish losses downstream of Iron Gate Dam, or the life-stage affected, and the disease causing the losses. The DEIR states that the Proposed Project affects stream temperatures downstream as far as the Salmon River (RM 66). As previously noted in these comments, PacifiCorp model results (see PacifiCorp 2004a, 2008) show that the "thermal lag" effects of the Klamath Hydroelectric Project reservoirs on water temperatures downstream of Iron Gate Dam (RM 190) progressively diminish until reaching a downstream location where effects are absent. From December through July, the effects are within model error or absent by the time the river reaches the confluence with the Scott River (RM 143.9). In August and November, the effects are absent by the time the river reaches Seiad Valley (RM 120), and in September and October, by the time the river reaches the confluence with Clear Creek (RM 95). In no cases does modeling indicate that effects of the thermal lag extend to the confluence with the Salmon River (RM 66). The DEIR fails to accurately reflect existing conditions and the impacts of the Proposed Project.

The DEIR states, and PacifiCorp' s prior water quality modeling (PacifiCorp 2006, 2014) confirms, that the spring water temperatures are higher under the Proposed Project which could increase C. shasta disease rates because polychaete hosts develop spores more quickly under warmer water conditions. The DEIR spends a great deal of time noting the severity of C. shasta for Klamath River salmonid populations, but fails to acknowledge that dam removal has the potential to exacerbate C. shasta infection prevalence and does not discuss this effect of the Proposed Project in any detail. The DEIR is required to present both positive and negative effects of the Proposed Project.

Response to Comment ORG46-227
Section 3.3.2.3 *Aquatic Resources – Environmental Settings – Habitat Attributes Expected to be Affected by the Proposed Project – Disease and Parasites* summarizes the location of fish losses downstream of Iron Gate Dam, life stages affected, and the diseases causing the losses under existing conditions. Please also refer to response to comments ORG46-222, ORG46-224, and AQF-6.

Regarding the thermal lag comment, please refer to responses to comments ORG46-84 and ORG46-91 through ORG46-93.

Please refer to Section 3.3.5.5 *Aquatic Resources – Environmental Settings – Potential Impacts and Mitigation – Fish Disease and Parasites* for a discussion of the effects of warmer water during spring on risk of disease transmission. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*. Please also refer to Master Response AQF-6.

Comment ORG46-228
The DEIR should clarify how the 2017 United States District Court ordered flow requirements are included the analysis presented in the DEIR. The DEIR acknowledges that "the Proposed Project would not result in major flow alterations," and yet this paragraph goes into detail about the 2017 United States District Court ordered flow requirements, which are related to USBR's operation of its Klamath Irrigation Project, and not the operation of the Klamath Hydroelectric Project (see Hoopa Volley Tribe v. National Marine Fisheries Service et al., 230 F.Supp.3d 1106 (2017)). This paragraph then continues, "Because polychaete populations are located outside of the main flow along the margins of the river (Bartholomew and Foott 2010), variable flows disrupt this habitat. Therefore, removal of the Lower Klamath Hydroelectric Project dams would disrupt microhabitat conditions and is expected to reduce polychaete populations (Stocking and Bartholomew 2007, Bartholomew and Foott 2010) and presumably, reduce infection rates within polychaete populations both in the short and long term (Hetrick et al. 2009)." The DEIR fails to acknowledge that current operations of the Klamath Hydroelectric Project, consistent with Endangered Species Act requirements, include provisions for variable now delivery. As previously acknowledged earlier in the paragraph in the DEIR, removal of the Klamath Hydroelectric Project dams is not expected to result in major now changes. Thus, it is unclear how flow variability that could result from the Proposed Project would produce conditions that could disrupt microhabitat conditions and reduce polychaete populations and therefore infection rates. The DEIR here fails to acknowledge that now variability can be achieved, and is currently being achieved, through modified operations of the Klamath Hydroelectric Project. Indeed, the available reservoir storage of the Klamath Hydroelectric Project and ability to manipulate flows through relatively precise modifications of Iron Gate Powerhouse releases, and, at higher flows, releases from the upstream Copco No. 1 and No. 2 developments, create opportunities for managed now variability in the Klamath River that will be more difficult to achieve

under the Proposed Project. The DEIR should acknowledge that the Proposed Project has the potential to reduce management tools to address fish disease by constraining the ability to deliver flushing and variable flows without impacting upstream irrigation operations or causing impacts to other aquatic resources, such as through reduced Upper Klamath Lake levels as a result of flushing now operations that can currently be delivered primarily from Klamath Hydroelectric Project reservoir storage.

Response to Comment ORG46-228
With respect to how 2017 court-ordered flows are included in the EIR analysis, please see Volume III Attachment 1 Section 3.1.6 *Introduction – Summary of Available Hydrology Information for the Proposed Project*, Master Response HYD-1 for a discussion of the 2019 BiOp flows (i.e., the current flow requirements), and the response to comment ORG46-166.

With respect to the comment regarding flow variability under the Proposed Project and conditions that could disrupt microhabitat conditions and reduce polychaete populations, Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites* accurately describes the effects of the Proposed Project on flow variability by stating, "…elimination of the Lower Klamath Project would create more flow variability due to peak flows from storm events no longer being retained in Lower Klamath Project reservoirs," while noting that flows would continue to be controlled by Keno Dam and the 2019 BiOp, and would be within the range of historical conditions. For additional detail, please also refer to Master Response FLD-1. As discussed in Section 3.11.4.3 *Geology, Soils, and Mineral Resource – Impacts Analysis Approach – Bedload Sediment*, the Proposed Project would have the effect of increasing sediment supply and transport and creating a more dynamic and mobile bed downstream of Iron Gate Dam, which as predicted by Bartholomew and Foott (2010), would disrupt microhabitat conditions from the increased frequency of sediment mobilization due to the decrease in median particle size. Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites* has been revised to clarify causes of flow variability. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

With respect to the potential for the Proposed Project to reduce management tools to address fish disease, flow releases, including flushing flows, are determined by the United States Bureau of Reclamation (USBR) Klamath Irrigation Project, which is currently required to operate flows in accordance with the 2019 BiOp (USBR 2018a; NMFS 2019; USFWS 2019a), and is independent of the Proposed Project. Implementation of the Proposed Project, including removal of the J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate dams, does not impact flows required for the USBR Klamath Irrigation Project, including flows for management of *C. shasta*. For information on the flow releases under the 2019 BiOp, please refer to Volume III Attachment 1 Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project* and Volume III

Attachment 1 Section 3.11.4.1 *Geology, Soils, and Mineral Resource – Impacts Analysis Approach – Flows*. Note that the 2019 BiOp does not require flows equivalent to the 2017 court-ordered flushing and emergency dilution flows, which included flow releases averaging 11,250 cubic feet per second (cfs) for 24-hours downstream of Iron Gate Dam, that were in effect in the interim prior to the 2019 BiOp.

Comment ORG46-229

The current infectious zone is further downstream from Iron Gate Dam than is indicated in this paragraph. The DEIR should consider the information available from Oregon State University through 2018. (https://microbiology.science.oregonstate.edu/content/monitoring-studies).

Surface flushing flows are released from Link River Dam and ultimately Iron Gate Dam at USBR's direction to enhance sediment transport throughout the upper Klamath River, not just downstream of Iron Gate Dam. The DEIR asserts that this action has contributed to reduction in disease rates, but there is no real evidence provided to support that and as the DEIR notes, "...the flow regime has not, in isolation, been successful in avoiding high disease concentrations." There is no evidence presented to support the assertion that a new infectious zone would not develop elsewhere.

Response to Comment ORG46-229

With respect to the comment regarding the location of the current infectious zone downstream of Iron Gate Dam, please refer to response to comment ORG46-224.

Regarding the concern that a new infectious zone could develop elsewhere in the Klamath River under the Proposed Project, Volume III Attachment 1 Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites* does not express certainty regarding whether a new nidus would form under the Proposed Project, but rather this section assesses the *risk* of the formation of a new nidus elsewhere. The EIR concludes that such formation would be unlikely.

Comment ORG46-230

This paragraph is rife with assumptions and qualitative statements that influence the reader in the absence of supporting information (e.g., 'however unlikely'). The DEIR seems to allow for the possibility that the Proposed Project may result in infection of Chinook occurring upstream of Iron Gate Dam - an event incorrectly attributed to continued hatchery operations - and the necessity of surface flushing flows "from a new upstream location" to disrupt C. shasta life cycles even though those surface flushing flows have not been shown to be effective. To achieve a surface flushing flow, USBR would have to release water from Keno Dam; USBR is proposing such an action, but from Iron Gate Dam, in its current biological assessment (USBR 2018a). The lack of specifics in the

DEIR (e .g., Keno Dam as a release location) illustrates the lack of understanding of the Klamath River and operations of water management by the authors of the DEIR.

Response to Comment ORG46-230
Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites* has been revised to clarify how the 2019 BiOp Flows would be likely to affect the potential for fish disease in the reach from Keno Dam to Iron Gate Dam under the Proposed Project. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources.* Please also see Master Response AQF-5 for additional discussion of the potential for fish disease upstream of Iron Gate Dam.

Comment ORG46-231
While the DOI did in fact recommend trap and haul of Chinook around Keno Reservoir, that was in the context of a relicensed Klamath Hydroelectric Project. It is unclear what authority DOI would have to impose such conditions on USBR; recall that USBR who will own Keno Dam if the KHSA is fully implemented.

The DEIR indicates that high rates of infection downstream of Iron Gate Dam are a function of the dam and the hatchery concentrating adult salmon. If conditions in Keno Reservoir constitute a water quality barrier and salmon would not be able to pass through the reservoir, they would congregate downstream of Keno Dam. Using the DEIR's logic, a concentration of Chinook in this area would form a new C. shasta infectious hot-spot.

The next paragraph in the DEIR goes on to say that Chinook historically concentrated their spawning in the Sprague River, but the previous paragraph said that they probably would not be to successfully pass Keno Reservoir. These apparent contradictions in the DEIR makes it difficult to understand the effects of the Proposed Project.

Response to Comment ORG46-231
Please note that the section the comment references refers the reader to a discussion of Department of the Interior's (DOI's) fish passage recommendations in Section 3.3.5.3 *Aquatic Resources – Potential Impacts and Mitigation – Water Quality.* Please note that Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites* has been revised to make minor modifications to the analysis of the risk of a nidus forming upstream of Iron Gate Dam under the Proposed Project. Please refer to Volume III Attachment 1 Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites* for the revisions. Please also refer to Master Response AQF-5.

Comment ORG46-232

There has been a great deal of copying from previous work with little effort to actually assimilate the information in those documents, update it, and prepare a concise discussion of the current status of fish disease on the Klamath River. For example, the beginning of the second paragraph in the DEIR is strikingly similar to that in the 2012 KHSA EIS/ EIR (DOI and CDFW 2012). Specifically, in this sentence in the DEIR:

"The current infectious zone and high parasite loads below Iron Gate Dam are the result of a synergistic effect of numerous factors that occur within the current disease zone in the Klamath River from the reach from Shasta River downstream to Seiad Valley (FERC 2007, Hamilton et al. 2011, Bartholomew and Foott 2010." The italicized part is a direct quote from the 2012 KHSA EIS/EIR (DOI and CDFW 2012 see Volume 1, pg. 3.3-42).

Similarly, the following sentence that discusses the factor associated with the infectious zone is only different by a few minor editorial changes from that in the 2012 KHSA EIS/EIR.

From the DEIR (at 3-279): "These factors include: (1) close proximity of myxospore-shedding carcasses (concentration of carcasses); (2) abundant polychaete populations that are found in atypically stable habitats; (3) suitable water temperatures (greater than 59°F) during periods when juvenile salmonids are present; and 4) low flow variability (Bartholomew and Foott 2010). This synergy would be unlikely in the Upper Klamath River (Hamilton et al. 2011)."

From the FEIS (DOI and CDFW 2012 Volume 1 at 3-3-42): "Factors associated with the current infectious zone and high parasite loads include: 1) close proximity of myxospores-shedding [sic] carcasses (concentration of carcasses), 2) abundant polychaete populations that are found in atypically stable habitats, 3) permissible temperatures (>15 C) during periods when juvenile salmonids are present and 4) low flow variability (Bartholomew and Foott 2010). This synergy would be unlikely in the Upper Klamath River."

Because the DEIR fails to take into account more recent scientific information, it provides an outdated analysis that portrays undue certainty that the Proposed Project will result in improved fish disease conditions for salmonids. The "synergistic effects" that are purportedly responsible for the high prevalence of fish disease in the Klamath River is attributed to: 1) high concentration of infected spawners; 2) abundant polychaete habitats from stable flow conditions; 3) suitable water temperatures (warmer than 59°F) when juvenile salmonids are present; and 4) low flow variability. As previously noted, this analysis is flawed (see comment 3.2-34).

Regarding factor 1, high concentration of infected spawner, recent work undertaken by Foott et al. (2016) indicates that a low number of infected adult

salmon, just over 7 percent, were responsible for 76-95 percent of the total spore count in a given season; a spore load sufficient to maintain high infection prevalence in polychaetes. Thus, high spawner density does not appear to be a factor that, if reduced, would be likely to reduce the high infection prevalence.

Regarding factor 2, abundant polychaete habitats from stable flow conditions, the DEIR does not consider its own conclusion that "the Proposed Project would not result in major flow alterations" (DEIR pg. 3- 277), which means that flows sufficient to achieve bedload movement and scour (Shea et al. 2016) are unlikely to be provided by the Proposed Project, and that scour may not be very effective at reducing polychaete concentrations due to the relatively high survival rates of polychaetes in response to flow alterations (Malakauskas et al. 2013).

Regarding factor 3, suitable temperatures, the DEIR does not acknowledge that the Proposed Project will result in increased water temperatures downstream of Iron Gate Dam in the late winter and spring when juvenile salmon are present, resulting in a more rapid development of C. shasta and a greater chance of disease infection than current conditions.

Regarding factor 4, low flow variability, the DEIR does not consider that flow variability is currently being provided under current operations of the Klamath Hydroelectric Project to mitigate the effects of current operations (PacifiCorp 2012), that flow variability may actually be reduced under the Proposed Project as hydroelectric reservoir storage and variable powerhouse releases are no longer possible, and that flow management under USBR's biological opinion is likely to result in Klamath River flows similar to those experienced under current conditions (see USBR 2018a for the proposed flow conditions presently being considered by USBR).

Further, the DEIR does not consider that polychaete habitat could increase under the Proposed Project as upstream river segments currently within the Klamath Hydroelectric Project experience increased periphyton and macrophyte growth and as downstream river segments are exposed to more fine sediments that can contribute to polychaete habitat formation.

Response to Comment ORG46-232

Please refer to Master Response AQF-6 regarding comments related to disease conditions factors and analysis of changes under the Proposed Project downstream of Iron Gate Dam. Master Response AQF-5 includes additional information on disease factors and analysis in the context of changes upstream of Iron Gate Dam.

Regarding the spawner density assertion please refer to response to comment ORG46-185.

Regarding flow stability and polychaete habitat assertions refer to response to comment ORG46-228.

Regarding increased temperatures downstream of Iron Gate Dam and chance of disease, please refer to response to comment ORG46-218.

Regarding consideration of polychaete habitat under the Proposed Project, and in particular the concern regarding habitat changes due to increased exposure to periphyton and macrophyte growth and increased exposure to fine sediments, please refer to Volume II Appendix F Section F.5.1.2 *Changes in Bed Substrate* (pages F-11 and F-12) and Section F.5.2.3 *Changes in Bed Substrate* (page F-20) for an analysis of bed substrate changes in the Hydroelectric Reach and the reach downstream of Iron Gate Dam under the Proposed Project. Note that these sections predict no long-term increase in fine sediments that would support increased polychaete habitat. Please also refer to Master Response AQF-5.

Comment ORG46-233

Regarding the formation of a disease zone, Hendrix (2011) estimated that upper Klamath River habitat may produce between 17,000 and 53,000 Chinook depending on whether fish express an ocean type or stream type life history. The majority of this production is expected from the Sprague River and Williamson River. This number of fish seems sufficient to create the possibility of large concentrations of spawning adults dependent upon the distribution and total amount of spawning habitat. According to Bartholomew and Foott (2010), the 59°F water temperature criterion (cited in the DEIR) applies when infectious dose is small. Bartholomew and Foott (2010) state (on pg. 38) that when infectious dose is high, temperature is not a strong predictor of survival. The data presented by Bartholomew and Foott (2010) in their Table 6.1 show substantial effects on salmonids at temperatures ranging from 13°C to 21°C (55.4-69.8°F). Hurst et al. (2012) concluded that initially reintroduction of fish will not be adversely affected by the high parasite densities. However, after dam removal, adult salmon would transport parasite genotypes present from downstream of Iron Gate Dam to the upper basin. The polychaete host for C. shasta is present throughout the Klamath River, including in high densities in the Williamson and Sprague rivers. Because of this, reintroduction of Chinook and Coho infected with C. shasta would likely infect the polychaete hosts when the adults die. The result would be that C. shasta would become established and reach spore densities that result in infection of juvenile Chinook and Coho.

The DEIR incorrectly concludes that the nidus of C. shasta infection is unlikely to occur or will be smaller than that under Existing Conditions. These statements are not adequately supported and need to be updated to indicate that there is a risk such a nidus may develop, but the probability of its occurrence is unknown as are the location, size, and effect on the population of salmonids.

Response to Comment ORG46-233
Regarding the risk of infection following dam removal in the Williamson and Sprague rivers, please refer to Master Response AQF-5.

With respect to the comment's citation of Hendrix (2011) predictions to express the concern that increased fall-run Chinook salmon abundance would increase disease risk upstream of Iron Gate Dam following dam removal, please refer to response to comment ORG46-223.

Regarding the risk of disease increasing at water temperatures greater than 59ºF, the EIR does not refer to 59ºF as a "criterion" as suggested by the comment; instead the EIR consistently discuses disease risk as related to a multitude of factors (of which water temperatures is one). Please also refer to Master Response AQF-5 and ORG46-223.

With respect to the potential for introduction of parasite genotypes upstream of Iron Gate Dam under the Proposed Project, anticipated parasite population dynamics are discussed in Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites.* This discussion is consistent with the comment's claim that *C. shasta* genotypes currently observed downstream would be introduced upstream of Iron Gate Dam.

Comment ORG46-234
The DEIR states that flushing and emergency dilution flows may be required under the Proposed Project. The DEIR does not clearly present the analysis for these flows for the Proposed Project or the alternatives.

Response to Comment ORG46-234
Please see response to comment ORG46-166 and Master Response HYD-1.

Comment ORG46-235
Refer to previous comments regarding the potential for introduction of C. shasta to the polychaete population in the Williamson River (see comment 3.3-76). There is no discussion in the DEIR to support the assertion that Chinook would not congregate in these locations and the DEIR does not recognize that relatively few infected adults salmon can fully seed the polycheate populations (Foott et al. 2016)

Response to Comment ORG46-235
Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Disease and Parasites* has been revised to clarify available data on potential holding habitat. Please refer to Volume III Attachment 1 Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Disease and Parasites* for the revisions. With respect to disease potential upstream of Iron Gate Dam, including a discussion of the asserted potential for a

relatively small number of infected adult salmon to seed polycheate populations, please refer to Master Response AQF-5.

Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment ORG46-236

The NMFS and CDFW have jointly proposed reduced production goals at Iron Gate Hatchery and Fall Creek Hatchery. While the DEIR partially recognizes this, the production target for yearling Chinook should be 115,000 not the 1 million fish presented in the DEIR (see NMFS and CDFW 2017 for details). The DEIR needs to be updated to reflect the actual production targets and the impact of these reductions would have on the fisheries of the Klamath River (see Major Issue 2.6).

Response to Comment ORG46-236

Section 3.3.5.6 *Aquatic Resources – Potential Impacts and Mitigation – Fish Hatcheries* has been revised to correct the typographical error. Please refer to Volume III Attachment 1 Section 3.3.5.6 *Aquatic Resources – Potential Impacts and Mitigation – Fish Hatcheries* for these revisions.

Comment ORG46-237

The DEIR states that during the first 8 years after dam removal, hatchery production effects on aquatic resources would be similar to Existing Conditions. While production targets for Coho remain the same as under existing conditions, Iron Gate Hatchery will be producing fewer Chinook. Therefore, the DEIR needs to accurately characterize the effects on aquatic resources and the fisheries that this reduction in hatchery production would have (see Major Issue 2.6).

Response to Comment ORG46-237

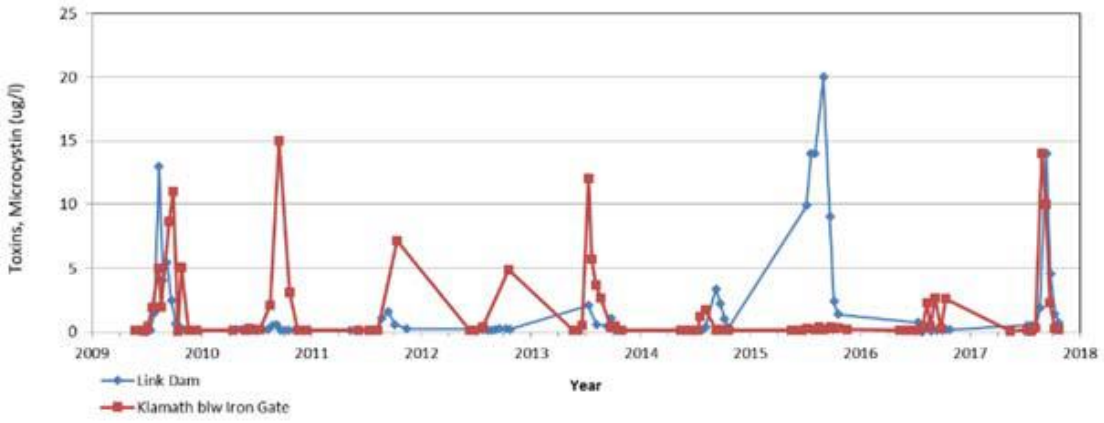
Volume III Attachment 1 Section 3.3.5.6 *Aquatic Resources – Potential Impacts and Mitigation – Fish Hatcheries* describes the potential effects of hatchery releases on natural stocks. While goals for hatchery releases of Chinook salmon smolts and yearlings would be reduced, large releases of hatchery origin Chinook would continue during the 8-year period following dam removal. In addition, actual hatchery production varies annually based on adult returns and hatchery performance, and for Chinook salmon smolts has typically been about 1 million less than production goals. Therefore, the effects of continued releases of hatchery origin Chinook salmon smolts on aquatic resources during the 8-year period following dam removal is expected to be similar to existing conditions. There are no substantial difference anticipated in effects on aquatic resources between existing conditions and the 8-year period following dam removal.

Please note that this assessment is distinct from the assessment of total number of fish available for harvest, as is discussed in Master Response AQF-3. Please

also refer to Master Responses AQF-2 for additional discussion of hatchery operations.

Comment ORG46-238

The DEIR states "While some microcystin may be transported to downstream reaches of the Klamath River from large blooms occurring in Upper Klamath Lake, the levels would not be nearly as high as those experienced under existing conditions, because seasonal blooms in Copco No. 1 and Iron Gate reservoirs are the primary source of Microcystis aeruginosa to the Middle and Lower Klamath River (see Section 3.4.2 Phytoplankton)." It is unclear from the data (see below) what the actual effects of microcystin release from Keno Dam could be on the Klamath River. While in some years releases from Iron Gate Dam are higher in microcystin than those from Keno Dam, this is not the case in all situations. Following implementation of the Proposed Project, Upper Klamath Lake and Keno Reservoir will become the primary source of microcystin in the Klamath River.



Response to Comment ORG46-238

Data in the graph provided in the comment show microcystin concentrations in the Klamath River at Link Dam and downstream of Iron Gate Dam. Microcystin concentrations measured at Link Dam cannot be used to represent microcystin concentrations downstream of Keno Dam since microcystin concentrations at Link Dam would not include changes in microcystin concentrations from the Keno Reservoir. The comment does not provide data on microcystin concentrations downstream of Keno Dam, so it is not possible to draw conclusions about the relative microcystin concentrations downstream of Keno Dam compared to downstream of Iron Gate Dam.

Please refer to Master Response PAP-1 for discussion of the potential transport of algal toxins from upstream sources (i.e., Upper Klamath Lake and Keno Reservoir) into the Hydroelectric Reach and the Middle and Lower Klamath River, including a comparison of microcystin concentrations in the Klamath River downstream of Keno Dam and downstream of Iron Gate Dam.

Comment ORG46-239

The DEIR mistakenly characterizes the miles of stream as salmonid habitat without providing supporting evidence from specific habitat evaluations of the streams in question. A more accurate discussion would present the miles of stream potentially accessible to salmonids and not attempt to characterize them as habitat. There is a large difference between a migratory corridor through which fish simply pass and spawning or rearing habitat. Presenting data as miles of 'habitat' misleads the reader into believing that this area is all useful when in fact it may not be. Most of Fall Creek, for example, is relatively high gradient, has a boulder and large cobble substrate, and is not suitable salmonid spawning habitat.

Response to Comment ORG46-239

The EIR's characterization of suitable habitat that potentially occurs upstream of Iron Gate Dam is based on the best available and most current scientific and factual data, including Huntington (2006), DOI (2007), FERC (2007), and NMFS (2007b). Section 3.3.5.8 *Aquatic Resources – Potential Impacts and Mitgation – Aquatic Habitat* has been revised to clarify the extent of suitable habitat upstream of Iron Gate Dam. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment ORG46-240

Although cited on page 3-228 as a personal communication, PacifiCorp is not aware of any ongoing work related to improving fish passage at Keno Dam following transfer to the federal government. The last sentence of this paragraph is incorrect. While USBR would take ownership of Keno Dam under the KHSA, and USBR has assessed passage improvements that may be desirable at Keno Dam should the Proposed Project occur, PacifiCorp is not aware of any plans that USBR has to improve fish passage, and such work is certainly not "in the process" of being completed as represented in the DEIR.

Response to Comment ORG46-240

The EIR accurately cites Terri Reaves Gilmore (United States Bureau of Reclamation [USBR]) based on a personal communication in the form of an email, which stated:

"Reclamation, along with our partners, have been meeting to discuss the current fish passage facility and any potenrial upgrades. As mentioned, Keno is generally understood to be inadequate for passing sucker, etc. As such, Reclamation is studying alternatives and interm measures that may be needed at the Keno Dam fish passage facility for post dam removal conditions. At this time, we haven't settled on a perferred alternative" (T. Reaves Gilmore, USBR, pers. comm., October 2018)."

Section 3.3.5.8 *Aquatic Resources – Potential Impacts and Mitgation – Aquatic Habitat – Upper Klamath River and Connected Waterbodies* has been clarified in

Volume III of the EIR to indicate that fish passage improvements at Keno Dam are currently being discussed by USBR. Please refer to Volume III Section 3.3 *Aquatic Resources* for the revisions.

Comment ORG46-241

The DEIR's reference to conclusions from the Maule et al. (2015) study on C. shasta effects to fall-run Chinook needs to be updated in light of new information. Chinook salmon are only susceptible to the Type I C. shasta genotype, which was not present in the upper Klamath River Basin at the time of the study. Hurst et al. (2012) concluded that after dam removal, adult salmon would transport parasite genotypes (i.e., Type I) from areas down stream of Iron Gate Dam to the upper basin. Thus, in the future, juvenile Chinook will be susceptible to infection from this parasite, which will likely lead to increased mortality.

Response to Comment ORG46-241

Table 3.3-10 of Volume III Attachment 1 Section 3.3.2.3 Aquatic Resources – *Habitat Attributes Expected to be Affected by the Proposed Project – Disease and Parasites* includes a summary of the *C. shasta* genotypes in the Klamath Basin, distribution, affected species, and other relevant information. Volume III Attachment 1 Section 3.3.5.8 *Aquatic Resources – Potential Impacts and Mitgation – Aquatic Habitat* includes a discussion of the suitability of conditions for Chinook salmon upstream of Iron Gate Dam, and the susceptibiliy of Chinook salmon juveniles to Type I *C. shasta* as described by Maule et al. (2009). The comment refers to research by Maule et al. (2015), which appears to be an incorrect citation. Volume III Attachment 1 Section 3.3.5.5 *Fish Disease and Parasites* addresses the results of Hurst et al. (2012), including the implications of concentrations of *C. shasta* in areas upstream of Iron Gate Dam. Please also refer to Master Response AQF-5 for a discussion of the potential for disease risk upstream of Iron Gate Dam under the Proposed Project.

Additionally, Section 3.3.5.8 *Aquatic Resources – Potential Impacts and Mitgation – Aquatic Habitat* has been revised to clarify Maule et al. (2009) statements regarding reintroduction of spring-run Chinook salmon. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment ORG46-242

The DEIR recognizes that seasonally poor water quality conditions in Keno Reservoir/Lake Ewauna have the potential to create a barrier to safe, effective, and timely fish passage through this waterbody, as has been recognized by the DOI and the NMFS. Given that the ability of salmonids to migrate to habitat that will be made accessible from the Proposed Project is fundamental to the entire success of the Proposed Project and the logic behind the Proposed Project, the DEIR should assess the effects to the Proposed Project outcome should passage through Keno Reservoir/Lake Ewauna continue to be challenged by water quality conditions. The DEIR should assess what those poor water quality conditions are, how frequently the currently occur, and whether a fish passage

barrier at Keno Dam created by poor water quality conditions would result in crowding of fish downstream of the dam that could result in a disease nidus such as is hypothesized to exist downstream of Iron Gate Dam due to high spawner density. This is especially important in light of the fact that the trap and haul fish passage program to address poor water quality conditions in Keno Reservoir is not an element of the Proposed Project and is not, to PacifiCorp's knowledge, planned to be implemented by USBR or other agencies.

Response to Comment ORG46-242
Master Response AQF-5 includes a detailed discussion of disease risk upstream of Iron Gate Dam and the risk of a nidus developing downstream of Keno Impoundment/Lake Ewuana related to water quality and fish passage issues.

Comment ORG46-243
The DEIR states that the Proposed Project will increase Chinook salmon abundance based on Hendrix (2011) modeling analysis, among others, which is viewed to be the most robust assessment. To be precise, the Hendrix (2011) analysis forecasts that natural Chinook salmon production will increase. The analysis does not present data for hatchery fish returning to Iron Gate Hatchery or Trinity River Hatchery. This distinction is important because as the DEIR states, Iron Gate Hatchery produces about 50,000 adults (see DEIR pg. 3- 248). Hendrix (2011) estimates that the Iron Gate Dam to Keno Dam reach would produce 23,000 adult natural origin fall-run Chinook if there was no harvest of those adults. This number is approximately 50 percent less than the corresponding number of adult Chinook currently produced by Iron Gate Hatchery.

The DEIR notes that one of the reasons that Hendrix (2011) model results are used in the analysis is that it provided variance estimates of uncertainty, yet the results of this uncertainty analysis are not presented in the DEIR. This uncertainly analysis should be described in the DEIR especially since other analyses estimated substantially less Chinook production for the same reach. For example, Lindley and Davis (2011) estimated that adult escapement (after harvest) for the reach extending from Iron Gate Dam to Keno Dam would be less than 1,000 spring Chinook and 1,000 fall Chinook, respectively. Additionally, the results from habitat modeling conducted during FERC relicensing (Oosterhout 2005; PacifiCorp 2005) and the opinion of the Chinook Expert Panel (Goodman et al. 2011) as to potential production compared to current hatchery production of adults should be described in the DEIR. All three of these analyses showed that Chinook production would be similar to, or less than, the number of adults produced by Iron Gate Hatchery. For example, model results for Oosterhout (2005) and PacifiCorp (2005) indicated that if average harvest rates are applied, adult escapement in the Iron Gate to Keno reach is less than 5,000 adult fall-run Chinook.

At a minimum, the analyses by PacifiCorp (2005) and Oosterhout (2005) should be described, particularly because these two analyses are thorough, specific to the Klamath River, and provide adult production estimates for every dam removal alternative in the DEIR. These two analyses incorporated actual measurements of stream habitat and water quality for virtually every river mile from Iron Gate Dam to upstream of Upper Klamath Lake. The data for the two analyses were collected by agencies and PacifiCorp staff as part of the FERC relicensing process and data inputs to the models used were reviewed and agreed to by the involved fisheries agencies. In contrast, the Hendrix (2011) model used the much more simplified assumption that habitat quality in the Upper Klamath Watershed is similar to other streams up and down the West Coast that support wild populations of Chinook (even though the Klamath River is like no other stream on the West Coast and has water quality challenges unlike most other watersheds). Thus, the analyses of PacifiCorp (2005) and Oosterhout (2005) are based on basin-specific scientific information in contrast to Hendrix (2011) that uses generic data from the Pacific Northwest, Canada, and Alaska.

Overall, the lack of objectivity and balanced presentation of model types, assumptions, applicability, and results creates a biased perspective on the potential salmon production following implementation of the Proposed Project. The DEIR should clearly state that the although the Proposed Project could lead to increase natural production it is highly uncertain that total Chinook production will increase over current conditions. The level of uncertainty surrounding the Hendrix (2011) modeling can be found in tables in that report and the subsequent Hendrix (2012) report. The uncertainty information from these sources should be described in the DEIR.

Response to Comment ORG46-243

The comments regarding the observation that the EIR focuses on predictions of natural versus hatchery fish under the Proposed Project are noted. Please refer to Master Response AQF-3 for a discussion of the implications (including harvest) of increasing natural production of Chinook salmon under the Proposed Project, as a replacement for hatchery production. Uncertainty in the analysis of fall-run Chinook salmon production modeling, and the analyses of PacifiCorp (2005) and Oosterhout (2005), are addressed in Master Response AQF-8. Note that PacifiCorp (2005) is not a separate analysis, and rather is a response to a Federal Energy Regulatory Commission (FERC) Additional Information Request regarding the Oosterhout (2005) Ecosystem and Diagnosis Treatment Model (EDT).

Comment ORG46-244

The DEIR mistakenly reports that the Hendrix (2011) analysis provides forecasts of Type I and Type II life history strategies, when in fact, Hendrix (2011) modeled Type III, not Type II. Specifically, the analysis looked at possible adult production for ocean-type and stream-type Chinook with the latter being considered a spring-run Chinook. Thus, the Hendrix analysis is an estimate of total Chinook

production for the Proposed Project area. For the Iron Gate Dam to Keno Dam reach, Hendrix (2011) modeled an ocean-type Chinook that is assumed to be a fall-run Chinook.

Response to Comment ORG46-244
Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-7 has been revised to fix a typographic error regarding the Chinook salmon type included in the Evaluation of Dam Removal and Restoration of Anadromy (EDRRA) model. Please refer to Volume III Attachment 1 Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-7 for the revisions.

Comment ORG46-245
The DEIR states that the Hendrix (2011) model assumes that Iron Gate Hatchery production does not occur under the Proposed Project. This statement is an oversimplification of what Hendrix (2011) modeled. Specifically, the model results from Hendrix (2011) are for natural origin fish only and that hatchery returns to the hatchery are not provided. Further complicating the issue however, is the fact that the production function used in the model to determine harvest levels includes hatchery fish that spawned naturally. Hatchery fish that spawn naturally count toward the 40,700-adult natural escapement goal. Therefore, reduction or elimination of hatchery production in the short term would affect the ability of the resource agency managers to achieve the 40,700-adult natural escapement target since achieving that target relies upon fish production from hatchery fish that spawn naturally. Eliminating hatchery fish from the spawning grounds could increase the productivity of the natural population over time, but this will take many decades to occur.

Response to Comment ORG46-245
A fundamental concept of Chinook salmon population dynamics included in the Hendrix (2011) model is that the primary density-dependent limitation to fall-run Chinook population production is available spawning habitat (whereas other limitations such as disease and water temperature, are considered as density independent functions). Increased access to spawning habitat under the Proposed Project is therefore predicted to result in an increase in production, and any spawning habitat not used by hatchery-produced adults would be used by naturally-produced adults. This transition would occur over time. Under the Proposed Project, production of hatchery fall-run Chinook salmon would continue for eight years following dam removal and would support the gradual transition to complete natural production. Predictions of the response of the fall-run Chinook salmon population to the Proposed Project are described in Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-7 and include eight years of hatchery production following dam removal, after which hatchery production would cease. Restored access to hundreds of miles of historical habitat is predicted to result in an increase in natural production of fall-run Chinook salmon under the Proposed

Project. Volume III Attachment 1 presents the final Section 3.3 *Aquatic Resources*.

Please also refer to Master Response AQF-8.

Comment ORG46-246

The DEIR indicates that a 43 percent decrease in hatchery juvenile production equates to a 43 percent decrease in adult production. However, this statement is only accurate if the ratio of subyearlings and yearlings released from the hatchery is the same for both Existing Conditions and the Proposed Project which is clearly not the case. Currently the ratio of yearlings to subyearlings is 0.18, over 5 times higher than the ratio of 0.03 in the Proposed Project. Because yearlings have two to three times the survival rate of subyearlings, the resulting adult production is expected to be less under the Proposed Project with the larger reduction in hatchery production of yearling Chinook. The reduction in yearling production is substantially larger (87%) than for subyearlings (33%).

Response to Comment ORG46-246

Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-7 has been revised to clarify anticipated survival rates for smolt and yearling release under the Proposed Project. Revisions include re-calculations within all appropriate analyses. Although a few numeric predictions have been slightly revised, no revisions resulted in changes to significance determinations. Please refer to Volume III Attachment 1 Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-7 for the revisions.

In addition, Section 3.12.5.1 *Historical Resources and Tribal Cultural Resources – Potential Impacts to Tribal Cultural Resources,* Potential Impact 3.12-9 has been revised to clarify anticipated survival rates for smolt and yearling release under the Proposed Project. Revisions include re-calculations within all appropriate analyses. Although a few numeric predictions have been slightly revised, no revisions resulted in changes to significance determinations. Please refer to Volume III Attachment 1 Section 3.12.5.1 *Historical Resources and Tribal Cultural Resources – Potential Impacts to Tribal Cultural Resources* Potential Impact 3.12-9 for the revisions

Comment ORG46-247

This paragraph in the DEIR does not accurately reflect the Proposed Project. Please consider the following:

1. As it is written, the reader is unclear if the discussion is focused on outcomes for the Iron Gate Dam to Keno Dam reach or for all habitat upstream of Iron Gate Dam.

2. The assumption that there would be a 43 percent reduction in smolt production and a corresponding and equal decrease in adults is incorrect (see comment 3.3-89 directly above). Because this incorrect assumption is used throughout this analysis, the entire analysis needs to be revised.

3. The DEIR erroneously states that "The elimination of the goal of releasing around six million Chinook salmon smolts and yearlings annually after 8 years..." is incorrect. Please refer to the correct hatchery production targets from NMFS and CDFW 2017 (see comment 3.3-79). According to NMFS and CDFW (2017) the total annual Chinook production target is about 3,515,000 juvenile Chinook, not 6 million as stated in the DEIR. This error affects the entire analysis.

4. Hendrix (2011) analysis results assume active reintroduction starting in 2019 with fry being planted into suitable habitats at levels that that habitat can support them. Because there is no fry stage in the model, Hendrix (2011) predicted stocking to habitat capacity by assuming that the number of adult returns were at or above the unfished equilibrium population size (about 17, 000 to 53,691) from 2019 to 2029. For the Iron Gate Dam to Keno Dam reach, Hendrix (2011) simply added in habitat capacity to the lower river population. Thus, the Hendrix (2011) modeling assumes that reintroduction would be immediate, and no other approach would result in quicker reintroduction. The model was not designed to forecast how quickly adult production would increase under a natural recolonization process as assumed for the Proposed Project.

The DEIR asserts that a combination of hatchery adult returns and returns from newly accessible habitat upstream of Iron Gate Dam would equate to the active reintroduction stocking levels assumed in Hendrix (2011) yet the DEIR provides no evidence or reasoning to support this conclusion.

Response to Comment ORG46-247

With respect to item no. 1 in the comment, Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-7 states that that natural spawning would occur in "newly accessible habitat," which is all habitat upstream of Iron Gate Dam. Directly following dam removal most fall-run Chinook salmon natural spawning is anticipated occur in the Iron Gate to Keno reach of the Klamath River, with a broader distribution over time.

With respect to item no. 2 in the comment, please refer to response to comment ORG46-246.

With respect to item no. 3, the typographical error in Potential Impact 3.3-7 has been corrected from "releasing around six million Chinook salmon smolts and yearlings," to correct state "releasing around 3.5 million Chinook salmon smolts and yearlings." Because this was a typographical and not analytical error, no further changes to the EIR are required. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

With respect to item no. 4 in the comment, Potential Impact 3.3-7 states, "between post-dam removal years 3 and 10, both hatchery returns and returns from newly accessible habitat would occur, potentially increasing the rate of reintroduction *comparable* to the effect of active reintroduction assumed in the Evaluation of Dam Removal and Restoration of Anadromy (EDRRA) model." An assessment that the rates are "comparable to" the EDRRA rates assumed in Hendrix (2011) does not mean that the combination of hatchery adult returns and returns from newly accessible habitat upstream of Iron Gate Dam "would equate to" the active reintroduction assumptions in Hendrix. The rates are comparable in that the rate of recolonization would be increased due to hatchery production (i.e., increased straying rates), as it would under active reintroduction, but that does not assume that the rate of increase is the same. Potential Impact 3.3-7 also provides a discussion of the likely rate of re-colonization based on Chinook salmon straying rates, and observations following removal of barriers in other watersheds. Therefore, the EIR indicates that immediate optimization of the newly accessible habitat is not anticipated. The details of the Hendrix (2011) model described in the comment are also provided in the EIR, and they are incorporated to the extent relevant to the analysis. In addition, as described in revised Potential Impact 3.3-8, it is anticipated that Oregon Department of Fish and Wildlife (ODFW) will undertake active reintroduction of spring-run Chinook salmon (T. Wise, ODFW, pers. comm., 2019). Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment ORG46-248

The DEIR cites the Hendrix (2011) analysis to claim that fishery closures are less likely under the Proposed Project (dam removal) than Existing Conditions. However, this outcome of less likely fish closures is not described in Hendrix (2011) and it is not clear how the DEIR can support this assertion. Fishery closure information was presented in an earlier draft report but not in the final Hendrix (2011) report and drafts are typically not cited specifically because they can change before becoming final as appears to have been the case here. Regardless, in the draft Hendrix report, a 2.5 percent abundance exceedance value between the two alternatives was used to support the conclusion that fishery closures were less likely with a dams-out scenario. The draft analysis also assumed that the 40,700-adult escapement target would still apply even though spawners were assumed to colonize an additional 59 to 80 miles of habitat between Iron Gate Dam and Keno Dam.

For the first few generations during and after dam removal, the DEIR's analysis should more accurately state that the risk of a fishery closure may increase. This conclusion is based on the following assumptions presented in the DEIR:

1. Substantial reduction in hatchery Chinook production at Iron Gate Hatchery. Iron Gate Hatchery fish contribute a substantial number of adults to the Klamath

River natural escapement target and about 28,000 fish on average to harvest (CAHSRG 2012).

2. Loss of at least 1-year class of mainstem spawning fall-run Chinook because of dam removal impacts.

3. Unknown/uncertain speed and effectiveness of recolonization, yearly environmental conditions (flow and temperature during and after dam removal), and uncertainty around modeling predictions of adult production.

4. The current relatively low abundance of fall-run Chinook salmon throughout the upper Klamath River which limits production and therefore fishery escapement and harvest goals.

Response to Comment ORG46-248

Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-7 has been revised to remove attribution to Hendrix (2011) for describing the probability of fishery closures under the Proposed Project. Please refer to Volume III Attachment 1 Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-7 for the revisions.

The comment's speculation that there will be an increased risk of ocean fishery closures following dam removal is not supported by the referenced assumptions. First, with regard to cited "substantial" reduction in hatchery production, analysis in the EIR finds a decrease of approximately 3,552 adults on average resulting from reduced hatchery production, which is within the existing degree of annual variability in hatchery-origin Chinook salmon returns (2,558 to 72,474 for the period 1980 to 2001 [CDFW 2016b]) and natural Chinook salmon returns (6,957 to 91,757 for the period 1980 to 2001 [CDFW 2016a]). Second, with regard to cited "loss of at least 1-year class of mainstem spawning because of dam removal impacts," analysis in the EIR finds that mainstem spawning contribues only a small proportion of the overall production. Based on redd surveys from 1999 through 2009 (Magneson and Wright 2010), an average of approximately 2,100 redds could be affected in the mainstem. As described in detail in Volume II Appendix E.3.2.1, based on escapement estimates in the Klamath Basin from 2001 through 2009 (CDFG 2010, unpublished data) on average this would be approximately eight percent of all anticipated fall-run Chinook salmon redds in the Klamath River Basin in the fall spawning of dam removal year 1. In addition, reduced hatchery production would not begin until the year after impacts to mainstem spawning have occurred, so these would not represent cumulative reductions in production. Third, with regard to cited "unknown/uncertain" speed of recolonization, the EIR uses predictions that consider this uncertainty, and environmental variablity exists under current conditions as well, contributing to a risk of fishery closure regardless of dam removal. Finally, regarding the current low abundance of fall-run Chinook salmon, annual returns fluctuate based on

environmental and other factors unrelated to dam removal. The predicted insubstantial short-term reductions in abundance resulting from dam removal would be within the existing degree of annual variability in Chinook salmon returns.

Comment ORG46-249

The DEIR should acknowledge the possibility that the Proposed Project might essentially simply result in the replacement of hatchery Chinook production with natural origin production. The Chinook Expert Panel (Goodman et al. 2011) concluded that natural fall Chinook from the Iron Gate to Keno reach (following dam removal and including implementation of restoration actions associated with the now expired Klamath Basin Restoration Agreement) had the potential to match current adult production from the Iron Gate Hatchery. Additionally, this was the conclusion of detailed fish production modeling undertaken during the FERC relicensing process (PacifiCorp 2005; Oosterhout 2005). See Major Issue 2.6.

Response to Comment ORG46-249

The EIR is consistent with the comment noting the predicted increase in fall-run Chinook salmon abundance with increased habitat access under the Proposed Project, and reduced hatchery production. Volume III Attachment 1 Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-7 discusses the available analysis and predictions of fall-run Chinook salmon production, including summarizing the results of the Chinook Expert Panel (Goodman et al. 2011), Hendrix (2011), and Oosterhout (2005). PacifiCorp (2005) is an additional information request response to Federal Energy Regulatory Commission (FERC) and is consistent with Oosterhout (2005). Potential Impact 3.3-7 also discusses the effects of eliminating hatchery production after eight years on predicted abundance under the Proposed Project.

Comment ORG46-250

The DEIR fails to note that the action that the Expert Panels considered and discussed in their reports is dam removal AND implementation of the Klamath Basin Restoration Agreement. The Klamath Basin Restoration Agreement included an abundance of funding for restoration and long-term management actions that would benefit fish; these are not part of the Proposed Project. Because of this, extrapolating the Expert Panel' s determinations to the Proposed Project is not valid. While the DEIR acknowledges the uncertainty reported in the Expert Panel Report on spring-run Chinook recolonization it inaccurately constrains the limitations expressed in Goodman et al. (2011) to just low abundance and productivity of spring-run Chinook. In fact, the other main concern expressed in Goodman et al. (2011) relating specifically to spring-run Chinook was the projected increase in spring (February to July) water temperatures in the Klamath River that could limit upstream movement of adult spring-run Chinook.

The DEIR makes an inappropriate comparison between the removal of Condit Dam on the White Salmon River and the Proposed Project as it relates to the recolonization by salmon. Specifically:

1. Condit Dam was located only about 3.3 miles upstream from the confluence of the White Salmon River and the Columbia River, not 190 miles from the Pacific Ocean like on the Klamath River.

2. There is not 120 square-miles of hypereutrophic lake feeding poor quality water into the White Salmon River. According to Allen et al. (2016) the mainstem White Salmon has relatively cold water throughout the year provided by snowmelt and springs.

3. While spring-run Chinook were considered extirpated from the White Salmon River and have since recolonized the river in low numbers as indicated in the DEIR, it is important to have the full context for this statement and understand the differences between this river and the Klamath River. Spring-run Chinook migrate up the Columbia River in substantial numbers; the 10-year average count at Bonneville Dam is over 148,000 spring-run Chinook (FPC 2019) With populations at this size, even minor straying into the White Salmon River could be reasonably expected to occur. This is very different from conditions on the Klamath River where the nearest spring-run Chinook population is a very small one (only 166 spring-run Chinook were counted in 2017; SRRC 2017) on the Salmon River over 123 river miles downstream of Iron Gate Dam.

4. Adult fall-run Chinook salmon were trapped and moved to the river upstream of Condit Dam before removal occurred. This created a population of juveniles that were not directly impacted by removal and ready to migrate downstream and then return from the ocean in a 2-5 years. Upon return, they would home to the areas where they were spawned. This situation is more akin to the conditions assumed in Hendrix (2011).

Response to Comment ORG46-250

With respect to KBRA, Volume I Section 2.6.4 *Proposed Project – Project Background – Prior/Related Environmental Reviews* (pages 2-24 and 2-25) clearly states that the Klamath Basin Restoration Agreement (KBRA) is not part of the Proposed Project. Accordingly, actions associated with the KBRA were not considered in the analysis of potential effects due to the Proposed Project (or the alternatives). The analysis of potential effects carefully considered findings by the Chinook Salmon Expert Panel with regard to KBRA actions. Inclusion of the KBRA by the Chinook Salmon Expert Panel was noted under the discussion for fall-run Chinook salmon Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-7. Discussion in Potential Impact 3.3-7 is consistent with the comment that the Expert Panel considered increased in Chinoook salmon abundance predicated

upon KBRA actions, which are not included in the Proposed Project, and the EIR's analysis puts references to the Expert Panel in appropriate context. The Expert Panel results are one source of information that is considered in the EIR, in addition to other critical sources of data that are evaluated to reach the conclusions stated in the Potential Impact 3.3-7.

Please also refer to Master Response AQF-12 for a discussion of the incorporation of expert panel reports in the analysis of effects in the EIR.

Regarding the assertion that the EIR does not include mention of the Expert Panel's additional concern about water temperatures, Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-8 has been revised to clarify that water temperatures would be slightly warmer in the spring under the Proposed Project. Please refer to Volume III Attachment 1 Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-8 for the revisions.

Regarding the differing conditions for spring-run Chinook populations in the White River and the Klamath River, the EIR identified the White Salmon River as a recent example of recolonization after dam removal that is specific to spring-run Chinook salmon. As discussed in the EIR, such comparisons are intended to provide examples to inform the analysis of effects for the Proposed Project. However, this example (or other examples of Chinook salmon recolonization after dam removals) are not relied upon for precise predictions and therefore detailed comparison is unnecessary. The section appropriately discusses impediments to recolonization on the Klamath River, especially for spring-run Chinook salmon, and the EIR's analysis places information regarding prior recolonization efforts in other watersheds into the appropriate context.

Comment ORG46-251

The DEIR states that Upper Klamath Lake may have considerable production potential for Chinook. If so, the DEIR should then make similar statements for the reservoirs under all the alternatives where reservoirs remain in place. Reservoir environmental conditions in the early spring (to June) and fall/winter (October – February) have water quality conditions that would be supportive of Chinook, Coho, and Steelhead rearing (as assumed in the DEIR for Upper Klamath Lake). Thus, the DEIR should assume the reservoirs would have similar rearing value as Upper Klamath Lake.

The DEIR also states that most or all spring-run Chinook upstream migrants would be able to pass upstream through the Keno Reservoir/Lake Ewauna area before seasonal water quality reductions would restrict passage. However, the DEIR concludes in Section 4 that spring-run Chinook passage with reservoirs in place would be more restrictive even though environmental conditions are as good or better in the reservoirs than Lake Ewauna and Keno Reservoir. It is

unclear how better conditions for passage through IronGate and Copco reservoirs equates to poorer passage of fish. The DEIR should correct this analysis and conclusions accordingly.

Response to Comment ORG46-251
The referenced statement in Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-8 concerns *historic* Chinook production potential in Upper Klamath Lake. The statement in the EIR does not refer to existing or potential future conditions, as alluded to by the commenter. Further, the referenced sources are specific to Upper Klamath Lake.

Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* – Potential Impact 3.3-8 states that most or all spring-run Chinook salmon would be able to pass upstream through Keno Reservoir/Lake Ewauna area before water quality would restrict passage. This statement is reiterated in Volume I Section 4.4.3.7 *Continued Operations with Fish Passage Alternative – Aquatic Resources – Fish Passage* Potential Impact 4.2.3-8 (page 4-141).

The text directly following the referenced section addresses the anticipated improvements to migration potential through the Hydroelectric Reach under the Proposed Project, including access to thermal refugia, improved thermal conditions for growth, more natural flow and water quality regimes, and reductions in disease. Further, Volume I Section 4.4.3 *Continued Operations with Fish Passage Alternative – Aquatic Resources* (page 4-99) and Volume I Section 4.4.3.7 *Continued Operations with Fish Passage Alternative – Aquatic Resources – Fish Passage* Potential Impact 4.2.3-8 (page 4-140) describes the potential impacts of maintaining the reservoirs with upstream and downstream fish passage on spring-run chinook with reservoirs in place.

The presence of dams and reservoirs under the Continued Operations with Fish Passage Alternative would continue to cause seasonally poor water quality, and high late summer and early fall water temperatures, allowing some conditions favorable for the transmission of fish disease to persist. These reservoir-related conditions would continue to have negative effects on spring-run Chinook salmon populations, as compared to a without-dams scenario under the Proposed Project (Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-8).

Comment ORG46-252
The CDFW (2014) source cited to support the smolt-to-adult survival rate of 0.99 presented in the DEIR is a decent start but the smolt-to-adult ratio should have been updated to reflect the more recent years of data and increase the accuracy of this prediction.

Response to Comment ORG46-252
With respect to the coho salmon smolt-to-adult survival rate cited from CDFW (2014), 0.99 percent is the most recently published value for smolt-to-adult survival, and thus it is the best available and most current scientific and factual data. Personal communications with California Department of Fish and Wildlife (CDFW) (M. Knechtle, biologist, CDFW, pers. comm., April 2019) suggest that recent years have exhibited slightly lower survival, with an estimated smolt-to-adult survival rate for the period 1994 to 2016 of 0.9258. However, the rate of 0.99 is considered by CDFW to be accurate based on their data and observations. A slightly lower survival assumption would potentially lessen the effect of ceasing hatchery operations after eight years; however, the reported coho salmon hatchery release smolt-to-adult value of 0.99, as affirmed by CDFW, is used for the EIR analysis.

Comment ORG46-253
The DEIR makes the unsupported assertion that when the hatcheries stop releasing fish, disease rates and resulting mortality would be reduced in outmigrating fish. The DEIR does not explain how this reduction in disease rates would occur since infection is based on spore density in the river and not really abundance of juvenile fish; also, returns of infected adults would continue to infect the polychaete populations.

The DEIR also proposes that the reduction in hatchery releases would reduce competition for food and space in the river. There is no evidence to support the claim that competition for space or food is in any way limiting the population of Chinook and Coho.

Response to Comment ORG46-253
Please refer to Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites* for a more in-depth discussion of the potential effects of the Proposed Project on coho and Chinook salmon populations in relation to disease factors. Please also refer to Section 3.3.5.6 *Aquatic Resources – Potential Impacts and Mitigation – Fish Hatcheries* for a more in-depth discussion of the potential effects of changes to hatchery production and dispersing hatchery operations (to Fall Creek Hatchery [FCH]) including potential impacts to aquatic resources due to fish disease and parasites. The referenced sections provide several citations to support the assertions regarding hatchery effects. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Please also refer to Master Response AQF-6, which describes key factors and resources used in the analysis of disease dynamics and the effects assessment, and response to comment ORG46-254, below, for information regarding competition.

Comment ORG46-254

The DEIR suggests that a reduction in hatchery production would result in significantly reduced competition for space and food with natural origin fish. According to the DEIR, this would in turn result in higher growth rates for natural origin smolts, large fish size, and higher survival and adult returns by a rate that would be "...more than the loss of hatchery progeny." There are two main issues with this conclusion:

1. The DEIR implies that food is limiting in the Lower Klamath River, but yet water temperature effects in previous sections of the DEIR are based on criteria where food is not limiting. The DEIR should resolve this apparent contradiction.

2. The discussion regarding reintroduction of fall-run Chinook, the DEIR concludes "... that the Proposed Project would increase the abundance, productivity, population spatial structure, and genetic diversity of fall- run Chinook salmon in the Klamath Basin (Hendrix 2011)." The conclusion that fall-run Chinook productivity would increase was based on the implementation of KBRA actions, which are not included in the Proposed Project. Despite this issue and other issues already raised in these comments with the Hendrix model, the DEIR should explain how this increased natural production does not result in a higher level of competition for food and space than is present with the hatchery releases. If all fall-run Chinook are of natural origin, then spawning and emergence timing would be similar in reaches downstream of Keno Dam, effectively increasing the duration competitive interactions for food and space compared to the existing conditions where hatchery juveniles do not interact with natural origin fish until they are released and that release timing is typically towards the end of the natural-origin fish movement period (late May/early June).

Response to Comment ORG46-254

With respect to whether food is treated as limiting or not, Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* describes the analysis of reduced hatchery production on the growth and survival of natural origin smolts. This analysis is not reliant on an assumption of food limitation. Rearing salmonids compete for resources of food and space, and the available information (e.g., McMichael et al. 1997) indicates that reduced competition with hatchery produced fish would support potential increased growth rates of naturally produced fish.

The water temperature criteria used in the EIR analysis were based on USEPA (2003) guidelines for salmonids, which were developed based on an assumption of limited food supply. Please also refer to response to comment ORG46-219 for detailed response to issue of food limitation assumptions and water temperature effects.

With respect to the potential for an increase in natural Chinook Salmon production, Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation*

– *Aquatic Resource Impacts* Potential Impact 3.3-7 predicts an increase in natural Chinook salmon production. However, the overall density of rearing Chinook salmon would not increase over existing conditions, since the restored access to areas upstream of Iron Gate Dam would substantially increase the availability of rearing habitat. In addition, in the long term, the river would eventually exhibit enhanced habitat complexity due to increased fine and coarse sediment supply, a more natural flow regime, greater sediment transport rates, and more frequent bed mobilization that would increase spawning habitat availability and quality and improve early rearing habitat downstream from Iron Gate Dam, as well.

Comment ORG46-255

The DEIR should clarify if the predicted colder fall and winter water temperatures under the Proposed Project would have any effect on salmonid egg incubation survival. For example, Carter and Kirk (2008) concluded that stream temperatures of less than 3°C result in higher egg mortality for Chinook and Steelhead. Carter and Kirk (2008) also reported that the optimal temperature for salmonid egg survival ranges from 6 to 10°C. The DEIR indicates that the Proposed Project would produce mainstem temperatures near or below the 3°C value from December through January in contrast to Existing Conditions where similar conditions occur for a about 10 days in early February (see Figure 3.3-5).

Response to Comment ORG46-255

With respect to the comment's concern regarding the effects of cold water on incubating coho salmon eggs under the Proposed Project, please note that water temperature effects are discussed in Section 3.3.5.4 *Aquatic Resources – Potential Impacts and Mitigation – Water Temperature.* Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

In addition, to emphasize the effects of changes in water temperature on coho salmon spawning in the mainstem Klamath River under the Proposed Project would be misleading. Coho salmon are distributed throughout the Klamath River downstream from Iron Gate Dam, and they spawn primarily in tributaries (Trihey and Associates 1996, NRC 2004, NMFS 2010a); therefore, temperature effects on mainstem spawning would not be a substantial effect of the Proposed Project. During their upstream migration, adult coho salmon from the Upper Klamath River Population Unit currently may travel as far as Iron Gate Dam (river mile [RM] 193.1), and they were formerly known to occupy mainstem Klamath River and tributary habitat at least as far upstream as Spencer Creek at RM 232.6 (NRC 2004, as cited in NMFS 2007a). Thus, the mainstem Klamath River functions primarily as a migration corridor for coho salmon. Based on Magneson and Gough (2006) spawning surveys from 2001 to 2005, only from 6 to 13 redds are typically observed in the mainstem. In 2015, no redds were observed in the mainstem Klamath River between Portuguese Creek (RM 128) and Bogus Creek (RM 192.6) (Hentz and Wickman 2016), and seven were observed in 2017 in the same reach (Dennis et al. 2017).

Comment ORG46-256

It is not clear in the DEIR if the earlier outmigration that is discussed only pertains to mainstem spawning Coho or a minor segment of the overall population. The vast majority of the Coho smolts will come from tributaries not affected by mainstem water temperatures, and their migration timing will therefore not be based on mainstem water temperatures.

Response to Comment ORG46-256

Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resources Impacts* Potential Impact 3.3-9 cites the Hoar (1988) summary of temperature effects on smolt timing and discusses anticipated effects on coho smolts in the Area of Analysis for aquatic resources. As described in Potential Impact 3.3-9, coho salmon juveniles in the mainstem Klamath River upstream of the confluence with the Salmon River, (whether produced within the mainstem *or* the tributaries) are expected to undergo the physiological transition to the smolt life-stage and migrate downstream earlier under the Proposed Project than under existing conditions due to the water temperature shifts that are predicted to occur following dam removal. Please refer to Volume III Attachment 1 for the final Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resources Impacts*.

Comment ORG46-257

Reference is made to aquatic resource measure AR-6 (Suckers) being included in this alternative. Given that this impact is not considered significant, it is unclear why this measure is included, perhaps 11 is required for Fish and Game Code 2081.11 under CEQA although CDFW has not made a final determination as to whether this measure meets the standards for take authorization under Fish and Game Code, Section 2081.11. The DEIR is not clear as to what happens if CDFW does not agree that AR-6 meets the conditions for take authorization in the future.

Response to Comment ORG46-257

As discussed in Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-13, although the EIR finds no significant impact of the Proposed Project on Lost River and shortnose suckers in the short or long term, the Proposed Project itself includes Aquatic Resource Measure AR-6 (Suckers) to reduce the short- and long-term effects of reservoir removal. Section 2081.11 was added to the Fish and Game Code to authorize take of Lost River and shortnose suckers, subject to certain conditions. Aquatic Resource Measure AR-6 was developed in coordination with California Department of Fish and Wildlife (CDFW) (and other agencies) and is conditioned on approval from CDFW. CDFW (2018b) has reviewed Aquatic Resource Measure AR-6 and preliminarily agreed that the Proposed Project with implementation of Aquatic Resource Measure AR-6 potentially meets the standards for take authorization under Fish and Game Code, section 2081.11.

The EIR is not required to speculate as to what changes to Aquatic Resource Measure AR-6 might be proposed if CDFW's final decision differs from the preliminary agreement. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment ORG46-258

The DEIR does not provide the rationale (other than a citation) as to why "Facilitating the movement of anadromous fish presents a relatively low risk of introducing pathogens to resident fish upstream of Iron Gate Dam." The DEIR should explain why this would present a low risk given the previous comments raised about disease (e.g., Major Issue 2.8).

Response to Comment ORG46-258

Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Disease and Parasites* includes an assessment of risk of introducing pathogens to resident fish upstream of Iron Gate Dam under the Proposed Project. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*. Please also refer to Master Response AQF-5, particularly the section titled *Risk of Nidus Forming Upstream of Iron Gate Dam*.

Comment ORG46-259

The DEIR should be edited to read "However, SSCs [suspended sediment concentrations] would be the result of sediment stored in J.C. Boyle and Copco reservoirs, which is relatively small potential impact (USBR 2012) because a large proportion of the adult redband trout population should be already spawning in Spencer or Shovel creeks during the dam removal." Impacts should be characterized in relation to the significance criteria and not described as 'small potential' as is presented in this text. Even a small impact can be significant.

Response to Comment ORG46-259

Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* – Potential Impact 3.3-14 has been clarified with respect to how mobilization of sediment deposits in J.C. Boyle, Copco No. 1, and Iron Gate Dam would affect the adult redband trout population. Please refer to Volume III Attachment 1 Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* – Potential Impact 3.3-14 for the revisions.

Comment ORG46-260

The DEIR does not analyze and describe the effects to fish communities in the Klamath River of releasing the entire population of Yellow Perch (Perca flavescens) from Copco and Iron Gate reservoirs (likely numbering into the hundreds of thousands) into the lower river during and after drawdown of the reservoirs. Yellow Perch will utilize side channels and off-channel habitat for rearing. These habitat types are also used by Chinook, federally-threatened

Coho, and Steelhead as well as native resident fish. If the Yellow Perch are not expected to survive the drawdown, then the DEIR should present the facts supporting this and discuss the likely disposition of carcasses that remain in the reservoir or are released downstream.

Response to Comment ORG46-260
Please refer to response to comment ORG46-14 for a detailed discussion regarding the release of yellow perch into the Middle and Lower Klamath River reaches.

Regarding the potential for yellow perch to survive initial reservoir drawdown, please refer to the Klamath River Expert Panel findings (Buchanan et al. 2011a), where the panel was convened to assess Lower Klamath Project dam removal effects on resident fish and concluded that dam removal, "…would change reservoir habitat to free-flowing river, which would adversely affect non-native fishes in the lower Klamath basin between Keno Dam and Iron Gate Dam. Abundances of largemouth bass, yellow perch, bluegill, and brown bullhead would significantly decline or be eliminated because their preferred reservoir habitat would be gone."

With respect to the comment's request for additional details regarding the disposition of yellow perch carcasses that remain in the reservoir or are released downstream following drawdown, as discussed in response to comment ORG46-14, yellow perch and other exotic fish species well adapted to lotic environments would be unlikely to survive dam removal under the Proposed Project. Therefore, yellow perch carcasses would be likely to be transported downstream of Iron Gate Dam during reservoir drawdown. While carcasses may be temporarily trapped in small wetted depressions in the reservoir footprints or deposited along channel margins downstream of the dams, they are not expected to accumulate in large numbers during and following dam removal due to continuous flushing by high river flows and ongoing predation by terrestrial biota, including raptors.

Comment ORG46-261
The DEIR states that "The areas downstream of the Trinity River confluence do not currently support Anodonta spp. and are unlikely to in the future (Davis et al. 2013)." The DEIR should further explain why the salvage and relocation plan considers these sites.

Response to Comment ORG46-261
As described in Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-19, Aquatic Resource Measure AR-7 includes development of a salvage and relocation plan prior to Lower Klamath Project dam removal, completion of reconnaissance surveys for existing freshwater mussels in the Klamath River from Iron Gate Dam to Cottonwood Creek, and potential relocation of mussels to habitat between the

upstream extent of J.C. Boyle Reservoir and Keno Dam. Translocation efforts described in proposed Aquatic Resource Measure AR-7 are expected to be successful for *G. angulata* and *M. falcata* (based on suitable habitat in translocation sites), but these efforts are unlikely to be successful for *Anodonta spp.* The EIR is clear that the translocation sites would be selected to benefit all freshwater mussels, while noting that these locations are not expected to benefit *Anodonta spp*.

Potential Impact 3.3-19 has been revised to clarify that Aquatic Resource Measure AR-7 refers to freshwater mussels in general and which species would be relocated. Please refer to Volume III Attachment 1 Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-19 for the revisions.

Comment ORG46-262

The DEIR states that "the total potential production from redds in Bogus Creek is a low proportion of all the production from the Klamath River Basin for Chinook salmon, Coho salmon, and steelhead." However, the DEIR should note that Bogus Creek production makes up a substantial portion of the natural escapement target for the Klamath River (that target is 40,700 Chinook). Both hatchery and natural origin fish that spawn naturally are counted in the target. Achieving the adult escapement target is important because it affects ocean fisheries that may be closed if the escapement target is not met (Cejnar 2018).

Related to this is the extremely small population of Coho presently found in the Klamath River. Applying the same threshold for a significant impact to Coho as Chinook would seem to underestimate the actual potential impact to the Coho population. The status of this population and the potential effects of the Proposed Project are discussed in detail elsewhere (see Major Issue 2.1).

Response to Comment ORG46-262

Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-23 has been slightly modified to more clearly state the importance of production of all salmonid species from Bogus Creek. The discussion has been revised to clarify that the impact being discussed is not the risk of losing all production from Bogus Creek; rather it is a small probability of the potential for a reduction in production. Please refer to Volume III Attachment 1 Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-23 for the revisions.

Comment ORG46-263

The DEIR muddles the seasonal nature of the information in this long paragraph confusing the reader and leading to inaccurate conclusions. For example, toward the end of this paragraph, the DEIR concludes: "Thus, blue-green algae are able to outcompete diatoms and/or green algae under lower mixing

conditions in reservoirs." However, this is only accurate during summer and early fall when water temperatures are warmer. At other times, diatoms and green algae are able to outcompete blue-green algae. The DEIR needs to present a clear discussion of the seasonal succession and relative dominance of the diatoms, green algae, and blue-green algae, and all the factors that determine succession and relative dominance in addition to mixing conditions (such as, temperatures, light levels, nutrient availability/ratios, growth rates).

Response to Comment ORG46-263
Volume I Section 3.4.2.1 *Phytoplankton and Periphyton – Environmental Setting – Phytoplankton* (pages 3-392 to 3-403) discusses the general environmental conditions that influence phytoplankton, including an explanation that the composition of the phytoplankton communities shifts seasonally in response to changing temperature, light, and nutrient levels (page 3-392, paragraph 2). Please refer to Volume III Attachment 1 Section 3.2.2.7 *Water Quality – Environmental Setting – Chlorophyll-a and Algal Toxins* and Volume I Section 3.4.2.3 *Phytoplankton and Periphyton – Environmental Setting – Hydroelectric Reach* (pages 3-405 to 3-413) for discussions of the phytoplankton seasonal patterns in the Klamath River Basin.

While the seasonal pattern of changing dominance of diatom, green algae, and blue-green algae [cyanobacteria] in lakes and reservoirs is associated with changing water temperature, light, and nutrient levels, multiple studies have shown that changes in turbulent mixing also result in shifts in the competitive balance between phytoplankton species that can control their buoyancy (i.e., cyanobacteria) and species that cannot control their buoyancy (i.e., diatoms and green algae) (Huisman et al. 2004; McDonald and Lehman 2013; Visser et al. 2016). Artificial mixing devices (e.g., aeration systems) have been shown to be an effective measure to shift the phytoplankton dominance from cyanobacteria to diatoms and green algae (Visser et al. 2016). Thus, changes in turbulent mixing due lower inflows and increased thermal stratification during the summer and fall are a significant influence on seasonal phytoplankton patterns observed in the Lower Klamath Project reservoirs.

Section 3.4.2.1 *Phytoplankton and Periphyton – Environmental Setting – Phytoplankton* (pages 3-392 to 3-403) has been revised to clarify the seasonal succession of diatoms, green algae, and blue-green algae. Please refer to Volume III Attachment 1 Section 3.4.2.1 *Phytoplankton and Periphyton – Environmental Setting – Phytoplankton* for the revisions.

Comment ORG46-264
The DEIR refers to PacifiCorp-funded research by Oregon State University to determine the causes of the changes in the presence and amounts of microcystin in Copco and Iron Gate reservoirs (Otten et al. 2015; Otten and Dreher 2015; Otten and Dreher 2017). However, the discussion of this research is overly simplified and incomplete. For example, sequencing of a particular genetic

marker (i.e., the cpcBA) indicated that four or five different allotypes (clustered into operational taxonomic units; OTUs) comprised the Klamath River Microcystis population (Otten et al. 2015). The dominance in certain years by the only Microcystis strain correlated with microcystin production (i.e., OTU 1) raises the possibility that toxin biosynthesis confers some sort of competitive advantage over the other nontoxigenic Microcystis strains. It has been suggested that microcystin production provides cells with a competitive advantage during periods of high light or oxidative stress (Paerl and Otten 2013). Otten et al. (2015) speculated that a noticeable reduction in optically active components (i.e., total chlorophyll-a and dissolved organic carbon) within the reservoirs in 2010, 2012, and 2013 resulted in higher ultraviolet light exposures in the photic zone, and therefore caused potentially higher amounts of reactive oxygen species (and, hence, microcystin) to be generated.

Although the OTU 1 Microcystis strain correlated with microcystin production often dominates in Copco and Iron Gate reservoirs, there have been documented periods when the OTU 1 strain was replaced by other Microcystis strains that are believed to not generate microcystin (Otten and Dreher 2017). To further address the matter, Otten and Dreher (2017) completed a multiyear assessment using analysis of variance and change point statistics to determine if changes in Microcystis population structure (i.e., strain composition) and toxigenicity coincided with specific environmental conditions. Regarding water quality variables that might influence toxicity via altered bloom composition, a number were found to significantly vary seasonally from year-to-year, but none did so in a temporally coherent manner coincident with the Microcystis strain succession patterns observed in the reservoirs (Otten and Dreher 2017). However, the assessment suggested that a reduction in light intensity and/or a shift in photosynthetically available radiation toward the red end of the visible light spectrum due to episodic wildfire smoke was a plausible explanation for observed strain turnover events. Because wildfires exert their influence regionally, differences in water chemistry between the reservoirs is largely irrelevant, which may explain why strain succession patterns between reservoirs tend to exhibit similar patterns even though the reservoirs can differ with regard to their physicochemical makeup.

Response to Comment ORG46-264

Section 3.4.2.3 *Phytoplankton and Periphyton Environmental Setting – Hydroelectric Reach – Phytoplankton* has been revised to clarify the genetic variations in *Microcystis aeruginosa* and microcystin production along with the environmental conditions that correspond to changes in the *Microcystis aeruginosa* populations. While the comment was about Section 3.4.2.3, page 3-410, paragraph 2, the clarification was made on page 3-412 after paragraph 1 to group the new discussion of *Microcystis aeruginosa* genetic markers and microcystin with the existing discussion of *Microcystis aeruginosa* genetic variations and the transition to a discussion of microcystin concentrations in the Klamath River. Please refer to Volume III Attachment 1 Section 3.4.2.3

Phytoplankton and Periphyton– Environmental Setting – Hydroelectric Reach – Phytoplankton for the revisions.

Comment ORG46-265

The DEIR states that "Nuisance blooms of periphyton have not been documented in the riverine portions of the Hydroelectric Reach. In the J.C. Boyle Peaking Reach, it has been noted that periphyton tends to be absent from the margins of the river that are alternately dried and wetted during peaking operations (E. Asarian, pers. comm., 2011)." The DEIR should clarify the reasons that nuisance blooms of periphyton during summer have not been documented in the riverine portions of the hydroelectric reach. For example, in Keno and J.C. Boyle reservoirs, light limitation is prevalent as highly impaired water released from Keno Dam are turbid, colored, and have notable suspended material limiting periphyton growth, a condition that will persist under the Proposed Project and all alternatives. Downstream of the J.C. Boyle Powerhouse, peaking operations alternatively produce high flows and low flows in the downstream river reach, ranging from about 3,000 cfs to 300 cfs and this environment limits colonization by periphyton. Under the Proposed Project, stable flows will be the norm and the J.C. Boyle Peaking Reach will be colonized with periphyton growth. During summer periods, this will likely cause pH excursions above 9 s.u. throughout the reach and may cause local dissolved oxygen conditions to vary notably through the 24-hour period.

Response to Comment ORG46-265

Please refer to response to comment TR20-28 for clarification regarding the reasons that periphyton tend to be absent from the margins of the J.C. Boyle Peaking Reach. As acknowledged in Volume I Section 3.4.5 *Phytoplankton and Periphyton – Potential Impacts and Mitigation – Periphyton* Potential Impact 3.4-4 (pages 3-435 to 3-437), there are multiple processes that influence periphyton establishment and growth (e.g., light availability, nutrient availability, water temperature, flow variations, sediment transport). Light availability, high water velocities, and the alternatively high and low flows downstream of the J.C. Boyle Powerhouse (due to hydropower peaking operations) contribute to limited periphyton growth in the J.C. Boyle Peaking Reach under existing conditions (PacifiCorp 2005a), so Section 3.4.2.3 *Phytoplankton and Periphyton – Environmental Setting – Hydroelectric Reach – Periphyton* has been revised to clarify that these processes are influencing the periphyton establishment and growth in the J.C. Boyle Peaking Reach. Please refer to Volume III Attachment 1 Section 3.4.2.3 *Phytoplankton and Periphyton – Environmental Setting – Hydroelectric Reach – Periphyton* for the revisions.

Please refer to Volume I Section 3.4.5 *Phytoplankton and Periphyton – Potential Impacts and Mitigation – Periphyton* Potential Impact 3.4-4 (pages 3-435 to 3-437) for the analysis of changes in periphyton growth in the Hydroelectric Reach from the conversion of the reservoir areas to a free-flowing river and the elimination of hydropower peaking operations under the Proposed Project.

Section 3.2.5.5 *Water Quality – Potential Impacts and Mitigation – pH* Potential Impact 3.2-11 provides an analysis of the pH under the Proposed Project and Section 3.2.5.5 *Water Quality – Potential Impacts and Mitigation – Dissolved Oxygen* Potential Impact 3.2-10 provides an analysis of the dissolved oxygen concentrations under the Proposed Project. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

The comment does not provide any data to support its assertions that the J.C. Boyle Peaking Reach periphyton growth under the Proposed Project would result in pH exceeding 9 standard units (s.u.) throughout the reach during summer periods and dissolved oxygen concentrations varying notably over a 24-hour period. Please also refer to ORG46-149 for further discussion of the pH in the Hydroelectric Reach with respect to periphyton and macrophyte growth under the Proposed Project. Additionally, the comment's assertion that periphyton would colonize the J.C. Boyle Peaking Reach under the Proposed Project conflicts with the comment's previous assertion that light limitation from turbid, colored water released from Keno Dam limits periphyton growth. Potential light limitations in the Hydroelectric Reach would persist under the Proposed Project and all alternatives since the Proposed Project would not alter light limitation conditions in the Klamath River upstream of J.C. Boyle Reservoir and the short residence time of J.C. Boyle Reservoir likely results in relatively limited settling of suspended particles that influence light limitation in the Klamath River.

Volume I Section 3.4.5 *Phytoplankton and Periphyton – Potential Impacts and Mitigation – Periphyton* Potential Impact 3.4-4 (pages 3-435 to 3-437) determines that the generally high gradient and velocity in the J.C. Boyle Peaking Reach does not currently support excessive periphyton mats, so the J.C. Boyle Peaking Reach would not be anticipated to support excessive periphyton mats if J.C. Boyle Dam were to be removed and hydropower peaking flows were to cease. Potential light limitations based on light extinction measurements between Keno Dam and the Oregon-California state line (see response to comment ORG46-36) would further support the analysis in Volume I Potential Impact 3.4-4 (pages 3-435 to 3-437) that there would not be excessive periphyton growth in the J.C. Boyle Peaking Reach under the Proposed Project.

Comment ORG46-266

The DEIR includes no discussion of the existing, extensive macrophyte growth in the Klamath River reach downstream of Iron Gate Dam. Macrophyte densities are considerable between Iron Gate Dam and the Shasta River, and continue to be present in high densities downstream to the Scott River. These plants have a dominant impact on water quality in terms of pH, dissolved oxygen, nutrient uptake, as well as an autochthonous production of particulate and dissolved organic matter to the Klamath River.

Response to Comment ORG46-266
As discussed in the introduction of Volume I Section 3.4.2 *Phytoplankton and Periphyton – Environmental Setting* (page 3-392), there is no known quantitative or species-specific information characterizing aquatic plants (i.e., submerged and/or floating macrophytes) in the Hydroelectric Reach or the Middle and Lower Klamath River. Sullivan et al. (2013) sampled macrophytes in the Klamath River between Link River and Keno Dam, but the primarily calm, slow-moving reservoir habitat of the Lake Ewuana/Keno Impoundment that dominates conditions between Link River and Keno Dam is different from the turbulent, fast-moving river habitat in the Hydroelectric Reach and the Middle and Lower Klamath River under the Proposed Project, and estimates of macrophyte abundance from the slow-moving reservoir habitat between Link River and Keno Dam would likely significantly overestimate macrophyte abundance in these reaches. Prior studies (City of Klamath Falls 1986,1989) documented that macrophytes in the Hydroelectric Reach between J.C. Boyle Dam and Copco No. 1 Reservoir were typically found only along the margins or pools and low gradient areas of the Klamath River due to the steep gradient, associated high water velocities, and lack of fine sediment substrate within this reach. Observations of aquatic macrophytes are common in the main channel in the Middle Klamath River from Iron Gate Dam to the Scott River (river mile [RM] 145.1), but they are only present in the quiet backwater areas in the Klamath River downstream of the Scott River confluence (PacifiCorp 2005; Stillwater Sciences 2009). There are no reports of excessive aquatic macrophyte biomass in the available data record, so aquatic macrophytes have typically been assumed to play a minor role in primary productivity and nutrient cycling in the Middle or Lower Klamath River (Stillwater Sciences 2009). The comment does not provide any new data or information to support its assertion that macrophytes have a dominant impact on water quality parameters.

Additionally, the net influence of potential macrophytes on water quality parameters in the Klamath River under existing conditions would be implicitly included in available water quality empirical data since these data express the net influence of all processes on water quality parameters. For example, measured nutrient data used in the Yurok Tribe nutrient budget (Asarian et al. 2010) quantifies the net influence of all nutrient recycling processes occurring in the river, including nutrient uptake (or release) by macrophytes. Please refer to the responses to comments ORG46-34, ORG46-136, ORG46-146, and ORG46-149 for further clarification of the potential influence of macrophytes in the Klamath River on water quality parameters.

Comment ORG46-267
Under the Proposed Project, the entire periphyton community will shift. The nitrogen-fixing diatoms noted in the DEIR (Epithemia sorex, Epithemia turgida, and Rhopalodia gibba, including the blue-green algae Calothrix sp.), which currently dominate the lower river in late summer and early fall will probably shift upstream in response to nutrient limitation as a result of nutrient uptake by

predominately macrophytes, but also periphyton. Aquatic vegetation, currently absent under the reservoirs and in the J.C. Boyle Peaking Reach will seasonally colonize the stream reaches and convert available nutrients from upstream sources (e.g., Upper Klamath Lake) to aquatic vegetation biomass. As current extent of nitrogen-fixing periphyton shifts upstream, the amount of nitrogen fixation occurring in the river would increase. This would further increase the nutrient loading in the river during summer and early fall periods, impacting water quality in the river as well as the downstream estuary. This critical effect of the Proposed Project on the aquatic system response is absent from the DEIR's analysis and discussion.

Response to Comment ORG46-267

Volume I Section 3.4.2.4 *Phytoplankton and Periphyton – Environmental Setting – Middle and Lower Klamath River – Periphyton* (pages 3-418 to 3-420) is summarizing the periphyton community under existing conditions, so it would not discuss changes in the periphyton community under the Proposed Project. Please refer to Volume I Section 3.4.5 *Phytoplankton and Periphyton – Potential Impacts and Mitigation* Potential Impact 3.4-4 (pages 3-435 to 3-437) and Potential Impact 3.4-5 (pages 3-437 to 3-440) for analysis of periphyton community variations under the Proposed Project due to increased nutrients from upstream dam removal and conversion of the reservoir areas to a free-flowing river.

While the comment claims nutrient uptake by macrophytes and periphyton would result in nutrient limitations in the Klamath River and the location where nitrogen-fixing periphyton species dominate would shift upstream from its current location under the Proposed Project, this assertion is speculative. As analyzed in Section 3.2.5.3 *Water Quality – Potential Impacts and Mitigation – Nutrients* Potential Impact 3.2-8, model results from a Yurok Tribe nutrient budget analysis and the Klamath River Total Maximum Daily Load (TMDL) analysis indicate nutrient concentrations would increase in the Klamath River downstream of Iron Gate Dam under the Proposed Project. The Yurok Tribe nutrient budget analysis estimated nutrient variations in the Klamath River under the Proposed Project by multiplying the length of the reservoir areas by data-driven estimates of the per-mile relative nutrient retention (or release) rates from free-flowing Klamath River reaches under existing conditions. Estimates of nutrient concentrations under the Proposed Project using the Yurok Tribe nutrient budget analysis implicitly included nutrient processes such as uptake of nutrients for seasonal phytoplankton, periphyton, and macrophyte growth and subsequent downstream release, as these processes were ongoing and inherently included in the nutrient retention rate estimates. Accordingly, the influence of macrophyte growth is included in the analysis of nutrient conditions in the Klamath River under the Proposed Project.

Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

As analyzed in Volume I Section 3.4.5 *Phytoplankton and Periphyton – Potential Impacts and Mitigation* Potential Impact 3.4-5 (pages 3-437 to 3-440), the location where nitrogen-fixing periphyton species begin to dominate would shift farther downstream in the Lower Klamath River because nutrients (e.g., nitrogen) in the Klamath River downstream of Iron Gate Dam are estimated to increase under the Proposed Project (Asarian et al. 2010), contrary to the unsupported claims in the comment.

Comment ORG46-268

The DEIR states "Overall, under the Proposed Project, long-term reductions in nuisance and/or noxious phytoplankton blooms in the reservoirs in the Hydroelectric Reach would reduce or eliminate the transport of nuisance and/or noxious phytoplankton species, blooms of these phytoplankton species, and concentrations of algal toxins (e.g., microcystin) into the Middle and Lower Klamath River and would be beneficial." While the reservoirs would no longer support cyanobacteria, there are other suitable habitats in the Klamath River for these and other toxin-producing species that the DEIR does not acknowledge. For example, under existing conditions, backwater areas on the river (e.g., Brown Bear) have had some of the highest microcystin concentrations on the Klamath River (outside of Copco and Iron Gate reservoirs). If these areas still contain backwater habitats and have a supply of nutrients and warm temperatures, there is no reason why high microcystin concentrations will not continue to occur in these areas. The back eddy and slack water habitats of the Klamath River have conditions (water temperature, light levels, flow rates, and nutrient availability/ ratios) that make them suitable habitat for cyanobacteria growth and production of associated toxins. Potentially toxigenic cyanobacteria (like Microcystis) are common in the Klamath River and other rivers and estuaries around the world where conditions are suitable to support their growth. Some species, like Phormidium, are benthic mat-forming species capable of producing toxins, thriving in relatively dynamic river systems (e.g., see work on the unregulated South Fork Eel River by Bouma-Gregson et al. 2017), and have been detected in the Klamath River (Otten 2017a).

Response to Comment ORG46-268

Please refer to the previous paragraph on page 3-431 in Volume I Section 3.4.5.1 *Phytoplankton and Periphyton – Potential Impacts and Mitigation – Phytoplankton* Potential Impact 3.4-2 (pages 3-428 to 3-433) that acknowledges that some cyanobacteria growth may still occur after dam removal in the Middle and Lower Klamath River due to calm, slow-moving habitats along shorelines and protected coves and backwaters in the Middle and Lower Klamath River, especially during low-flow periods. Volume I Section 3.4.5.1 *Phytoplankton and Periphyton – Potential Impacts and Mitigation – Phytoplankton* Potential 3.4-2 (pages 3-428 to 3-433) does not conclude that these calm, slow-moving habitats would be free of phytoplankton, microcystin, or other algal toxins.

High concentrations of phytoplankton cells and algal toxins have been measured in calm, slow-moving habitats along shorelines, protected coves, and backwaters along the Klamath River (Kann et al. 2010a; Genzoli and Kann 2017). However, the growth and/or reproduction of phytoplankton cells within these habitats have not been documented, with high concentrations of blue-green algae cells and associated algal toxins generally attributed to entrapment and accumulation of cells and toxins transported downstream from the reservoirs rather than growth and/or reproduction within these slow-moving shoreline habitats (Falconer et al. 1999; Kann et al. 2010a; State Water Board et al. 2010, updated 2016; Genzoli and Kann 2016, 2017). Benthic mat-forming periphyton may produce algal toxin concentrations in the Klamath River, but the relative contribution of benthic mat-forming periphyton species to algal toxin concentrations in the Klamath River compared to phytoplankton species has not been quantified and there is no data indicating elevated microcystin concentrations are due to benthic mat-forming periphyton. Analysis of algal toxins from benthic mat-forming periphyton in the Klamath River by Otten (2017) are specifically about anatoxin-*a* rather than microcystin. Genetic analysis of anatoxin-*a* measured in the Klamath River indicated *Oscillatoria* sp., *Phormidium* sp., or *Tychonema* sp. were likely sources of the anatoxin-a in the river rather than *Dolichospermum* sp. (i.e., *Anabaena flos-aquae* in the EIR) or *Aphanizomenon* sp., but *Oscillatoria* sp., *Phormidium* sp., or *Tychonema* sp. were not observed during 2016 at any sites where the anatoxin-*a* or its associated genes were detected (Otten 2017). While Otten (2017) did not observe *Oscillatoria* sp. during 2016 where anatoxin-*a* or its associated genes were detected, there were multiple detections of *Oscillatoria* sp. in sampling of periphyton communities in the Klamath River from 2004 to 2013 (Asarian et al. 2014, 2015). *Phormidium* sp., or *Tychonema* sp. were not observed in sampling of periphyton communities in the Klamath River from 2004 to 2013 (Asarian et al. 2014, 2015). While data suggests benthic mat-forming periphyton may be contributing to anatoxin-a concentrations in the Klamath River and some periphyton species are capable of producing microcystin under certain conditions, there is no evidence that benthic mat-forming periphyton are contributing detectable amounts of microcystin to the Klamath River and genetic analysis has directly linked the measured microcystin in the Klamath River to *Microcystis aeruginosa*.

The potential for benthic mat-forming periphyton species to produce algal toxins under the Proposed Project would be similar to existing conditions since the overall growth and abundance of periphyton downstream of Iron Gate Dam under the Proposed Project would be similar to existing conditions. As analyzed in Volume I Potential Impact 3.4-5 (pages 3-437 to 3-439), there would be a less than significant change in the overall growth and abundance of periphyton downstream of Iron Gate Dam under the Proposed Project because potential increases in periphyton growth from increases in nutrient transport and recycling would be counteracted by potential decreases in periphyton growth from increases in nutrient uptake and retention by periphyton growth in the

Hydroelectric Reach, increases in frequency and intensity of scouring events, and elimination of seasonal nutrient releases from reservoir sediments.

Comment ORG46-269
Some vegetation type descriptions are missing alliances in Table 3.5-1. Standardize the vegetation type titles and include forest for forest vegetation.

Response to Comment ORG46-269
Volume I Section 3.5 *Terrestrial Resources* Table 3.5-1 (page 3-458) summarizes the vegetation cover types documented in the Primary Area of Analysis for terrestrial resources based on the California Wildlife Habitat Relationships (CWHR) system. The vegetation type titles are standardized according to the CWHR classification scheme; forest types do not include "forest" in the title. Corresponding alliances, as defined in the Manual of California Vegetation classification scheme, that were documented during Klamath River Renewal Corporation 's (KRRC's) 2018 surveys are provided in the description for each CWHR vegetation to the extent that data are available.

Comment ORG46-270
A chart listing positive and negative impacts resulting from the conversion from reservoir to stream habitat would clarify the Proposed Project effects on wildlife species. A description of the existing ecosystem in the reservoir and how it is used by wildlife should be included.

Response to Comment ORG46-270
Volume I Section 3.5.2.4 *Terrestrial Resources – Existing Setting – Non-special-status Wildlife* (page 3-475) and Section 3.5.2.5 *Terrestrial Resources – Existing Setting –Special-status Species – Special-status Wildlife* (page 3-500) have been revised to provide additional detail clarifying wildlife species use within the existing ecosystem in the reservoir. Please refer to Volume III Attachment 1 Section 3.5.2.4 *Terrestrial Resources – Existing Setting – Non-special-status Wildlife* and Section 3.5.2.5 *Terrestrial Resources – Existing Setting –Special-status Species – Special-status Wildlife* for the revisions.

The commenter indicates that a chart listing positive and negative impacts resulting from the conversion from reservoir to stream habitat would clarify the effects on wildlife species. The chart approach is not how the EIR is organized and would not provide additional detail to the effects on wildlife species. The EIR terrestrial wildlife analysis was organized by species or species groups that have the potential to be affected by an action associated with the Proposed Project (e.g., suspended sediment effects on amphibians that have the potential to be in downstream aquatic habitats [see Volume I Section 3.5.4 *Terrestrial Resources – Impact Analysis Approach*, page 3-516], modification of reservoir habitat to river or upland habitat that may reduce habitat for western pond turtle or increase deer winter range habitat [see Volume I Section 3.5.5.3 *Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural*

Communities, pages 3-524 to 3-575]). The existing information on environmental setting for special-status wildlife species is provided by species (pages 3-500 to 3-513). As part of the EIR analysis, information is provided about use of existing habitats (e.g., structures providing habitat for bat maternity colonies, seasonal water bird use of the reservoirs during migration and/or for overwintering, aquatic habitat for swifts and bats that feed on flying insects, turtle use along reservoirs for basking and nesting). The following impact analyses in Volume I consider changes in habitat and the relationship to special-status species following completion of the Proposed Project (and the alternatives, as applicable): 3.5-12 (pages 3-540 to 3-543), 3.5-16 (pages 3-555 to 3-559), 3.5-17 (pages 3-559 to 3-560), 3.5-18 (pages 3-560 to 3-561), 3.5-19 (page 3-561), 3.5-20 (pages 3-561 to 3-562), 3.5-21 (pages 3-562 to 3-563), 3.5-22 (pages 3-563 to 3-570), 3.5-23 (page 3-570), 3.5-25 (pages 3-572 to 3-573), and 3.5-29 (pages 3-575 to 3-576).

Please also refer to Master Response TER-1.

Comment ORG46-271

There is no definition provided in the DEIR for the term "substantial." The DEIR should provide such a definition to ensure that a) the reader understands exactly what the significance criteria are, and b) the analysis in the DEIR is then clear in terms of how the Proposed Project and alternatives actually effect these resources.

Response to Comment ORG46-271

Regarding the use of the term substantial, please refer to Master Response CEQ-3.

Comment ORG46-272

Effects on the Secondary Area of Analysis are expected to be indirect. This may be the main difference between the Primary and Secondary areas, but the DEIR does not state this clearly.

Response to Comment ORG46-272

For the Terrestrial Resources Secondary Area of Analysis, Volume I Section 3.5.1 *Terrestrial Resources – Area of Analysis* briefly reviews potential future actions related to the transfer of Parcel B lands following dam removal to the respective states (i.e., California or Oregon), or to a designated third-party transferee following dam removal (see also Section 2.7.10 *Proposed Project – Land Disposition and Transfer*, pages 2-108 to 2-109). The Secondary Area of Analysis was not defined based on an expectation that effects in this area would be indirect. Rather, as stated in Volume I Section 3.5.1 *Terrestrial Resources – Area of Analysis* on pages 3-453 to 3-515, because of uncertainty regarding what future activities may occur on Parcel B lands, their extent, and their precise location, the analysis of impacts in the Secondary Area of Analysis is necessarily less detailed. Given that potential impacts would vary depending on future land uses, potential impacts in the Secondary Area of Analysis were analyzed with

respect to likely future construction activities given the range of expected land uses (open space, active wetland and riverine restoration, river-based recreation, grazing, and potentially others). Additional information is provided in Volume I Section 3.5.5.3 *Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities* Potential Impact 3.5-28 (pages 3-574 and 3-575).

Comment ORG46-273

The document lacks steps typically found in a revegetation plan such as a planting plan and plant pallet and therefore does not adequately assess impacts to vegetation communities. Mitigation should include a concept of vegetation types after the dams are removed, acres of habitat to be revegetated, and wildlife associations with those habitat types to fully evaluate the effectiveness of the mitigation measures. Without specifics, it is not possible to determine if the mitigation is adequate to offset for the impacts of the Proposed Project.

Response to Comment ORG46-273

The Reservoir Area Management Plan (Volume II Appendix B: *Definite Plan – Appendix H*), which is part of the Proposed Project, includes a planting plan and palette; seeded species and pole cutting species proposed for collection and propagation are presented in Tables 5-2 and 5-3, and species proposed per vegetation zones are presented in Tables 5-5 through 5-10 of the Reservoir Area Management Plan. The Reservoir Area Management Plan also includes measures to characterize vegetation and delineate wetlands which would inform the vegetation types targeted for restoration. Finally, the Reservoir Area Management Plan includes performance criteria for the established habitats; these habitats would be monitored for five years or until the performance criteria have been met.

Section 3.5.5.1 *Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities* Potential Impact 3.5-1 has been clarified to indicate that the amount of wetland and riparian habitat created through revegetation efforts would far exceed the acreage of any wetlands and/or riparian vegetation that cannot be avoided during construction activities. Moreover, Potential Impact 3.5-2 has been clarified to indicate that since the proposed acreage to be restored (182 acres) is greater than the total acreage that would be potentially impacted by reservoir drawdown (approximately 15 acres of riparian vegetation and 19 acres of wetlands), there would be no net loss of wetlands under the Proposed Project. Please refer to Volume III Attachment 1 Section 3.5.5.1 *Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities* Potential Impact 3.5-1 and Volume III Attachment 1 Section 3.5.5.1 *Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities* Potential Impact 3.5-2 for the revisions.

Additionally, please refer to ORG46-270 and ORG46-283 for a discussion of changes to the EIR regarding non-special status and special-status species'

habitat associations. Please also refer to Volume I Section 3.5.2.4 *Terrestrial Resources – Environmental Setting – Non-special-status Wildlife* (pages 3-474 to 3-477) and Section 3.4.2.5 *Terrestrial Resources – Environmental Setting – Special-status Species – Special-status Wildlife* (3-500 to 3-513) for both special-status and non-special status wildlife use within existing habitat types that would be similar to those that would be revegetated (including riparian, wetland, and upland areas); portions of these sections have been updated in Volume III Attachment 1 Section 3.5.2.4 *Terrestrial Resources – Environmental Setting – Non-special-status Wildlife* and Section 3.4.2.5 *Terrestrial Resources – Environmental Setting – Special-status Species – Special-status Wildlife*.

Comment ORG46-274

The DEIR does not address direct disturbance to wetlands where the dam will be physically removed or where construction would place structures into a water of the U.S. (e.g., Fall Creek Hatchery modifications; see comment 3.5-8). There will be no buffer at the dam and accidents such as hazardous spills could take place in a wetland.

Response to Comment ORG46-274

Section 3.5.5.1 *Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities* Potential Impact 3.5-1 considers general construction-related impacts on wetland and riparian vegetation communities, including potential impacts from modification of structures such as the Fall Creek Hatchery (FCH), and has been revised to clarify that removal of the dams themselves is also considered part of the proposed construction activities. Please refer to Volume III Attachment 1 Section 3.5.5.1 *Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities* for the revisions.

As discussed in Volume I Section 3.5.5.1 *Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities* Potential Impact 3.5-1, the Proposed Project identifies a number of pre-construction measures to reduce impacts on wetland habitats including the following: a wetland delineation, which would be incorporated into the Proposed Project design to avoid and minimize direct impacts on wetlands to the maximum extent feasible; fencing of wetland areas adjacent to the construction Limits of Work to prevent inadvertent entry; and establishment of a buffer per Mitigation Measure TER-1. The wetland delineation was conducted in 2019 and results indicate that some portions of the Fall Creek Hatchery retrofit are adjacent to riparian or wetland vegetation (i.e., riparian at the primary location of Fall Creek Hatchery and wetlands at the lower settling pond location); however, there are no wetlands adjacent to the dams (KRRC 2019c). Please refer to Volume III Attachment 1 Section 3.5.5.1 *Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities* for the revisions.

As discussed in Volume I Section 3.5.5.1 *Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities* Potential Impact 3.5-1, the

Proposed Project includes a Reservoir Area Management Plan (Volume II Appendix B: *Definite Plan – Appendix H*). Section 3.5.5.1 *Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities* Potential Impact 3.5-1 has been clarified to indicate that the amount of wetland and riparian habitat created through revegetation efforts would far exceed the acreage of any wetlands and/or riparian vegetation that cannot be avoided during construction activities. Please refer to Volume III Attachment 1 Section 3.5.5.1 *Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities* for the revisions.

The Proposed Project also includes construction best management practices (BMPs) (Volume II Appendix B: *Definite Plan – Appendix J*) to reduce potential impacts on water quality in waters during construction; these BMPs would apply during removal of the dam itself. Furthermore, Volume I Section 3.5.5.1 *Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities* Potential Impact 3.2-4 (pages 3-106 to 3-108) indicates that because the proposed BMPs are not sufficiently comprehensive to avoid all potential violations of water quality standards or other degradation of water quality in affected portions of wetlands within the Limits of Work, implementation of mitigation measures WQ-1 and TER-1 would be necessary to reduce any potential impacts not already addressed by the BMPs to less than significant. Section 3.5.5.1 *Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities* Potential Impact 3.5-1 has been revised to clarify that Mitigation Measure HZ-1 would also be implemented. Please refer to Volume III Attachment 1 Section 3.5.5.1 *Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities* for the revisions. These measures would ensure that there are no significant impacts on waters adjacent to the dams or where hatchery modifications would be made.

Comment ORG46-275

This analysis in the DEIR is contradictory and does not address the impacts to these resources. For example, the DEIR states that "Degradation or removal of wetland and riparian habitat in the areas listed above would be a significant short-term and long-term impact" (DEIR pg. 3-520). The DEIR goes on to analyze the potential effects of revegetation and wetland creation within the reservoir footprints. Ultimately, if all of this work is successful, then perhaps the long-term impact is less than significant, but the short-term impact would appear to remain significant.

Response to Comment ORG46-275

Comment noted. Section 3.5.4 *Terrestrial Resources – Impact Analysis Approach* has been revised to clarify the definition of short-term effects. Please refer to Volume III Attachment 1 Section 3.5.4 *Terrestrial Resources – Impact Analysis Approach* for the revisions.

Potential Impact 3.5-2 in Section 3.5.5.1 *Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities* (pages 3-519 through 3-521) addresses potential short- and long-term impacts due to reservoir drawdown; this potential impact analysis has been clarified to indicate that the proposed acreage to be restored is greater than the total acreage that would be potentially impacted; therefore, there would be no net loss of wetlands under the Proposed Project. Please refer to Volume III Attachment 1 Section 3.5.5.1 *Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities* EIR Potential Impact 3.5-2 for the revisions.

Comment ORG46-276

The analysis of impacts to wetland habitats downstream of Iron Gate Dam is inadequate for the following reasons:

1. Implementation of the Proposed Project would result in the release of sediment into the Klamath River downstream of Iron Gate Dam. Not all sediment will be transported all the way to the Pacific Ocean (see Major Issue 2.4). Some of this material will deposit in slack water, eddies, backwaters, and side channels in the 190 miles of river between Iron Gate Dam and the ocean.

2. The Klamath River is a jurisdictional water of the U.S. subject to permitting for placement of fill by the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act and, because it is navigable, under Section 10 of the Rivers and Harbors Act. The DEIR Significance Criteria requires a significant impact when the Proposed Project would "Result in substantial modifications of federally protected wetlands as defined by Section 404 of the Clean Water Act through direct removal, filling, hydrological interruption, or other means." (DEIR pg. 3-515). The DEIR fails to define the term "substantial."

3. The DEIR does not quantify the amount of sediment that will be deposited into the river, the duration of that fill, or the flows necessary to continue transporting it downstream. This is in contradiction to Appendix F of the DEIR which discusses bedload modeling and presents a range of channel elevation changes expected for the Klamath River downstream of Iron Gate Dam (for example see DEIR Figure F-11).

4. Impacts need to consider that sediment would now from the dam site to the ocean and could cause long-term impacts. The analysis does not evaluate or even attempt to quantify the amount of wetland fill that would occur downstream of Iron Gate Dam as a result of the Proposed Project. It is hard to understand how the deposition of some fraction of the millions of cubic-yards of material that will be released is not a substantial modification of federally-protected wetlands. The conclusion that this impact is less than significant is not support ed by the information in the DEIR.

The discussion of impacts needs to consider sedimentation resulting from large-scale changes such as wildfires that remove stabilizing vegetation. The DEIR fails to describe the impacts that will occur, what the flood cycle would be like following implementation of the Proposed Project, how USBR would operate Upper Klamath Lake for flood control, and the effects that would have on sediment transport and jurisdictional wetlands. The DEIR does not describe how the present vegetation and wildlife would be impacted by short and long-term changes resulting from this high amount of sedimentation and that it may take more than 1 year for the sediment to be washed out of the system.

Response to Comment ORG46-276
Volume I Section 3.5.5.1 *Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities* Potential Impact 3.5-3 (pages 3-521 and 3-522) analyzes potential impacts on wetland habitat downstream of the Lower Klamath Project dams due to sediment deposition resulting from dam removal and concludes that there would be a less than significant impact on wetland habitat with the Proposed Project.

Section 3.5.5.1 *Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities* Potential Impact 3.5-3 has been revised to clarify the predicted mobility of sediment deposits in the Klamath River downstream of Iron Gate Dam following dam removal, the extent of wetlands in the reaches between Iron Gate Dam and Cottonwood Creek where significant short-term sedimentation is predicted, and the potential for recolonization of wetland vegetation. These clarifications have not affected the conclusion that there would be no net loss of wetland habitat and there would be a less than significant impact. Please refer to Volume III Attachment 1 Section 3.5.5.1 *Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities* Potential Impact 3.5-3 for the revisions.

Regarding the first concern that some sediment may deposit in slack water, eddies, backwaters, and side channels between Iron Gate Dam and the ocean, please refer to Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5, which is partially modified in Volume III Attachment 1, and to Master Response GEO-1.

Regarding the second claim that the Draft EIR fails to define the term "substantial" in the significance criteria, Klamath River Renewal Corporation (KRRC) is coordinating with the U.S. Army Corps of Engineers regarding the Section 404 individual permit for the Proposed Project (Volume II Appendix B: *Definite Plan* [pages 36 to 37 of the *Definite Plan*]). The CEQA analysis is independent of the Section 404 application and process. For the purposes of the CEQA EIR, 'substantial' is defined generally and the general definition applies to the CEQA EIR analysis of modifications to protected wetlands (see Master Response CEQ-3). 'Substantial' is also defined in specific resource contexts and this applies to sediment deposition. Section 3.11.3 *Geology, Soils, and Mineral*

Resources – Significance Criteria has been clarified to define 'substantial' in the context of sediment deposition. Please refer to Volume III Attachment 1 Section 3.11.3 *Geology, Soils, and Mineral Resources – Significance Criteria* for the revisions.

Regarding the third concern that the Draft EIR does not quantify the amount of sediment that will be deposited into the river, the duration of that fill, or the flows necessary to continue transporting it downstream, please refer to ORG46-13 and Master Response GEO-1. Additionally, note that Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 and Appendix F have both been revised to discuss reach-averaged sediment deposition or erosion and bed elevation change results of both SRH-1D simulations (i.e., the 48 2-year simulations and three 50-year simulations) (USBR 2012a). Please refer to Volume III Attachment 1 Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* – Potential Impact 3.11-5 and to Volume III Attachment 1 Appendix F for the revisions.

Regarding the fourth assertion that sediment could flow from the dam site to the ocean and cause long-term impacts, both short- and long-term sedimentation impacts are analyzed in Volume 1 Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5, which is partially modified in Volume III Attachment 1. For the reasons discussed in Potential Impact 3.11-5, the long-term change in sediment supply and transport due to dam removal would be beneficial from the Hydroelectric Reach to the Klamath River Estuary, and there would be no significant impact in the Pacific Ocean nearshore environment. Please also refer to Master Response GEO-1. The potential impacts of sedimentation on wetlands specifically are analyzed in Section 3.5.5.1 *Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities* Potential Impact 3.5-3, which as discussed above in this comment response, has been revised in Volume III Attachment 1.

The last paragraph of the comment covers multiple topics which are covered in the EIR and master responses. Volume I Section 3.24.11 *Cumulative Effects – Geology, Soils and Mineral Resources* Potential Cumulative Impact 3.24-41, which is partially modified in Volume III Attachment 1, considers the sedimentation effects from the Proposed Project in combination with wildfire and concludes that the impact would not be cumulatively considerable. Volume I Section 3.24.27 *Cumulative Effects – Terrestrial Resources* Potential Cumulative Impact 3.24-26 considers the effects on terrestrial resources from the Proposed Project in combination with wildfire and concludes that the impact would not be cumulatively considerable. Volume I Section 3.6 *Flood Hydrology* Potential Impacts 3.6-3 through 3.6-5 and Master Response FLD-1 cover flood hydrology effects. Volume 1 Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5, which is partially modified in Volume III Attachment 1, and Master Response GEO-1, discuss the temporal component of sediment transport and remobilization of deposits

following dam removal. Please refer to Section 3.5.5.1 *Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities* and Volume III Attachment 1 Section 3.5.5.1 *Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities* Potential Impact 3.5-3 for the revisions for potential impacts of sedimentation on wetland vegetation, and Volume I Section 3.5 *Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural communities* Potential Impact 3.5-18 (pages 3-560 to 3-561) for potential impacts of sedimentation on wildlife, which include amphibians and reptiles that use wetland habitat.

In summary, no significant or cumulatively considerable impacts to vegetation and/or wildlife resulting from sedimentation under the Proposed Project are found in the EIR.

Comment ORG46-277

The DEIR states that "Project activities including construction as well as reservoir drawdown would result in population-level impacts to culturally significant plant species or substantial degradation or removal of wetland and riparian habitat; therefore, there would be a significant short-term and long-term impact on culturally significant species." Mitigation Measure TER-1 is an avoidance measure only. It does not prevent impacts to culturally significant species affected by construction outside of wetlands, or for indirect impacts to species within wetlands (e.g., from desiccation as groundwater is removed). The DEIR is required by CEQA to include mitigation that actually mitigates for impacts of the Proposed Project. Such a measure would include a detailed plan to address culturally significant plants, with a list of species and a schedule for implementation to substantiate the claim that long-term and short-term impacts will not occur. Short- and long-term impacts to culturally significant species must be defined. Without these specifics, the DEIR is deferring mitigation.

Response to Comment ORG46-277

The Proposed Project includes actions to account for culturally significant species that cannot be avoided or that may be indirectly impacted (e.g., through disconnection from groundwater) including revegetation with wetland and riparian species in the reservoir footprints as defined in the Reservoir Area Management Plan (Appendix B: *Definite Plan – Appendix H*). Potential Impact 3.5-6 in Section 3.5.5.2 *Terrestrial Resources – Potential Impacts and Mitigation – Culturally Significant Species* (page 3-524) has been clarified to note that all of the culturally significant species that are documented to occur within the Primary Area of Analysis are associated with riparian and wetland habitat and that the revegetation mixes listed in the Reservoir Area Management Plan (Appendix B: *Definite Plan – Appendix H*) include all of those species. Please refer to Volume III Attachment 1 Section 3.5.5.1 *Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities* for the revisions.

Section 3.5.4 *Terrestrial Resources – Impact Analysis Approach* has been revised to clarify the definition of short-term effects. Please refer to Volume III Attachment 1 Section 3.5.4 *Terrestrial Resources – Impact Analysis Approach* for the revisions.

Comment ORG46-278

We recommend that the new mitigation measure recommended above (see comment 3.5-9) include a statement that culturally significant species will be collected from local seed and propagation material.

Response to Comment ORG46-278

Please refer to responses to comments LA9-38 and ORG46-277.

Comment ORG46-279

Using the terminology 'Recommended Terrestrial Measure 1" the DEIR creates confusion about mitigation measure numbering. In addition, the description in the DEIR lacks understandable transitions through the discussion of the restoration process. Some parts are handled under the Plant Mitigation and Monitoring Plan and others in the Final Restoration Plan. It is unclear what resources would be mitigated for under which plan and how these two plans are related. The DEIR is required to clearly present mitigation measures including and a discussion of how these plans would be designed to survive the natural flood cycle and describe the scope of revegetation in the riparian habitat.

Response to Comment ORG46-279

A Plant Mitigation and Monitoring Plan is referenced in Recommended Terrestrial Measure 1 of Section 3.5.5.1 *Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities* (page 3-525). As presented, the recommended Plant Mitigation and Monitoring Plan would include measures to successfully mitigate for impacts to special-status plants at a minimum 1:1 ratio. These measures would include translocation, propagation, and planting procedures that take into account the special-status species' life history and monitoring procedures that would effectively assess the success of the restoration efforts, as specified in Appendix J of the Definite Plan. The impact analysis explains that such a plan could be developed and implemented as part of the Final Restoration Plan through the Federal Energy Regulatory Commission (FERC) process. As the State Water Board cannot ensure implementation of the terrestrial aspects of the Final Restoration Plan, Recommended Terrestrial Measure 1 may not be implemented, which is why the EIR concludes that Potential Impact 3.5-7 (pages 3-524 and 3-525) would be significant and unavoidable. Please see Master Response CEQ-2 for further discussion of Recommended Measures.

As described in Section 3.5.5.1 *Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities* Potential Impact 3.5-2 (pages 3-519 through 3-521), the Proposed Project includes several actions to encourage rapid

revegetation with native riparian species in the reservoir footprints as defined in the Reservoir Area Management Plan (Appendix B: *Definite Plan – Appendix H*) that take into account the natural flood cycle and would ensure no net loss of wetland or riparian habitat acreage and functions. Section 3.5.5.1 *Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities* Potential Impact 3.5-2 has been clarified to indicate that the proposed acreage to be restored is greater than the total acreage that would be potentially impacted; therefore, there would be no net loss of wetlands under the Proposed Project. Please refer to Volume III Attachment 1 Section 3.5.5.1 *Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities* EIR Potential Impact 3.5-2 for the revisions.

Comment ORG46-280

The DEIR does not address long-term impacts to Western Pond Turtles. Because the Western Pond Turtle relies on open water, implementation of the Proposed Project will remove a substantial amount of occupied Western Pond Turtle habitat, a long-term impact that the DEIR fails to address. Mitigation needs to be proposed for this significant impact.

Response to Comment ORG46-280

Long-term impacts on western pond turtles and a discussion of the loss of reservoir habitat is provided in Volume I Section 3.5.5.3 *Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities* Potential Impact 3.5-22 (pages 3-563 to 3-569). The EIR acknowledges that the Proposed Project would result in removing approximately 90 percent of the existing aquatic surface area resulting in a substantial decrease of open water (i.e., from approximately 1,950 acres to approximately 195 acres); however, the impact on western pond turtle would be more directly related to a change in the amount of shoreline habitat than open water habitat (page 3-568). There are currently approximately 18.4 miles of suitable nesting and basking habitat (PacifiCorp 2004a-2) along the shorelines of Copco No. 1 and Iron Gate reservoirs. Following the removal of the reservoirs, approximately 17.7 miles of mainstem and tributary reaches would be re-exposed in the reservoir footprints (see Reservoir Area Management Plan [Volume II Appendix B: *Definite Plan – Appendix H*]); however, the potential habitat suitability of the newly exposed shoreline is uncertain at this time. Implementation of Mitigation Measure TER-4 would reduce long-term impacts to less than significant.

Comment ORG46-281

"No pets will be allowed in the construction areas" should be added as a sixth bullet under Recommended Terrestrial Measure 5: Requirements for Construction Personnel.

Response to Comment ORG46-281

As Klamath River Renewal Corporation (KRRC) already indicates that contractors will not allow pets within the Limits of Work as part of the Proposed

Project (Appendix B: *Definitive Plan – Appendix J*, pages 551 of 878), this term is not included in Recommended Terrestrial Measure 5, as provided in Volume I Section 3.5.5. *Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities*.

Comment ORG46-282

Table 3.5-8 and subsequent text lack discussion of how dam removal will affect bat feeding habitat by species. The DEIR description does not adequately justify a no impact for sensitive bat species. This justification for why the Proposed Project would not degrade bat habitat is required; especially because Proposed Project impacts, including removal of buildings, would eliminate bat nesting habitat and by removing the reservoirs, the Proposed Project would permanently alter the feeding habitat by removing open water areas.

Response to Comment ORG46-282

Volume I Section 3.5.5.3 *Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities* Table 3.5-8 identifies evidence of bat use at Lower Klamath Project structures based on a June 2017 reconnaissance survey and May and June 2018 surveys (pages 3-547 to 3-549). Data collected in fall 2018 were similar to data collected previously in the year and are incorporated into Volume III Attachment 1 Section 3.5.5.3 *Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities* Table 3.5-8.

Please refer to Volume I Section 3.5.5.3 *Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities – Potential Impacts* Potential Impact 3.5-14 which has identified short- and long-term significant and unavoidable impacts on bats from construction noise and loss of roosting habitat, contrary to the comment's expressed concern. While recent surveys have identified only Yuma myotis as using Lower Klamath Project facilities for roosting habitat, because other bat species are present in the area; the bats are mobile; and the habitat could provide for other species as well, the EIR conservatively does not limit this finding to just Yuma myotis (KRRC 2019d). As noted, State Water Board Recommended Terrestrial Measure 12 *Roosting Bats and Habitat*, would reduce impacts to less than significant.

For a discussion of how dam removal would affect bat feeding habitat, please refer to Volume I Section 3.5 *Terrestrial Resources – Potential Impacts and Mitigation* Potential Impact 3.5-21 (pages 3-562 to 3-563), which contemplates a reduction in aquatic foraging habitat for bats that feed on flying insects. Of the species in Table 3.5-8, Yuma myotis is the only bat that feeds primarily on aquatic flying insects. Numerous other water bodies in the area are present to provide sufficient foraging opportunities. Additionally, as discussed in Volume I Section 3.5 *Terrestrial Resources – Potential Impacts and Mitigation* Potential Impact 3.5-17 (pages 3-559 to 3-560), once benthic macroinvertebrate populations reestablish following reservoir drawdown, bats would be able to

forage for flying insects over re-established riverine habitat. Transitioning aquatic habitat to upland habitat may increase foraging opportunities for special-status bat species that feed mostly on terrestrial invertebrates species (Western mastiff bat, Townsends's western big-eared bat, spotted bat, pallid bat, fringed myotis, and long-eared myotis) [Western Bat Working Group 2019]). Section 3.5.5.3 *Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities – Potential Impacts* has been clarified to include species-specific bat foraging information and affects following reservoir drawdown. Please refer to Volume III Attachment 1 Section 3 Section 3.5.5.3 *Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities – Potential Impacts* for the revisions.

Comment ORG46-283

The DEIR analysis of Proposed Project impacts on wildlife as a result of conversion of open water to riverine habitat is overly simplified. For example, there is no description of how present species utilize the reservoirs and how, or if, those species would or would not use the river after the Proposed Project is completed. Assuming that dabbling ducks, for example, would simply go elsewhere to forage assumes that there is suitable habitat nearby to support those species, an assumption that is not supported in the DEIR. The DEIR does not even reference the results of other dam removal projects to discuss how aquatic-habitat focused wildlife species composition changed after removal. The conclusion that the impacts to these species would be less than significant is unsupported.

Response to Comment ORG46-283

As noted in comment response ORG46-270, Section 3.5.2.4 *Terrestrial Resources – Existing Setting – Non-special-status Wildlife* and Section 3.5.2.5 *Terrestrial Resources – Existing Setting –Special-status Species – Special-status Wildlife* have been revised to clarify how present non-special status and special-status wildlife species utilize the reservoirs. Please see Volume III Attachment 1 Section 3.5.2.4 *Terrestrial Resources – Existing Setting – Non-special-status Wildlife* and Section 3.5.2.5 *Terrestrial Resources – Existing Setting –Special-status Species – Special-status Wildlife* for the revisions.

Additionally, Section 3.5.2.5 *Terrestrial Resources – Existing Setting –Special-status Species – Special-status Wildlife* (page 3-500) have been revised to clarify how nearby wildlife refuges, creeks, lakes and reservoirs currently supports special-status wildlife species. Please see Volume III Attachment 1 Section 3.5.2.5 *Terrestrial Resources – Existing Setting –Special-status Species – Special-status Wildlife* for the revisions.

With respect to incorporating the results of other dam removal projects in the EIR analyses, please refer to Volume I Section 3.5.5.3 *Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities – Potential Impacts* Potential Impact 3.5-17 (pages 3-559 to 3-560),

which incorporates information based on multiple dam removal studies to evaluate a change in benthic macroinvertebrate populations, a prey source for western pond turtle and birds, and other wildlife species. Potential Impact 3.5-21 and 3.5-29 have been revised to clarify results from wildlife studies following dam removal. Please refer to Volume III Attachment 1 Section 3.5.5.3 *Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities* Potential Impacts 3.5-21 and 3.5-29 for the revisions.

Please also refer to Master Response TER-1 for a discussion of existing species' use of the Lower Klamath Project reservoirs.

Comment ORG46-284

Inundation maps are available for areas downstream of Copco Reservoir as well as the J.C. Boyle and Iron Gate facilities that are mentioned in the DEIR.

Response to Comment ORG46-284

Section 3.6.2.4 *Flood Hydrology – Environmental Setting – Risks of Dam Failure* has been revised to clarify that inundation maps are available throughout the Hydroelectric Reach. Please refer to Volume III Attachment 1 Section 3.6.2.4 *Flood Hydrology – Environmental Setting – Risks of Dam Failure* for revisions.

Comment ORG46-285

The DEIR states that "Existing conditions do not allow these reservoirs to assist in flood prevention in this manner." Flood control is not a primary purpose of how PacifiCorp operates the Klamath Hydroelectric Project, although the Klamath Hydroelectric Project nonetheless provides limited flood control benefits. Klamath Hydroelectric Project. There are occasions where reservoirs are drawn down prior to predicted high runoff events to allow for storage of high flows and modification of peak flows. The statement in the DEIR that "existing conditions do not allow" is not really correct. A more accurate statement would be "PacifiCorp does not currently operate Iron Gate and Copco reservoirs for flood control purposes."

Response to Comment ORG46-285

Section 3.6.5.1 *Flood Hydrology – Potential Impacts and Mitigation – Flood Hydrology* has been revised to clarify that Iron Gate and Copco reservoirs do not currently operate for flood control purposes. Please refer to Volume III Attachment 1 Section 3.6.5.1 *Flood Hydrology – Potential Impacts and Mitigation – Flood Hydrology* for revisions.

Comment ORG46-286

The discussion of drawdown of J. C. Boyle Reservoir is unclear as presented in the DEIR. The powerhouse would be offline, thereby removing the power canal as a conveyance avenue for water. Drawdown would have to happen via releases from the spillway or the low-level outlets. During periods of cold weather (e.g., single digit overnight low temperatures), PacifiCorp currently

operates J.C. Boyle Powerhouse continuously to keep ice from forming on the power canal. Icing is discussed in the DEIR, but the potential for an ice dam to form on the low-level outlets is discounted because of "surface ice would melt and be reduced because moving water mixes temperatures between the air and the ground...." Based on PacifiCorp's experience in the area, this is an overly optimistic assertion that could have implications for dam safety and flood control.

Response to Comment ORG46-286
PacifiCorp manages ice at J.C. Boyle Dam by keeping water moving through the intake and water conveyance systems in the winter. The Klamath River Renewal Corporation (KRRC) proposes to initiate drawdown on January 1 at J.C. Boyle Reservoir. Regardless of whether PacifiCorp opts to continue power generation until January 1, it is possible to run the water conveyance system to the powerhouse under a "no load" condition, whereby flow is moving through the intakes and the turbines are spinning at the powerhouse even when disconnected from the generators and thus not generating power. The KRRC proposes that this operation would enable reservoir drawdown, keep water flowing, and not interfere with the decommissioning of the power generation system. Throughout this phase of drawdown, water would consistently be moving through the intakes as flow in would roughly equal flow out, and thus ice formation is not expected to be an issue. As outlined in the Definite Plan, once the partially drawn down reservoir has stabilized using the spillway and intakes, the next step is to open the first of the diversion culverts. Once that happens, flows would no longer access the intake, and the intake gate would be closed. The river would flow freely through one and then both diversion culverts. At no point in the process would there be a reduction or stoppage of water flow, and therefore, KRRC proposes that there would be no formation of ice cover in J.C. Boyle Reservoir that would prevent or restrict drawdown (S. Gentzler, AECOM as Technical Representative, pers. comm., July 2019).

Comment ORG46-287
The normal water surface elevation in Iron Gate Reservoir is about 2,326.5 ft above mean sea level (msl) and the crest of the spillway is at 2,328.0 ft msl. If the water surface elevation were at 2,331.3 ft msl as reported in the DEIR, about 3 ft of water would be spilling into the spillway.

Response to Comment ORG46-287
The elevations presented in Volume I Section 3.6.5.1 *Flood Hydrology – Potential Impacts and Mitigation – Flood Hydrology* Potential Impact 3.6-1 (pages 3-626 to 3-630) are taken from Volume II Appendix B: *Definite Plan*, which uses the North American Vertical Datum of 1988 (NAVD88), not the Project datum. To convert from NAVD88 to the Project datum at Iron Gate Dam, subtract 3.33 feet (see Table 1.4-1 in Appendix B: *Definite Plan*). The normal operating elevation of 2,331.3 feet above mean sea level (amsl) for Iron Gate Reservoir, as stated on page 3-628, converts to 2,327.97 feet amsl, which is slightly lower than the spillway crest.

Comment ORG46-288

Climate change is projected to change the frequency and magnitude of high flow events (USBR 2011). There is no discussion of the sensitivity of the Proposed Project's flood risk-related impacts with regard to climate change, which is anticipated to reduce winter snowpack and increase winter flows as more precipitation falls as rain.

Response to Comment ORG46-288

The section referenced in the comment, Volume I Section 3.6.5.2 *Flood Hydrology – Potential Impacts and Mitigation – River Floodplain* Potential Impact 3.6-5 (page 3-634), analyzes whether the release of sediment stored behind the Lower Klamath Project dams and resulting downstream sediment deposition under the Proposed Project would result in potentially exposing people and/or structures to a substantial risk of damage, loss, injury, or death involving flooding. The impact analysis determines that because the sediment deposition would be relatively small in comparison with the existing channel bed and bar sediment conditions, and it would occur primarily in pools and not in the riffle and bedrock sections that tend to control water surface elevations, it would not affect stream characteristics in a way that would substantively alter flood inundation or flood risks and would therefore be a less than significant impact.

Increases in the frequency and magnitude of high flow events under climate change would not affect short-term sediment deposition in the Klamath River during reservoir drawdown, since the United States Bureau of Reclamation ‘s (USBR’s) sediment transport model was run using nearly five decades of hydrologic record (USBR 2012a) that inherently accounts for flow variability within and between years; numerous instances of dry, medium, and wet water year types; and varying sequences of water year types (e.g., more than one wet year in a row, more than one dry year in a row, dry years followed by wet years, wet years followed by dry years, etc.). In the long term, once the sediment has been deposited in the reach from Bogus Creek to Cottonwood Creek, an increased frequency and magnitude of high flow events could result in a higher incidence of mobilization of deposited sediments in these reaches and transport downstream, eventually to the Pacific Ocean (please also refer to the portion of ORG46-8 relating to climate change effects on geomorphology); however, because the deposition of sediments in these reaches would not expose people and/or structures to a substantial risk of damage, loss, injury, or death involving flooding, consideration of changes to the frequency and magnitude of high flows under climate change would not affect the discussion for Potential Impact 3.6-5.

Consistent with CEQA Guidelines section 15125 (a), future climate changes are not part of the existing condition against which this EIR compares potential impacts. While climate change predictions are used in some sections of the Lower Klamath Project EIR to provide additional context for potential impact analyses related to the Proposed Project or the alternatives (e.g., Section 3.2.5.1

Water Quality – Potential Impacts and Mitigation – Water Temperature Potential Impact 3.2-1, Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resources Impacts* Potential Impact 3.3-8, Volume I Section 4.2.2 *Alternatives – No Project Alternative – Water Quality – Water Temperature* Potential Impact 4.2.2-1 [pages 4-103 to 4-108]), the predictions are not relied upon for significance determinations associated with the Proposed Project or the alternatives. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality* and 3.3 *Aquatic Resources*.

Comment ORG46-289

The DEIR fails to address the impacts to greenhouse gas emissions resulting from removing an existing carbon-free power source (see Major Issue 2.5). The qualitative analysis in the DEIR identifies the possible replacement of hydroelectric power with nonrenewable energy sources as an indirect impact. The impacts of power replacement should be quantified to determine if the impacts are significant and to determine feasible mitigation to offset the impacts.

State climate change policy adherence is inadequately addressed.

The DEIR does not address California's policies set forth in Senate Bill (SB) 100 (De León), which increases California's renewable portfolio standard (RPS) to 60 percent by 2030 and establishes a state policy whereby renewable and zero-carbon resources supply 100 percent of retail sales to California end-use customers by December 31, 2045. Any loss of a zero-carbon resource will make this standard more costly and difficult to meet. Oregon and Washington are considering climate change bills impacting the electric sector in 2019 legislative sessions. Oregon is considering the adoption of a cap-and-trade program that will link with California's while Washington is considering both a cap-and-trade program and a proposal that would require utilities in Washington to achieve 100 percent carbon neutral energy portfolio s by 2030. Carbon-dioxide emissions calculations for the complete removal, rather than only those portions within California, are needed to support findings that the impacts of power replacement would be offset by mitigation.

Response to Comment ORG46-289

This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Greenhouse Gas Emissions and Energy*).

Comment ORG46-290

The DEIR states that "Removal of the reservoirs associated with the Lower Klamath Hydroelectric Project dam complexes would also result in a reduction in methane (CH4) production," and "As previously described, CH4 emissions from the reservoirs range from 4,000 to 14,000 MTCO2e per year." The DEIR should make it clear that there have been no measurements of methane emissions from the Klamath Hydroelectric Project reservoirs and that these estimates are

speculative. Estimates of methane emissions from Klamath Hydroelectric Project reservoirs (in DEIR Appendix N) are based on estimates from observations on reservoirs elsewhere in the U.S. Th ese estimates indicate that such emissions from Klamath Hydroelectric Project reservoirs would be a very small percentage of replacement power emissions. See Major Issue 2.5.

Response to Comment ORG46-290
This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Greenhouse Gas Emissions and Energy*).

Comment ORG46-291
Contrary to the statement in the DEIR, the mouth of the Klamath River is routinely closed by a sandbar. If this happens during the dam removal year, this would increase slack-water in the estuary and increase the rate at which fine materials are deposited in to the estuary. The statement that "If dam removal occurs during a low flow year, there may be relatively small volumes of sediment deposited in these areas" is completely unsupported in the DEIR.

Response to Comment ORG46-291
A sandbar does exist between two bedrock formations to the north and south of the Klamath River mouth, with the mouth typically situated on the far northern or southern end of the bar (Wallace 1998). The Klamath River Estuary mouth remains open most of the time, only occasionally closing during summer low flow periods (Stillwater Sciences 2009). During drawdown (November to March) and the following period of greatest sediment transport, the mouth would be open due to elevated flows. The subsection *Channel Response in the Klamath River Estuary* in Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 has been revised to clarify that the Klamath River mouth would be open during the drawdown period. Please refer to Volume III Attachment 1 Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 subsection *Channel Response in the Klamath River Estuary* for the revisions.

The Potential Impact 3.11-5 conclusion that relatively small volumes of sediment would be deposited in the Klamath River Estuary if dam removal occurs during a low-flow year, which is referred to in the comment, is supported by the impact analysis. However, the subsection *Channel Response in the Klamath River Estuary* in Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 has been clarified to include citations relevant to fine sediment being transported past the Klamath River Estuary to the Pacific Ocean, as already cited elsewhere in the EIR. Please refer to Volume III Attachment 1 subsection *Channel Response in the Klamath River Estuary* in Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 for the revisions.

Comment ORG46-292

The definition of Tribal Cultural Resources from PRC Section 210749(1)(a) in this paragraph of the DEIR has a typo that could lead to misinterpretation. The definition currently states (emphasis added) "...or included in a local register or historical resources." The word "or" should be changed to "of" per the following excerpt from PRC 210749(1)(a):

"Tribal Cultural Resources (TCRs) are defined consistent with Public Resources Code section 21074(1)(a) which includes sites, features, places, cultural landscapes, sacred places, and objects with cultural value to a California Native American tribe that are either included or determined to be eligible for inclusion in the California Register of Historical Resources, or included in a local register of historical resources, or as determined by the lead agency under the criteria for listing."

Response to Comment ORG46-292

Section 3.12 *Historical Resources and Tribal Cultural Resources* has been slightly modified to correct the typographical error in the definition of Tribal Cultural Resources (TCRs). Please refer to Volume III Attachment 1 Section 3.12 *Historical Resources and Tribal Cultural Resources* for the revision.

Comment ORG46-293

DEIR states that the KRRC conducted a records search in 2017 and that the KRRC search "compliments" [sic] record searches from 2012. Best practice in the industry is to complete a new or supplemental records search every 2 years because new cultural/tribal/historical resources may have been identified since the records searches were last completed. In an area with such high levels of archaeological and tribal sensitivity, there is a risk that additional cultural/tribal/historical resources may be present and have been identified since the 2017 (or earlier) records searches. Additional information may exist that could inform the Proposed Project and the assessment of impacts. A records search of the entire Project area should have been conducted in 2017. If the referenced 2017 records search does not cover the entire Klamath Hydroelectric Project area, a supplemental records search should be conducted before considering approval of the Proposed Project. It is unclear if the KRRC work was included in the preparation of the DEIR. This information should be included in the analysis.

Response to Comment ORG46-293

Please see the response to comment LA9-73.

Comment ORG46-294

This table includes a column for National Register of Historic Places (NRHP) Eligibility but does not include eligibility for the California Register of Historical Resources (CRHR). It is not clear if any of these resources have been evaluated or listed on the CRHR but not the NRHP. The State Water Board appears to

assume that NRHP status should also be assumed for the CRHR status. If a formal determination of eligibility was made under Section 106, then the resource is automatically listed in the CRHR. This should be clarified.

Response to Comment ORG46-294
Please see the response to comment LA9-77. Additionally, the introductory text in Section 3.12 *Historical Resources and Tribal Cultural Resources* has been clarified to indicate that while not all California Register of Historical Resources (CRHR)-eligible resources are also eligible for the National Register of Historic Places (NRHP), resources listed on or evaluated as eligible for the NRHP are considered historical resources under CEQA. Please refer to Volume III Attachment 1 Section 3.12 *Historical Resources and Tribal Cultural Resources* for the revisions.

Comment ORG46-295
Updated tribal cultural resources information provided by the Shasta Indian Nation as part of the State Water Board Assembly Bill 52 (AB 52) consultation should be included in this section. Specifically, the number of new tribal cultural resources identified along with the total number of tribal cultural resources identified should be provided. Without information on the types and number of sites identified and the source of that information, the analysis of impacts to tribal cultural resources is not substantiated in the DEIR. Obviously, confidential information should not be shared, but simple reference to a confidential appendix is not sufficient to understand the impact analysis or assess the adequacy of proposed mitigation measures.

Response to Comment ORG46-295
Section 3.12.2.3 *Historical Resources and Tribal Cultural Resources – Environmental Setting – Known Tribal and Historical Resources in the Vicinity of the Project* has been revised to clarify the number and types of known tribal cultural resources in the Project area based on information provided by the Shasta Nation and Shasta Indian Nation. Please refer to Volume III Attachment 1 Section 3.12.2.3 *Historical Resources and Tribal Cultural Resources – Environmental Setting – Known Tribal and Historical Resources in the Vicinity of the Project* for the revisions.

Comment ORG46-296
Describing the location of villages as is done in the DEIR may be disclosing confidential site location data. This sentence should be deleted or revised to maintain confidentiality and avoid the potential for site desecration by vandals.

Response to Comment ORG46-296
There is no village location description associated with the text referenced in the comment. The non-confidential portions of the EIR do not disclose information about tribal cultural resources that is not already in the public record.

Comment ORG46-297

Paragraph 1 seems to indicate that the significance criteria presented in this section were developed specifically for the Proposed Project; however, the DEIR needs to clarify that the actual criteria are specific to the Proposed Project and do not reflect the significance language presented in Appendix G of the CEQA guidelines.

Response to Comment ORG46-297

Section 3.12.3 *Historical Resources and Tribal Cultural Resources – Significance Criteria* has been clarified as requested. Please refer to Volume III Attachment 1 Section 3.12.3 *Historical Resources and Tribal Cultural Resources – Significance Criteria* for the revisions.

Comment ORG46-298

A source citation is needed in the following sentence to clarify whether it reflects a statement and understanding from the State Water Board or data as presented in Lenihan et. al. 1981: "When a river with a long history of cultural use is dammed and water is impounded, the cultural landscape is adversely affected through direct impacts to the archaeological or historical sites themselves and to the relationships of these properties to their environment and to each other on local and broader scales."

Response to Comment ORG46-298

The statement in question is not a quote from Lenihan et al. (1981). The statement in question was included in the KHSA 2012 EIS/EIR and it is in accord with statements from Native American Tribes made during consultation with the State Water Board for the Lower Klamath Project. The State Water Board agrees with the statement that when a river with a long history of cultural use is dammed and water impounded, the cultural landscape is adversely affected through direct impacts.

Comment ORG46-299

Given that research is underway at local repositories, the impact analysis for the Proposed Project is incomplete. The DEIR may be missing valuable information about potential historic built environment resources and historic period archaeological sites. Without this information, an accurate impacts analysis cannot be conducted and appropriate mitigation cannot be formulated. This could lead to a situation where the State Water Board incorrectly determines the magnitude of an impact or mitigation may be deferred and not enforced.

Response to Comment ORG46-299

Section 3.12.2.3 *Historical Resources and Tribal Cultural Resources – Known Tribal and Historical Resources in the Vicinity of the Proposed Project – Historical Landscape Analysis* has been updated to clarify that the Klamath River Renewal Corporation (KRRC) completed the review of the J.C. Boyle collection as well as the archival and historical landscape research at local County

repositories and historical societies. The Historic Landscape analysis conducted by the KRRC found no Historical Landscape in the Area of Analysis for the Project. Therefore, no unanalyzed impacts require analysis. Please refer to Volume III Attachment 1 Section *3.12.2.3 Historical Resources and Tribal Cultural Resources – Known Tribal and Historical Resources in the Vicinity of the Proposed Project – Historical Landscape Analysis* for the revisions.

Additionally, Section 3.12.4 *Historical Resources and Tribal Cultural Resources – Impact Analysis Approach* has been revised to clarify that (1) for the purposes of the EIR analysis, all known and unknown built environment and historic archaeological resources are assumed to be significant historical resources under CEQA and (2) some of these resources may not be National Register of Historic Places (NRHP)-eligible. Also, as listed in Section 3.12.5.2 *Historical Resources and Tribal Cultural Resources – Potential Impacts and Mitigation – Potential Impacts to Built Environment and Historic-period archaeological Resources*, the DEIR accurately discloses that the Proposed Project would have significant and unavoidable impacts to historic resources even with the inclusion of the KRRC's Historic Properties Management Plan. The KRRC confirmed on August 27, 2019 that the Historic Properties Management Plan will address properties eligible under both state and federal law (KRRC 2019a), applying California Register of Historical Resources and National Register of Historic Places criteria.

Please refer to Master Response CEQ-2 and response to comment ORG46-302 for additional discussion of mitigation measures related to historical resources.

Comment ORG46-300

More recent studies exist regarding the impacts of reservoir drawdowns on archaeological sites in the Pacific Northwest and broader western U.S. than are presented in the DEIR. More region-specific and Project-relevant examples exist than the Puebloan archaeological sites in the southwestern U.S. cited under Haynes (2008) and the Lenihan et. al. (1981) study conducted by the National Park Service in the Southwest Cultural Resources Center. More recent analysis should be used for the impact study as it relates to inundation, wave action, and freeze-thaw disturbance once archaeological sites are exposed. Disturbance from freeze-thaw events for newly exposed archaeological sites is not mentioned.

Response to Comment ORG46-300

The EIR analyses of potential impacts to archaeological sites and tribal cultural resources due to reservoir drawdown find that there would be significant and unavoidable impacts even with mitigation. Inclusion of an additional set of exposure-related potential impacts, such as freeze-thaw disturbance impacts on stone materials and other data classes following drawdown, would not change the impact assessments or significance determination. Additionally freeze-thaw impacts are within the range of consideration of natural elements/weather

exposure of the resource. Please refer to Potential Impact 3.12-2 for a discussion of potential impacts related to shifting, erosion, and exposure of known or unknown, previously submerged tribal cultural resources due to drawdown of Iron Gate, Copco No. 1, and Copco No. 2 reservoirs, and Potential Impact 3.12-13 for a discussion of potential impacts related to shifting, erosion, and exposure of historic-period archaeological resources due to drawdown of Iron Gate, Copco No. 1, and Copco No. 2 reservoirs. Volume III Attachment 1 presents the final Section 3.12 *Historical Resources and Tribal Cultural Resources*.

Comment ORG46-301

The concluding sentence "The results of these surveys on lands exposed from natural drawdown at Lake Mead, a man-made reservoir, are directly applicable to the proposed drawdown of the reservoirs along the Klamath River" is the opinion of the State Water Board. Other, more recent research has been conducted on reservoir drawdowns in California and Oregon that are equally as applicable if not more relevant, among them reservoir drawdown studies in California, Oregon, and Washington undertaken by the U.S. Army Corps of Engineers Portland District, Seattle District, Walla District, and Sacramento District. By not using the best available in formation, the State Water Board is providing an inadequate analysis in the DEIR.

Response to Comment ORG46-301

Reservoir drawdown studies undertaken by the United States Army Corps of Engineers (USACE) Walla Walla District and Portland District in support of the Columbia River Systems operation (Corcoran et al. 2001) as well as studies conducted in California, such as the Foster et al. (1977) study at the Folsom Reservoir, support and are consistent with the findings of the Draft EIR. Please note that the EIR analyses of potential impacts to archaeological sites and tribal cultural resources due to reservoir drawdown find that there would be significant and unavoidable impacts even with mitigation. Inclusion of additional literature references related to the potential for impacts due to reservoir drawdown would not change the impact assessments. Please refer to Potential Impact 3.12-2 for a discussion of potential impacts related to shifting, erosion, and exposure of known or unknown, previously submerged tribal cultural resources due to drawdown of Iron Gate, Copco No. 1, and Copco No. 2 reservoirs, and Potential Impact 3.12-13 for a discussion of potential impacts related to shifting, erosion, and exposure of historic-period archaeological resources due to drawdown of Iron Gate, Copco No. 1, and Copco No. 2 reservoirs. Volume III Attachment 1 presents the final Section 3.12 *Historical Resources and Tribal Cultural Resources*.

Comment ORG46-302

Regarding mitigation measures presented in this section, many of the measures consist of mitigation appropriate for compliance with Section 106 of the NHPA. For example, Mitigation Measure TCR-1 requires preparation of a Historic

Properties Management Plan (HPMP) and states that "The KRRC shall propose the HPMP for FERC's approval as a term of the license surrender order." This measure may be appropriate for the federal process and is enforceable by the federal lead agency in the NEPA/ permitting process; however, it is inconsistent with CEQA, not enforceable by the CEQA lead agency, and likely indefensible.

Response to Comment ORG46-302
Please refer to Master Response CEQ-2. The State Water Board developed tribal cultural resources mitigation measures in formal Assembly Bill 52 (AB 52) government-to-government consultation with Native American Tribes that have tribal cultural resources which could be impacted by the Proposed Project. To ensure implementation of the mitigation measures, the Klamath River Renewal Corporation (KRRC) was included in AB 52 consultations for development of tribal cultural resources mitigation measures. On October 17, 2018 and November 30, 2018 the KRRC confirmed their agreement with the mitigation measures, thus ensuring feasibility for implementation under CEQA.

Mitigation Measure TCR-1 requires the development of a Tribal Cultural Resources Management Plan (TCRMP) which will include, at a minimum, the items listed in TCR-1. The TCRMP will be included as a component of the Historic Properties Management Plan being developed as part of the Section 106 consultation in the Federal Energy Regulatory Commission (FERC) process. Given that Section 106 requirements are not required to extend to non-federally recognized Native American Tribes, and CEQA does not require that Tribal Cultural Resource impacts be dependent on a Native American Tribe's federal recognition status, the TCRMP covers both federal and non-federally recognized tribes.

Comment ORG46-303
The DEIR states "The TCRMP shall state a range of appropriate measures, and a protocol to select from such range." The mitigation statements in this section are general and do not include sufficient detail to demonstrate that the measure will reduce potential impacts. This in turn defers mitigation and is not enforceable by the CEQA lead agency. It is PacifiCorp's understanding that a discussion of impacts and mitigations for specific TCRs and historic period archaeological sites known at the time the DEIR was released should therefore be included. Appendix B includes substantial information about the known resources and resource-specific impacts. This information and corresponding mitigation should be included in the body of the DEIR.

Response to Comment ORG46-303
Please refer to Master Response CEQ-2 and response to comment on ORG46-302.

Mitigation Measure TCR-1 includes performance standards to ensure reduced impacts to tribal cultural resources. Specifically, TCR-1 item 3, states "The

TCRMP shall assure that the Project will avoid, minimize, or mitigate adverse impacts to TCRs, consistent with California Public Resources Code section 21084.3(a)."

California Public Resources Code section 21084.3(a) requires avoidance of damaging effects to tribal cultural resources where feasible. The measure identified in TCR-1 enumerate specific measures for consideration, including measures developed specifically for the Proposed Project through consultation, and the general measures identified in California Public Resources Code, section 21084.3(b). More broadly, consultation to identify specific measures for resources is best practice to avoid harm and minimize it when some level of harm is not feasible to avoid. (See, e.g,. 36 C.F.R. § 800.6*.)*

Requiring consultation to identify the appropriate use of specific measures or identification of additional measures to protect resources is particularly appropriate here, for several reasons. There is substantial uncertainty as to the location of submerged or buried resources, as to their condition, and as to whether they will be exposed during drawdown or disturbed during post-dam-removal construction or restoration activities. It would be impossible to determine, at this point, for example, whether a Project activity in one location versus another would have a greater or less impact on a particular tribal cultural resource. Similarly, the significance of a resource depends in part on the greater context in which the resource is found. The significance of known resources is likely to change based on their relationship to as yet unknown resources. Requiring consultation between the Klamath River Renewal Corporation (KRRC) and impacted tribes provides for adaptive management in protecting specific known and as of yet unknown tribal cultural resources, to the extent possible.

The KRRC has also agreed to complete evaluations of all currently identified cultural and historic resources within the limits of work and any resources that are identified in the future to determine whether they are eligible for listing in either the National Register of Historic Places (NRHP) or the California Register of Historical Resources [CRHR](KRRC 2019a, M. Kelly, AECOM as KRRC technical representative, pers. comm., August 2019).

The EIR acknowledges that completely avoiding harm is not likely to be feasible in all instances.

Additionally, as stated in the introduction to Section 3.12 *Historical Resources and Tribal Cultural Resources,* and in response to ORG46-302, the State Water Board engaged in regular Assembly Bill 52 (AB 52) consultations with the Shasta Indian Nation, the Shasta Nation, and the Yurok Tribe in 2017 and 2018. The consultations with all tribes resulted in identification of potentially-impacted resources, articulation of potential impacts, and involved extensive discussion regarding the appropriate mitigation measures to protect resources to the extent feasible, and in light of the considerable uncertainty regarding the location of and

the impacts to submerged resources. The consultation with the Yurok Tribe and Shasta Indian Nation resulted in final agreement on specific mitigation measures (see Section 3.12.5.1 *Potential Impacts to Tribal Cultural Resources*, Mitigation Measures TCR-1 through TCR-8).

Consultation with Shasta Nation did not reach agreement on mitigation measures, in light of the Shasta Nation's position regarding the severity dam removal impacts on Shasta Nation tribal cultural resources, particularly burial sites. However, consultation with the Shasta Nation informed the description of Tribal Cultural Resource (TCR) mitigation measures presented in the EIR to reduce the harm of potential impacts to tribal cultural resources, as well as the significance determinations listed in Section 3.12.

KRRC has formally committed to implementing the measures as part of concluding AB 52 consultation, and has initiated consultation for development of a Tribal Cultural Resources Management Plan (TCRMP) to meet the requirements described in Mitigation Measures TCR-1 through TCR-4, as well as the requirements of National Historic Preservation Act (NHPA), Section 106. Please note that the TCRMP will be submitted to Federal Energy Regulatory Commission (FERC) as part of the application for license surrender.

Please note that Appendix B is included by reference in TCR-1, item 1 which states, "Appendix B: *Definite Plan – Appendix L* includes a preliminary inventory of such [TCRs] resources. KRRC will continue to develop the inventory through the consultation process for the license surrender application under authority of the National Historical Preservation Act (NHPA) Section 106."

Comment ORG46-304

Mitigation measures TCR-1 through TCR-8 are specific to TCRs. It is inadequate to refer to these mitigation measures for Potential Impacts 3.12-12, 3.12-13, 3.12-14 that are specific to historic-period archaeological sites. The mitigation measures for TCRs in Section 3.12.5.1 are specific to TCRs and are not written to be adopted for resources other than TCRs. Because the application of these mitigation measures to historic-period cultural resources and archaeological sites is inappropriate, the DEIR needs to be updated for these resources to discuss them at the same level of detail, assess the effects of the Proposed Project, and identify appropriate mitigation measures as required pursuant to CEQA.

Response to Comment ORG46-304

As stated in Potential Impacts 3.12-12, 3.12-13, and 3.12-14, the Klamath River Renewal Corporation (KRRC) is developing a Historic Properties Management Plan, which includes identification of prehistoric and historic-period archaeological sites and measures to implement before and during drawdown and dam removal activities to protect significant historic, cultural, and tribal resources during Proposed Project implementation. The KRRC's proposed Historic Properties Management Plan [HPMP] (discussed in Mitigation Measure

TCR-1), Looting and Vandalism Prevention Program [LVPP] (discussed in Mitigation Measure TCR-2), and Inadvertent Discovery Plan [IDP](discussed in Mitigation Measure TCR-3) all would offer protections for historic-period cultural resources and archaeological sites as well as tribal cultural resources, as indicated in the Draft EIR. For example, the historic properties management plan described in TCR-1 will address protection of archeological sites (historic and prehistoric), regardless of whether the sites are significant because of their cultural importance to a California Native American Tribe (or Tribes), to California history without a strong link to a California Native American Tribe, or both. For example, a home site flooded by filling the reservoirs and then exposed upon drawdown would be assessed and addressed under the historic properties management plan regardless of whether the home was that of an important tribal elder, that of a settler with no particular link to local tribes, or a family with an important role in both tribal and non-tribal history. While the mitigation measures for tribal cultural resources include particular measures that would not apply to all historic resources, because some of the measures apply to all historic resources, and because many historic resources are also tribal cultural resources, it is appropriate to cite them in the analysis of historic-period cultural resources and archaeological sites.

Comment ORG46-305

The statement that "...the inclusion of documentation measures in conformance with the Secretary of the Interior's guidance would lessen the impact to the resource, the impact to the Klamath Hydroelectric Historical District under the Proposed" is misleading. The DEIR should acknowledge that any documentation implemented as mitigation would not actually lessen the impact of proposed demolition of contributing features of the Historical District. Rather, the documentation would only mitigate to some degree the loss of the historic resource. Therefore, the impact finding is not substantiated and the impact may remain significant after mitigation is applied.

Response to Comment ORG46-305

Section 3.12.5.2 *Historical Resources and Tribal Cultural Resources – Potential Impacts and Mitigation – Potential Impacts to Built Environment and Historic-period Archaeological Resources* has been revised to clarify that even with the inclusion of documentation measures in conformance with the Secretary of the Interior's guidance, the impact to the resource and its context would be significant and the historic resource would be materially impaired.

Comment ORG46-306

CEQA requires that mitigation measures prioritize preservation in place (CEQA Guidelines Section 15126.4). The mitigation measures in this section say little about the feasibility of preservation in place for all of the different types of historical resources (e.g., historic-period built environment, historic-period archaeological sites). Data recovery is only a suitable mitigation option after detailed analysis and documentation demonstrates that data recovery is the only

feasible mitigation. It does not appear that this detailed analysis has been conducted in such a manner that would allow this determination to be made.

Response to Comment ORG46-306
CEQA Section 15126.4 (b) discusses Mitigation Measures Related to Impacts on Historical Resources and includes considerations for historical built environment resources as well as for historical resources of an archaeological nature, for which preservation in place is specified as the preferred manner of mitigation. As stated in Volume III Attachment 1 Potential Impacts 3.12-11, 3.12-13, 3.12-14, 3.12-15, and 3.12-16, the Klamath River Renewal Corporation (KRRC) is developing a Historic Properties Management Plan (HPMP), which includes identification of historic-period cultural resources and archaeological sites and measures to implement before and during drawdown and dam removal activities to protect significant historic, cultural, and tribal resources during Proposed Project implementation. Implementation of the HPMP for Potential Impacts 3.12-12, 3.12-13, and 3.12-16 would reduce significant impact considerably, and, for many resources is expected to avoid impacts completely, through the design and implementation of construction plans or on-the-ground modifications to Proposed Project implementation. Implementation of the HPMP for Potential Impacts 3.12-11, 3.12-14, and 3.12-15 may reduce impacts to resources identified in the near vicinity, but given Proposed Project construction plans, impacts would remain significant and unavoidable. The aforementioned plan would consider feasible mitigation – including preservation in place – to minimize significant effects as outlined in CEQA Section 15126.4(b) and would be submitted to Federal Energy Regulatory Commission (FERC) for approval before the commencement of any ground disturbing activities (including reservoir drawdown).

Comment ORG46-307
The DEIR does not present adequate information to allow for evaluation of how widespread the resource is within the potential area of impact; simply including the percentage of Area of Analysis that contains agricultural resources would clarify this analysis.

Response to Comment ORG46-307
Section 3.15.2 *Agriculture and Forestry Resources – Environmental Setting* has been revised to clarify existing conditions for agricultural resources within the Area of Analysis with the addition of a new table. Please refer to Volume III Attachment 1 Section 3.15.2 *Agriculture and Forestry Resources – Environmental Setting* Table 3.15-1-A for the revisions. Please also refer to Volume III Attachment 1 Section 3.15.2.1 *Agriculture and Forestry Resources – Environmental Setting – Important Farmland* Figure 3.15-2.

Comment ORG46-308
Add the Area of Analysis to this figure to provide a visual perspective of the amount and distribution of agricultural and forestry resources within the area of potential impact.

Response to Comment ORG46-308
Section 3.15.2.1 *Agriculture and Forestry Resources – Environmental Setting – Important Farmland* Figure 3.15-2 has been revised to clarify the Area of Analysis for agriculture and forestry resources. Please refer to Volume III Attachment 1 Section 3.15.2.1 *Agriculture and Forestry Resources – Environmental Setting – Important Farmland* Figure 3.15-2 for the revisions.

Comment ORG46-309
The DEIR does not present adequate information to allow for evaluation of how widespread the resource is within the potential area of impact; simply including the percentage of Area of Analysis that contains forestry resources would clarify this analysis.

Response to Comment ORG46-309
The Area of Analysis does not contain land zoned by Siskiyou County as Forest Resources. Please refer to Volume I Section 3.14 *Land Use and Planning*, Figure 3.14-3 (page 3-880).

Comment ORG46-310
This table as presented in the DEIR does not provide context for the reader relative to the Area of Analysis. At a minimum, the table should include upland tree habitat information within the Area of Analysis and discuss the importance of providing the information for the expanded mapping area.

Response to Comment ORG46-310
Section 3.15.2.4 *Agriculture and Forestry Resources – Environmental Setting – Forestry Resources* Table 3.15-2 has been revised to clarify upland tree acreage within the agriculture and forestry Area of Analysis. This information does not change any significance determinations. Please refer to Volume III Attachment 1 Section 3.15.2.4 *Agriculture and Forestry Resources – Environmental Setting – Forestry Resources* for the revisions.

Comment ORG46-311
The list of significance criteria uses the descriptor "substantial" to indicate the threshold of a significant impact (e.g., substantial conversion, substantial adverse environmental impact, substantial loss). The DEIR needs to define the term 'substantial' as it relates to each of these different criteria.

Response to Comment ORG46-311
Section 3.15.3 *Agriculture and Forestry Resources – Significance Criteria* has been revised to clarify the meaning of the word “substantial” as used in the significance criteria related to conversion of farmland and forestland. Please refer to Volume III Attachment 1 Section 3.15.3 *Agriculture and Forestry Resources – Significance Criteria* for the revisions.”

Comment ORG46-312
The DEIR fails to address the impacts of diversions from Bogus and Fall creeks for hatchery operations in Section 3.15. Discuss how these diversions affect agriculture or forestry resources land and how any changes to these diversions under the Proposed Project would affect agriculture or forestry resources.

Response to Comment ORG46-312
The analysis in Section 3.15 *Agriculture and Forestry Resources* does not consider the potential impacts of the water diversions for the Bogus and Fall creeks hatcheries on agriculture and forestry resources because a) hatchery water use would be non-consumptive and there are no other water users between the point of diversion and the point of return for each of these facilities, and b) the lands surrounding these facilities are not zoned as Agriculture or Forest Resource lands by Siskiyou County; rather these lands are zoned as Open Space. In addition, none of the land surrounding the hatchery facilities is classified as Prime, Farmland of Statewide, or Farmland of Local Importance by the California Department of Conservation (CDOC). The land is classified as grazing land by the CDOC and would continue to be available for grazing irrespective of the proposed hatchery diversions. For additional information regarding hatchery-related water diversions, please refer to Volume I Section 3.8.5 *Water Supply/Water Rights – Potential Impacts and Mitigation* Potential Impact 3.8-1 (pages 3-676 to 3-678).

Comment ORG46-313
The list of significance criteria uses the descriptor "substantial" to indicate the threshold of a significant impact (e.g., substantial increase, substantial adverse effect). The DEIR needs to define the term 'substantial' as it relates to each of these different criteria.

Response to Comment ORG46-313
Please refer to Master Response CEQ-3.

Comment ORG46-314
The significance statement should be "Significant and unavoidable impact with mitigation" for Potential Impact 3.17-2 because the State Water Board cannot ensure implementation of the mitigation. Potential Impact 3.17-1 makes the same determination and the significance statement is "Significant and unavoidable impact with mitigation" on p 3-915.

Response to Comment ORG46-314
The significance determination (i.e., significant and unavoidable with mitigation) presented in Volume I Section 3.17.5 *Public Services – Potential Impacts and Mitigation* (page 3-915) refers to Potential Impact 3.17-1, Mitigation Measure HZ-1, and Recommended Measure TR-1. The significance determination on page 3-919 (i.e., significant and unavoidable) refers to Potential Impact 3.17-2 and Recommended Measure PS-1. Please refer to Master Response CEQ-2 for a

discussion of why the text of the Final EIR has been revised to reflect that Recommended Measure TR-1 is now Mitigation Measure TR-1. Please also refer to Volume III Attachment 1 Section 3.22.5 *Transportation and Traffic – Potential Impacts and Mitigation* Potential Impacts 3.22-1 through 3.22-5 for the revisions.

Comment ORG46-315

The first part of the first sentence of this section is missing, possibly omitting important information regarding what is addressed in this section.

Response to Comment ORG46-315

Section 3.18 *Utilities and Service Systems* has been clarified as requested. Please refer to Volume III Attachment 1 Section 3.18 *Utilities and Service Systems* for the revisions.

Comment ORG46-316

This section does not describe the baseline condition concerning electric utilities, the power generated by the hydroelectric dams, and the impacts from removing those dams and associated power transmission facilities. This section is also about the ability to deliver utilities. While the Proposed Project likely will not result in new needs for power, it will eliminate existing power sources at the hydroelectric dams. The impact analysis should address the removal of these utilities and how those utilities will be replaced and the impacts of that replacement (See Section 3 Thematic Comments).

Response to Comment ORG46-316

This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Greenhouse Gas Emissions and Energy*).

Comment ORG46-317

This section does not address impacts to other utilities, including phone lines, fiber optic lines, and natural gas service. This section should identify buried and overhead utilities and provide mitigation to minimize impacts to existing utilities.

Response to Comment ORG46-317

This comment raises concerns regarding potential impacts to utilities such as phone lines, fiber optic lines, and natural gas service. Please note that CEQA documents analyze significant effects on the physical environment: CEQA does not address potential social or economic effects from implementing a project. (CEQA Guidelines, § 15131(a).) However, to inform the public and decisionmakers regarding the potential consequences of the Proposed Project, the State Water Board has confirmed that neither fiber optic lines nor natural gas lines occur within the Proposed Project Boundary. Furthermore, utility providers have construction standards and policies that contractors are required to adhere to in order to minimize short-term disruptions to services and to ensure that there

would not be long-term or permanent disruption and related impacts, if and where those utilities exist.

Comment ORG46-318

The DEIR states that temporary sanitary facilities required by the Proposed Project will be determined by the number of workers onsite, but fails to incorporate information from other areas of the DEIR. Specifically, the number of workers is estimated in Section 3.22.5 Transportation and Traffic (pg. 3-1069; see Table 3.22-5). This number should be used to estimate the quantity of portable chemical toilets required during construction and any associated spill prevention and containment measures or other mitigation.

Response to Comment ORG46-318

Please note that the comment refers to the environmental setting. The relevant impact analysis occurs in Potential Impact 3.18-1 (pages 3-928 to 3-929). Potential Impact 3.18-1 expressly refers to Table 2.7-8, which includes the same workforce estimates as the table referenced in the comment (Table 3.22-5).

Comment ORG46-319

The Water Supply section description does not mention Yreka's water supply pipeline. The text does refer to Section 3.8 Water Supply/Water Rights; however, Section 3.18 should acknowledge that the City of Yreka 's water source and the infrastructure to deliver that water are located within the Area of Analysis. This section should also reference where in the DEIR additional information on Yreka's water supply pipeline can be found (including the impact analysis and mitigation to address impacts from temporary disconnections or service interruptions).

Response to Comment ORG46-319

The City of Yreka municipal water supply pipeline and the potential impacts from realigning this pipeline as part of dam removal are addressed in Volume I Section 3.8.5 *Water Supply/Water Rights – Potential Impacts and Mitigation* Potential Impact 3.8-4 (page 3-682). This topic is addressed in Volume I Section 3.8 *Water Supply/Water Rights*, as noted in Volume I Section 3.18 *Utilities and Service Systems* (page 3-925) and Volume I Section 3.18.2.3 *Water Supply* (page 3-926).

Comment ORG46-320

The list of significance criteria indicates that significant effects to utilities and service systems include new wastewater or stormwater facilities that would cause significant environmental impacts. The DEIR should fully define the threshold of change that would be considered a significant environmental impact.

PacifiCorp recognizes that CEQA allows the SWRCB to establish its own significance criteria. However, this question from Appendix G should also be

included because the Proposed Project requires surface water diversions for operations at the Fall Creek and Iron Gate hatcheries:
"Would the project: ... d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?" (See CEQA Appendix G XVI Utilities and Service Systems.)

Response to Comment ORG46-320
Please refer to Volume I Section 3.18.3 *Utilities and Service Systems – Significance Criteria*, Volume I Section 3.18.4 *Utilities and Service Systems – Impact Analysis Approach* and Volume I Section 3.18.5 *Utilities and Service Systems – Potential Impacts and Mitigation* (pages 3-927 through 3-929), which describe the approach for defining the threshold of change. Volume I Section 3.18.3 *Utilities and Service Systems – Significance Criteria* notes that effects to utility and service systems are considered significant if the Proposed Project would result in one or more of the following conditions or situations:

- Require or result in the construction of new wastewater treatment and/or disposal facilities or expansion of existing facilities, due to inadequate capacity to serve the Proposed Project's anticipated demand or where the construction of such facilities could cause significant environmental impacts.
- Require or result in the construction of new stormwater drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental impacts.

Volume I Section 3.15.5 *Utilities and Service Systems – Potential Impacts and Mitigation* Potential Impact 3.18-1 notes that the threshold is defined as whether the Proposed Project results in the need for construction or expansion of existing wastewater facilities and/or where such construction would result in a significant environmental impact. As noted in Potential Impact 3.18-2, the threshold is defined as whether the Proposed Project results in the need for construction or expansion of existing stormwater facilities where such construction would result in a significant environmental impact. As analyzed in Volume I, the Proposed Project would not require construction of additional facilities, and therefore neither of these thresholds would be exceeded.

Volume I Section 3.18 *Utilities and Service Systems*, (page 3-925) states that the hatchery water supplies/water rights are addressed in Volume I Section 3.8 *Water Supply/Water Rights*. Specifically, please refer to Volume I Section 3.8.2.1 *Water Supply/Water Rights – Environmental Setting – Upper Klamath Basin* (pages 3-670 to 3-671) and Volume I Section 3.8.5 *Water Supply/Water Rights – Potential Impacts and Mitigation* Potential Impact 3.8-1 (pages 3-676 to 3-679). Please also refer to Master Responses WSWR-3, WSWR-5, and WSWR-6. This section describes the available water supplies and entitlements, finding that water is available without injury to other lawful users and under existing rights.

Comment ORG46-321

Section 3.19 lacks clarity around the baseline condition. While the alternatives analyses seem to acknowledge the environmental baseline to be current conditions (i.e., the four dams, reservoirs, and associated structures), the analysis for the Proposed Project seems to generally reference a previously existing condition in which there were no hydroelectric facilities and instead free-flowing river. This previously existing condition also seems to be considered in defining the return to "more natural river, canyon, and valley vistas" as de facto beneficial. Unless the State Water Board has specifically defined multiple baselines for analysis, the DEIR should analyze the impacts of the Proposed Project in relation to baseline conditions, which are those at the time the NOP was issued in 2016.

Response to Comment ORG46-321

As stated in Section 3.19.2.1 *Aesthetics – Environmental Setting – PacifiCorp Analysis and Bureau of Land Management Methodology*, all of the facilities except three [all associated with J.C. Boyle in Oregon] are located in areas that have been designated as a Class III area by a Resource Management Plan or have been classified as a Class III area because the area has not been given a specific Visual Resource Management (VRM) class by the Bureau of Land Management (BLM) (PacifiCorp 2004a-3). Thus, the Class III VRM designation is the existing condition and environmental baseline under CEQA. Section 3.19.3 *Aesthetics – Significance Criteria* has been revised to clarify the baseline used for the EIR aesthetic resources analysis. The first significance criterion has been modified to remove the objectives associated with the Class III VRM designation and to more clearly identify how a shift in VRM classification relative to the baseline (i.e., existing conditions) is treated in the analysis. The modified criterion also explicitly acknowledges how the analysis was applied in areas where the VRM analysis was not conducted. Additionally, Section 3.19.4 *Aesthetics – Impact Analysis Approach* has been revised to align with the clarified significance criteria and to remove any reference to natural conditions, since this is not the CEQA baseline. Please refer to Volume III Attachment 1 Sections 3.19.3 *Aesthetics – Significance Criteria* and 3.19.4 *Aesthetics – Impact Analysis Approach* for the revisions.

Comment ORG46-322

The DEIR fails to provide an individual analysis of the aesthetic impacts of removing each facility. For example, the removal of Copco No. 2 would have very small long-term impacts related to the loss of open water vistas as compared with the larger facilities visible by larger numbers of viewers. While noted in some of the alternatives discussions, the analysis in the DEIR would be better substantiated with a clear discussion of impacts related to each facility.

Response to Comment ORG46-322
The Proposed Project is to remove all of the Lower Klamath Project dams and associated facilities and thus the EIR analysis appropriately considers the removal of all facilities as a combined action. That said, both facility removal (e.g., dams, reservoirs, powerhouses, existing recreational facilities) and facility construction (e.g., new recreational facilities) for each of the facilities were considered in identifying potential impacts to key viewpoints. Proposed Project components that could have significant impacts on aesthetics, as well as potentially affected viewer groups, are discussed individually in the analysis, as appropriate (e.g., discussion of Copco No. 1 Reservoir in Potential Impact 3.19-1). The example provided in the comment does not consider the broader context within which the aesthetic change related to removal of this reservoir would be made under the Proposed Project.

As appropriate, the potential aesthetic impacts of removing all or portions of the individual Lower Klamath Project dams and associated facilities are discussed in the analysis of alternatives to the Proposed Project (Volume I Section 4.3.19 *Partial Removal Alternative –Aesthetics*, Volume I Section 4.5.19 *Two Dam Removal Alternative – Aesthetics*, Volume I Section 4.6.19 *Three Dam Removal Alternative – Aesthetics*), as well as the potential aesthetic impacts of constructing new facilities (fish ladders and associated structures) under the alternatives to the Proposed Project (Volume I Section 4.4.19 *Continued Operations With Fish Passage Alternative – Aesthetics*). Examples of the assessment of individual project components can also be found in Table 4.3-1 through Table 4.3-7 for the Partial Removal Alternative (pages 4-76 to 4-83 and 4-90), and Table 4.4-2 (page 4-170) for the Continued Operations with Fish Passage Alternative, among others.

Comment ORG46-323
As cited in the PacifiCorp (2004c) Land Use, Visual, and Aesthetic Resources Final Technical Report, almost all of the facilities are in areas designated as Class III under the Bureau of Land Management's (BLM) Visual Resource Management (VRM) system. However, while some facilities have been designated as such in a BLM resource management plan (RMP) (BLM 1993), the balance of the facilities are designated Class III in the DEIR "because the area has not been given a specific VRM class by BLM." The DEIR must provide analysis as to why the areas outside of RMP coverage are considered to be in this category because the impacts are later analyzed against the level of change acceptable to Class III areas.

Further, as detailed on DEIR page 3-938, if the criteria from the baseline Visual Resource Inventory in the 2012 KHSA EIS/EIR (DOI and CDFW 2012) are considered, all of the Proposed Project area "...could be classified as VRM Class 11, based on Class A distinctive scenic quality of high visual sensitivity as viewed from a foreground/middleground distance zone, from an inventory context." However, impact analysis in Section 3.19 is based on Class III acceptable

change criteria (not Class II) with no reasoning presented for this difference. Overall, this difference in assigned verses functional VRM class creates an analysis in the DEIR that underestimates the degree of impact from the Proposed Project because more substantial changes are permitted in a Class Ill area with impacts remaining less significant than are permitted in a Class II area.

Response to Comment ORG46-323
The partial sentence quoted in the comment "because the area has not been given a specific VRM class by BLM" is from Section 3.19.2.1 *Aesthetics – Environmental Setting – PacifiCorp Analysis and Bureau of Land Management Methodology* and it is followed by a citation to PacifiCorp (2004a-3), which is the most recent assessment of land use, visual, and aesthetic resources in the aesthetics Area of Analysis. Please note that the first bulleted significance criterion in Section 3.19.3 *Aesthetics – Significance Criteria*, which listed objectives for Visual Resource Management (VRM) Class III areas including acceptable level of change, has been clarified to remove the specific comparisons to the Class III objectives and to focus specifically on whether the proposed activities would cause the VRM class to be degraded (i.e., changed to a higher numerical class) at a scenic vista in areas where the VRM analysis was conducted. Please refer to Volume III Attachment 1 Section 3.19.3 *Aesthetics – Significance Criteria* for the revisions.

The paragraph in Section 3.19.2.1 *Aesthetics – Environmental Setting – PacifiCorp Analysis and Bureau of Land Management Methodology* containing the sentence that is quoted in the second paragraph of the comment has been deleted as it does not belong in a discussion of the environmental baseline. The VRM Class II, III, and IV objectives have been added as footnotes to Table 3.19-2 to provide additional context for characterization of the environmental baseline. Please refer to Volume III Attachment 1 Section 3.19.2.1 *Aesthetics – Environmental Setting – PacifiCorp Analysis and Bureau of Land Management Methodology* for the revisions.

In addition, as discussed in response to comment ORG46-321, the significance criteria for the aesthetic resources analysis have been modified in Section 3.19.3 *Aesthetics – Significance Criteria* to clarify how the VRM results and other factors are used to determine impact significance. Please refer to Volume III Attachment 1 Section 3.19.3 *Aesthetics – Significance Criteria* for the revisions.

Comment ORG46-324
The conclusion of the discussion that the Proposed Project area would be considered Class II if BLM's Visual Resource Inventory Matrix was applied is that "If Class II objectives are applied, the changes due to the Proposed Project would be even more beneficial because they will return the areas to a more natural character, and would not change the significance of potential aesthetic impacts discussed in this section" (emphasis added). This statement refers to a more natural baseline prior to the hydroelectric complex, which is different than

the existing conditions/environmental baseline established at the time the NOP was issued as required in CEQA. Aside from the observation that the DEIR does not establish multiple baseline conditions, this conclusion is inaccurate because the significance threshold differs with different VRM classifications (see comment 3.19-3).

Response to Comment ORG46-324
The paragraph in Section 3.19.2.1 *Aesthetics – Environmental Setting – PacifiCorp Analysis and Bureau of Land Management Methodology* containing the sentence that is quoted in the comment has been deleted as it does not belong in a discussion of the environmental baseline. The Visual Resource Management (VRM) Class II, III, and IV objectives have been added as footnotes to Table 3.19-2 to provide additional context for characterization of the environmental baseline. Please refer to Volume III Attachment 1 Section 3.19.2.1 *Aesthetics – Environmental Setting – PacifiCorp Analysis and Bureau of Land Management Methodology* for the revisions.

In addition, as discussed in response to comment ORG46-321, the significance criteria for the aesthetic resources analysis have been modified in Section 3.19.3 *Aesthetics – Significance Criteria* to clarify how the VRM results and other factors are used to determine impact significance. Please refer to Volume III Attachment 1 Section 3.19.3 *Aesthetics – Significance Criteria* for the revisions.

Comment ORG46-325
The DEIR states that the impact analysis is built on the general premise that the removal of human-made elements and restoration to more natural conditions would have beneficial effects in light of the significance criteria. However, the criteria consider factors like contrast and degree of change. The significance criteria are not well defined (e.g., terms like "substantial adverse change," "moderate," and "substantially degrade" are not defined), and the DEIR presents no evidence to support the assertion that a majority of viewers would consider removal and restoration beneficial as opposed to simply changed. PacifiCorp realizes that the magnitude of impact to visual resources is in part subjective and based on what a viewer considers important (e.g., restored river versus open water lake views); however, based on the stated visual resources assessment methodology (BLM's Visual Resource Management Process), the significance criteria are not consistent with that process and therefore do not allow for an objective evaluation of change related to the baseline conditions.

Response to Comment ORG46-325
As explained in response to comment ORG46-321, the significance criteria have been revised for clarity and the impact analysis approach has been revised to align with the clarified significance criteria. Please refer to Volume III Attachment 1 Sections 3.19.3 *Aesthetics – Significance Criteria* and 3.19.4 *Aesthetics – Impact Analysis Approach* for the revisions. The meaning of "moderate" is provided in Section 3.19.4 *Aesthetics – Impact Analysis Approach* and is further

defined within Bureau of Land Management 's (BLM's) Visual Resource Manual [VRM] (BLM 1984). Terms like "substantial" are commonly used and accepted in CEQA analyses, are found in the CEQA Guidelines checklist questions, and are particularly appropriate for a topic such as aesthetics, which is inherently subjective.

Please also refer to Master Response CEQ-3, and responses to comments ORG46-321 and ORG46 -323.

Comment ORG46-326

The DEIR states that "Furthermore, although the reservoirs could be considered scenic resources in their own right, they are in general not consistent with the Class Ill VRM designation, because their creation changed the character of the natural landscape and they dominate the view from many public view locations." This does not assume a baseline condition with the reservoirs in place as required by CEQA, but rather assumes an earlier baseline prior to the reservoir's creation.

Response to Comment ORG46-326

Please refer to response to comment ORG46-321. Section 3.19.5 *Aesthetics – Potential Impacts and Mitigation* Potential Impact 3.19-1 have been revised to clarify how the Visual Resource Management (VRM) class is being used in the analysis and what is considered a substantial visual change. Please refer to Volume III Attachment 1 Section 3.19.5 *Aesthetics – Potential Impacts and Mitigation* for the revisions.

Comment ORG46-327

In discussing changes to flow and channel morphology, the DEIR notes that "...some aggradation of the channel immediately downstream of the dams is expected with the return to natural sediment loads. However, this would represent a return to natural conditions and is considered desirable." This conclusion is based on the premise that the millions of cubic-yards of sediment that will be released during dam removal is both a more natural condition and is beneficial visually. In this analysis it appears that the DEIR has muddled the impacts of the Proposed Project from the release of sediment with the Project objectives. The Proposed Project objectives include improving long-term water quality, advancing restoration of fish populations, restoring fish passage, and reducing disease rates in salmonids. The accumulation of sediment is an impact of the Proposed Project and should not be confused with the conditions the DEIR assumes are more desirable. Instead, this may be a localized change with less desirable visual (and other) effects depending on the viewpoint and those features that may be buried with sediment.

Response to Comment ORG46-327

Section 3.19.3 *Aesthetics – Significance Criteria* has been revised to clarify the landscape scenic elements that were considered in the analysis of potential

impacts. Please refer to Volume III Attachment 1 Section 3.19.3 *Aesthetics – Significance Criteria* for the revisions.

Section 3.19.5 *Aesthetics – Potential Impacts and Mitigation* has been revised to clarify the title of Potential Impact 3.19-2 where this impact analysis focuses on the potential effects of changes in flows and channel morphology on scenic river vistas. Potential Impact 3.19-2 has been revised to clarify which key observation points along the river were considered as part of the EIR analysis. A new Figure 3.19-2 and a new Table 3.19-1 have been added to Section 3.19.2.1 *Aesthetics – Environmental Setting – PacifiCorp Analysis and Bureau of Land Management Methodology* to show the location of key observation points (KOPs) for the existing condition, and a new Table 3.19-3 has been added to Section 3.19.5 *Aesthetics – Potential Impacts and Mitigation* to describe potential short-term (temporary) and long-term (permanent) impacts to views from those key observation points, as well as vista points and community, recreation site area, trail, scenic highway, or river vantage points within the designated Wild and Scenic River (WSR) sections. Additionally, Potential Impact 3.19-2 has been revised to clarify the link to the significance criteria used in the aesthetics analysis. Please refer to Volume III Attachment 1 Section 3.19.5 *Aesthetics – Potential Impacts and Mitigation* for the revisions.

Comment ORG46-328

The basis for the determination of a weak to moderate contrast from existing conditions with regard to the visual impacts of turbidity is not defined in the DEIR. Comparisons to the sediment load normally carried in winter or past examples should be provided in this analysis.

Response to Comment ORG46-328

Section 3.19.5 *Aesthetics – Potential Impacts and Mitigation* Potential Impact 3.19-3 has been revised to clarify how short-term and long-term water clarity were considered in the analysis. Please refer to Volume III Attachment 1 Section 3.19.5 *Aesthetics – Potential Impacts and Mitigation* Potential Impact 3.19-3 for the revisions.

Comment ORG46-329

The exposure of previously inundated areas is determined to represent a moderate contrast only in comparison to the existing condition under the VRM system. While arguments are presented to support this conclusion, it is somewhat subjective and could be considered a more severe impact by users that value open-water more than restored riverine views. Additionally, while this analysis is comparing the Proposed Project impact to the existing dammed river condition, it is inconsistent with other portions of the analysis that consider the pre-dam condition as a baseline.

Response to Comment ORG46-329
The paragraph referenced in Volume I on page 3-959 is part of Potential Impact 3.19-4, which focuses on potential short-term (temporary) visual changes resulting from reservoir drawdown and restoration including temporarily bare/unvegetated banks. The potential impact of replacing the existing scenic open-water reservoir view with restored riverine and canyon scenic views is discussed in Potential Impact 3.19-1. The analysis for Potential Impact 3.19-1 has been revised to clarify that replacing the open-water view with a restored riverine view would be a substantial change; however, since the Visual Resource Management (VRM) class would remain Class III (i.e., would not be degraded) at key observation points associated with the Lower Klamath Project facilities and located within the reservoir viewshed, the change is not considered to be adverse. Please refer to Volume III Attachment 1 Section 3.19.5 *Aesthetics – Potential Impacts and Mitigation* Potential Impact 3.19-1 for the revisions.

With respect to the comment's concern about the CEQA baseline used for the EIR analysis, please refer to response to comment ORG46-321.

Comment ORG46-330
As stated previously, the argument here is that the facilities are inconsistent with VRM Class III, which assumes a baseline prior to the existing conditions.

Response to Comment ORG46-330
Section 3.19.5 *Aesthetics – Potential Impacts and Mitigation* Potential Impact 3.19-5 has been revised to clarify how the Visual Resource Management (VRM) classification was considered in the analysis and to clarify the significance determination. Please refer to Volume III Attachment 1 Section 3.19.5 *Aesthetics – Potential Impacts and Mitigation* for the revisions. Please also refer to response to comment ORG46-321.

Comment ORG46-331
With regard to the removal of recreational facilities, construction of new facilities, and other infrastructure improvements the DEIR says "Construction activities and equipment would be seen during construct ion but would be temporary and would occur in already heavily disturbed areas. Therefore, they would not degrade the existing visual character of the sites or their surroundings. Similar to the other short-term potential visual impacts from construction this is considered less than significant."

The DEIR makes the presumption that the hydroelectric facility areas are heavily disturbed (by the simple existence of the dams and associated facilities themselves regardless of how well established in the landscape they may be), many of the facilities are remote recreational facilities or roads/bridges in rural settings which may not be commonly considered "heavily disturbed." While the impacts are short-term in nature and CEQA does not generally view temporary

impacts as significant, the basis for the impact determination is subjective and the duration of construction would be temporary though it may not be short-term.

Response to Comment ORG46-331
Section 3.19.5 *Aesthetics – Potential Impacts and Mitigation* Potential Impact 3.19-5 and Potential Impact 3.19-6 have been clarified to indicate which key observation points were considered as part of the EIR analysis. A new Figure 3.19-2, and new tables 3.19-1 and 3.19-3, have been added to Section 3.19 *Aesthetics* to describe potential short-term (temporary) and long-term (permanent) impacts to views from key observation points and/or scenic vistas. Potential Impact 3.19-5 and Potential Impact 3.19-6 have also been clarified to more closely link the impacts to the significance criteria, to clarify the degree of disturbance assumed for the existing landscape, and to clarify the time periods used for assessing construction-related visual impacts. Please refer to Volume III Attachment 1 Section 3.19.5 *Aesthetics – Potential Impacts and Mitigation* for the revisions.

Comment ORG46-332
Lower Klamath Hydroelectric Project Reservoir data appear to be from 2007 and should be updated to reflect data from the 2015 PacifiCorp Licensed Hydropower Development Recreation Report cited in the Definite Plan for the Lower Klamath Hydroelectric Project (Appendix Q-Draft Recreation Plan of Appendix B in the DEIR).

Response to Comment ORG46-332
Information requests were submitted to corresponding facilities and reservoir representatives (e.g., PacifiCorp, California Department of Fish and Wildlife [CDFW], and Bureau of Land Management [BLM]) to obtain the most recent data for Table 3.20-4. Where available, updated information has been added to Section 3.20.2.1 *Recreation – Environmental Setting – Regional Recreation – Reservoir- and Lake-based Regional Recreation* Table 3.20-4, including information regarding recreational use of the Lower Klamath Project facilities contained in PacifiCorp (2015). Please refer to Volume III Attachment 1 for the final Section 3.20 *Recreation*.

Comment ORG46-333
The DEIR presents out of date information (from 2007 or 2011) on whitewater boating data in the Hell's Corner Reach. Annual whitewater boating use data for the Hell's Corner Reach are available from the Bureau of Land Management, Klamath Falls Resource Area Office.

Response to Comment ORG46-333
The data in question were updated based on information provided by the U.S. Bureau of Land Management (BLM), Klamath Falls Resource Area Office. Please refer to Volume III Attachment 1 for the final Section 3.20 *Recreation*.

Comment ORG46-334

The statement "Data collected by USDA Forest Service and BLM…." is misleading when one considers there are approximately 190 river miles from Iron Gate Dam to the mouth and approximately 25 river miles (not including flatwater) between Iron Gate Dam and J.C. Boyle Dam. It is inappropriate to compare boating use numbers without normalizing the data in some fashion. For example, if a use-per-mile metric were developed, then perhaps an accurate statement about boating use levels in the two reaches could be made.

Response to Comment ORG46-334

The data presented in this section are to provide context for Potential Impact 3.20-5; user days and number of miles in between facilities are not used to support the impact significance determination. The impact analysis is dependent on whether flows would be acceptable for various river-based activities (e.g., whitewater rafting) (see Volume I Section 3.20.2.2. *Recreation – Environmental Setting – Klamath River-based Recreation – Upper Klamath River and the Hydroelectric Reach – Whitewater Boating Opportunities* Table 3.20-6), rather than user days. Please refer to Section 3.20.5 *Recreation – Potential Impacts and Mitigation* Potential Impact 3.20-5 for more details. Please refer to Volume III Attachment 1 for the final Section 3.20 *Recreation*.

Comment ORG46-335

By failing to update the use data, the DEIR is possibly misrepresenting the impacts of the Proposed Project. Specifically, whitewater boating use is described as "...decreased somewhat..." from 2000-2003 and 2005-2009 or "...in recent years." Updated rafting data should be included from 2009 onward, and an evaluation completed in the DEIR to assess if the boating has changed.

Response to Comment ORG46-335

The whitewater boating baseline described in Section 3.20.2.2 *Recreation – Environmental Setting – Klamath River-based Recreation – Upper Klamath River and the Hydroelectric Reach – Whitewater Boating Opportunities* Table 3.20-7 and the associated text have been updated with the most recent data available from published and unpublished reports acquired from corresponding agencies. Please refer to Volume III Attachment 1 for the final Section 3.20 *Recreation*.

Comment ORG46-336

Salmon harvest information is provided from 2001-2015; however, the DEIR text refers only to data from 2001-2010 when making the statement that "…angler success for Chinook salmon varied annually, but was generally greater in the first half of the decade than the latter half." This is a misleading statement because it is inappropriate to compare harvest numbers without normalizing the data for the effort made to harvest those fish. If a catch-per-unit effort metric were developed, then an accurate statement about harvest levels could be made. Some of the total harvest data presented is inaccurate, possibly leading to incorrect conclusions in the DEIR. A comprehensive review of the data and an

update of this table with data through at least 2017 (including the angler day data) is necessary. The best source of information is the CDFW Megatable for fall-run Chinook salmon on the Klamath (available at the link below).

https://nrm.dfg.ca.gov/documents/ContextDocs.aspx?cat=KlamathTrinity

Response to Comment ORG46-336
Section 3.20.2.2 *Recreation – Environmental Setting – Klamath River-based Recreation – Middle and Lower Klamath River – Fishing Opportunities* Table 3.20-9 has been updated with the most recent information available from California Department of Fish and Wildlife (CDFW) and the associated text has been modified accordingly. Please refer to Volume III Attachment 1 for the final Section 3.20 *Recreation*.

Comment ORG46-337
The DEIR is relying on outdated recreation annual use data for the J.C. Boyle Reservoir developed recreation facilities, calling into question the accuracy of the analysis and conclusions (sources used in the DEIR are from 2001/2002). More recent data should be provided in the DEIR and an evaluation completed if Estimated Facility Use is still considered below capacity. Annual use data for the Topsy Recreation site are available from the Bureau of Land Management, Klamath Falls Resource Area Office. Recreation use data for the recreation facilities managed by PacifiCorp were submitted to FERC as recently as April of 2015 (FERC Form-80 Recreation Use Report).

Response to Comment ORG46-337
Section 3.20.2.3 *Recreation – Environmental Setting – Lower Klamath Project Reservoir-based Recreation – Hydroelectric Reach – J.C. Boyle Reservoir* Table 3.20-11 has been updated with the most recent information available from PacifiCorp (2019b, c) and the U.S. Bureau of Land Management [BLM] (2019). Please refer to Volume III Attachment 1 for the final Section 3.20 *Recreation*.

Comment ORG46-338
A reevaluation of use versus capacity at each recreation facility is necessary because the DEIR is using outdated information in the analysis calling the accuracy of the analysis and conclusions into question. Currently the DEIR provides facility information for each reservoir using 2001/2002 data. At a minimum, this should be updated to reflect data provided in the April 2015 FERC From-80 Recreation Use Report and/or the PacifiCorp Licensed Hydropower Development Recreation Report used for the Definite Plan for the Lower Klamath Hydroelectric Project (Appendix Q is the Draft Recreation Plan within the Definite Plan which is Appendix B in the DEIR).

Response to Comment ORG46-338
The information referenced in the comment has been updated based on more recent information. Federal Energy Regulatory Commission (FERC) Form 80

has been referenced in the Final EIR. Please refer to Volume III Attachment 1 for the final Section 3.20 *Recreation*.

Comment ORG46-339

The DEIR states that "Copco No. 1 and Iron Gate reservoirs serve as the major sources of large seasonal phytoplankton blooms." While PacifiCorp does not dispute the fact that the Klamath Hydroelectric Project reservoirs support populations of cyanobacteria and other algae, the sources for the nutrients that drive those populations are Keno Reservoir and Upper Klamath Lake (see comments on DEIR Section 3.2 and comment 4.5-2). Operation of the intake barrier curtain in Iron Gate Reservoir has resulted in improved water quality downstream of Iron Gate Dam (Watercourse 2016; PacifiCorp 2017b). The statement in the DEIR is an oversimplification of a complex process to which the Klamath Hydroelectric Project reservoirs contribute, but are not solely responsible (see comment 3.2-9).

Response to Comment ORG46-339

Please refer to Volume I Section 3.4.2.1 *Phytoplankton and Periphyton – Environmental Setting – Phytoplankton* (pages 3-392 to 3-403), Section 3.4.2.3 *Phytoplankton and Periphyton – Environmental Setting – Hydroelectric Reach – Phytoplankton* (pages 3-405 to 3-413), Section 3.4.2.4 *Phytoplankton and Periphyton – Environmental Setting – Middle and Lower Klamath River – Phytoplankton* (pages 3-413 to 3-418), Section 3.4.2.5 *Phytoplankton and Periphyton – Environmental Setting – Klamath River Estuary* (pages 3-420 to 3-421), and EIR Section 3.4.2.6 *Phytoplankton and Periphyton – Environmental Setting – Pacific Ocean Nearshore Environment* (pages 3-421 to 3-422) for discussion of the habitat and nutrient conditions in the Klamath River that contribute to large seasonal phytoplankton blooms in the Lower Klamath River reservoirs, including the results of genetic analysis of *Microcystis aeruginosa* in Copco No. 1 Reservoir, Iron Gate Reservoir, and multiple Klamath River sites downstream of Iron Gate Dam that identified Iron Gate Reservoir as the principal source of *Microcystis aeruginosa* to the Klamath River downstream of Iron Gate Dam (Otten et al. 2015). Please also refer to Volume I Potential Impact 3.4-2 (pages 3-428 to 3-433) for an analysis of the changes in phytoplankton abundance under the Proposed Project due to dam removal and elimination of reservoir habitat. While nutrients currently entering the Hydroelectric Reach would continue to be available in the Klamath River following dam removal, phytoplankton, especially blue-green algae, would be limited in their ability to use those nutrients for growth and reproduction since dam removal would decrease the amount of optimal phytoplankton habitat (i.e., calm, slow-moving water).

Please refer to Volume I Potential Impact 4.2.2-2 (pages 4-109 to 4-111) for a discussion of the effects to date of the intake barrier/thermal curtain on releases of blue-green algae [cyanobacteria] downstream of Iron Gate Dam, including the statement that while results from the intake barrier/thermal curtain indicate that the curtain reduces entrainment of blue-green algae into the Iron Gate

Powerhouse intake and subsequent release downstream into the Klamath River (PacifiCorp 2017a), the data do not indicate that this measure could improve algal-derived (organic) suspended material in the reservoirs such that they would no longer cause an exceedance of water quality standards or achieve the Klamath Total Maximum Daily Loads (TMDLs) phytoplankton chlorophyll-*a* target of 10 micrograms per liter (ug/L) for Copco No. 1 and Iron Gate reservoirs during the May to October growth season (North Coast Regional Board 2010).

Comment ORG46-340
Again, the DEIR fails to update the data with readily available information. See comments 3.20-3, 3.20-4, and 3.20-5.

Response to Comment ORG46-340
Please refer to responses to comments ORG46-334, ORG46-335, and ORG46-336.

Comment ORG46-341
This paragraph is full of unsupported and undocumented assertions about how the Klamath Hydroelectric Project affects the fishery resources in the Klamath River downstream of Iron Gate Dam. This section of the DEIR should leave the detailed discussions of sediment transport, geomorphology, fish production, and habitat to the sections where that is most appropriate and include by reference those conditions that are directly applicable to the Wild and Scenic River designation and changes from the baseline condition that would be created by the Proposed Project.

Response to Comment ORG46-341
Section 3.20.2.4 *Recreation – Environmental Setting –Wild and Scenic River Conditions – California Klamath River Wild and Scenic River Segment* has been revised to reference other resource area subsections. Please refer to Volume III Attachment 1 Section 3.20.2.4 *Recreation – Environmental Setting –Wild and Scenic River Conditions – California Klamath River Wild and Scenic River Segment* for these revisions.

Comment ORG46-342
As noted in previous comments (see comments 3.20-6 and 3.20-7), information regarding use at existing recreation facilities is outdated throughout Section 3.20 and a reevaluation is required to adequately analyze the recreational impacts of the Proposed Project.

The statement that the PacifiCorp recreation facilities are operating "below capacity" is not substantiated in the DEIR because the data used in the analysis are 10 years out of date. If recreation use numbers in the past 10 years indicate the facilities are operating at a much higher capacity, an evaluation would be needed to ensure that surrounding recreational facilities have adequate capacity for similar activities (e.g., boating and camping) and can handle the loss of

recreational activities resulting from the Proposed Project. The DEIR is lacking the level of analysis necessary to substantiate a finding of No Significant Impact.

Response to Comment ORG46-342
Information requests were submitted to corresponding facilities and reservoir representatives (e.g., PacifiCorp, California Department of Fish and Wildlife [CDFW], and Bureau of Land Management [BLM]) to obtain the most recent data for Section 3.20 *Recreation*. Where available, updated information has been added to this section. Please refer to Volume III Attachment 1 Section 3.20 *Recreation* for the revisions.

Comment ORG46-343
The DEIR does not address the potential for hazardous materials impacts related to leaving potential contaminants in place (No Project Alternative).

Response to Comment ORG46-343
Volume I Section 4.2.21 *Alternatives – No Project Alternative – Hazards and Hazardous Materials* (page 4-74) provides a discussion of potential hazardous materials impacts under the No Project Alternative. Please also refer to Master Response HAZ-1 for additional information on the existing facilities.

Comment ORG46-344
Without completing the Phase 1 and 2 assessments and accurately evaluating the presence of any hazardous materials known and inventoried, the DEIR impact analysis cannot adequately evaluate the potential for public or environmental exposure, ensure applicable risk minimization plans address actual risk pathways, or definitively determine that mitigation measure implementation will reduce the impact to a less-than-significant level. The KRRC has been working on a Phase 1 and Phase 2 and this information should be included in this analysis as appropriate.

Response to Comment ORG46-344
Please refer to Master Response HAZ-1.

Comment ORG46-345
The analysis of the Proposed Project finds "no significant impact with mitigation" for all but the last three impacts analyzed. In most cases, this conclusion was reached with the implementation of mitigation measure HAZ-1. This mitigation measure presumes that the Final Hazardous Materials Management Plan will address all of the potential impacts discussed, coordinate the elements of the overall Health and Safety Plan, and sufficiently reduce potentially significant impacts to a less than significant level. This essentially defers development of specific mitigation and therefore, the sufficiency of the final plan as mitigation cannot be analyzed in this DEIR. Complicating the matter is that many of the specific risk pathways cannot be known without a complete Phase 1 and possibly

Phase 2 Site Assessments, neither of which is referenced in the DEIR (see comment 3.21-2).

Response to Comment ORG46-345

With respect to the commenter's claim that the EIR defers development of specific mitigation, the EIR explains that the Definite Plan includes a proposed Hazardous Materials Management Plan (HMMP), but the Hazardous Materials Management Plan is not yet finalized. Accordingly, Mitigation Measure HZ-1 is required to reduce potential impacts to less than significant.

Mitigation Measure HZ-1 requires the Klamath River Renewal Corporation (KRRC) to submit a Final Hazardous Materials Management Plan and obtain approval from the State Water Board prior to the start of pre-dam removal and construction activities. Mitigation Measure HZ-1 includes specific performance standards the mitigation will achieve: The State Water Board's water quality certification sets forth minimum monitoring and adaptive management requirements the Final Hazardous Materials Management Plan must meet. In addition, any modifications to the proposed Hazardous Materials Management Plan must be developed in coordination with the State Water Board and provide the same or better level of protection; the Final Hazardous Materials Management Plan must comply with applicable regulations; and the Final Hazardous Materials Management Plan must describe how the elements of the proposed Health and Safety Plan, Spill Prevention, Control, and Countermeasure Plan, the Emergency Response Plan, and the Traffic Management Plan (TMP) are coordinated together to adequately protect water quality with respect to hazardous materials management. The KRRC will be required to indicate compliance with those standards in its Final Hazardous Materials Management Plan, which must be approved by the State Water Board and included in the State Water Board's 401 Certification prior to the start of construction activities.

Please also refer to Volume I Section 3.21.2.1 *Hazards and Hazardous Materials – Environmental Setting – Transport/Releases of Hazardous Materials* (pages 3-1029 to 1031) and Volume I Section 3.21.2.3 *Hazards and Hazardous Materials – Environmental Setting – Contaminants/Contaminated Sites* (pages 3-1033 to 1035). Please also refer to Volume I Section 3.21.5 *Hazards and Hazardous Materials – Potential Impacts and Mitigation* Potential Impact 3.21-1 (specifically pages 3-1042 to 3-1045), Potential Impact 3.21-2 (specifically pages 3-1045 to 3-1046), and Potential Impact 3.21-4 (specifically pages 3-1046 to 3-1047) for analysis of the potential impacts of the Proposed Project as related to the routine transport, use, disposal, accidental spill/release, handling, and/or emissions of hazardous materials. Pages 3-1043 to 3-1044 list federal and state regulations applicable to the Proposed Project.

With respect to the commenter's concern that specific risk pathways cannot be known without a complete Phase 1 and possibly Phase 2 Site Assessments, that information was not available to the public when the Draft EIR was released

because PacifiCorp determined that the information could not be disclosed to the public. On December 30, 2019, the State Water Board received a submittal from PacifiCorp (PacifiCorp 2019a), which included redacted versions of Phase I and Phase II reports (KRRC 2019f,g,h,i,j,k,l,m,n,o). The redacted Phase I and Phase II reports confirm the findings in the Draft EIR, which disclosed the potential for certain types of hazardous materials (e.g., asbestos, heavy metals, polychlorinated biphenyls [PCBs], creosote-treated wood), at the various facilities as well as information in Appendix B: *Definite Plan – Appendix O-3 Hazardous Materials Management Plan*. For more information regarding the Phase I and II reports, please refer to Master Response HZ-1 and Volume III Attachment 1 Section 3.21 *Hazards and Hazardous Materials*.

Comment ORG46-346

Sections such as 4.4 (Continued Operations with Fish Passage Alternative) are unclear about what potential hazardous materials would still be transported. The overall amount and quantity of hazardous waste being removed and transported offsite could potentially be much less than the Proposed Project but are found to be significant and unavoidable as enforceable compliance and risk management plans cannot be guaranteed.

Overall, the alternatives analyses (Chapter 4) do not adequately describe the specific hazardous materials that would or would not be disturbed, removed, or transported as compared to the Proposed Project.

Response to Comment ORG46-346

The EIR acknowledges that the type of hazardous materials impacts under the Continued Operations with Fish Passage Alternative would be similar to those under the Proposed Project, and acknowledges that there would be less disturbance of hazardous materials under the Continued Operations with Fish Passage alternative than under the Proposed Project because of reduced construction activity, and because the power generation and transmission facilities would not be decommissioned (see Volume I Section 4.4.21 *Alternatives – Continued Operations with Fish Passage Alternative – Hazards and Hazardous Materials* [pages 4-178 to 4-179]). However, please note that construction of fish ladders would remain a major construction project, and would occur under wet circumstances that increase the risk of contamination by hazardous materials used in construction. Thus, absent mitigation, the risk remains significant. Hazardous materials management under any of the alternatives would be subject to the same state and federal regulatory programs as those that would be applicable under the Proposed Project, and Mitigation Measures HZ-1 would similarly reduce the potential impacts such that no significant impact would occur. Please note this finding in Volume I Section 4.4.21 *Alternatives – Continued Operations with Fish Passage Alternative – Hazards and Hazardous Materials* on page 4-178.

Since circulation of the Draft EIR, the dam owner has submitted redacted information on the types of materials present in the Lower Klamath Project facilities. Please see Master Response HAZ-1 for more discussion of this information. However, the submittals do not contain significant new information on hazard location and quantities. Furthermore, it is not certain which facilities would need to be removed or altered in light of construction of fishways. In light of the information limits and in light of the similarities in potential impacts and mitigation, the qualitative approach in the Draft EIR remains appropriate.

Comment ORG46-347

In explaining which roadways were considered for analysis, the DEIR states that analysis "...excludes other local roads...because those local roads would not be used for transportation of construction equipment or workers." This claim requires substantiation or further explanation that the use of other local roads would be prohibited per the traffic management plan. See comment 3.22-2 below on Figure 3.22-1.

Response to Comment ORG46-347

The comment references a statement and figure that generally describe major access roadways and requests additional information and analysis for other roadways. The additional information and analysis are found throughout the EIR. For example, Section 2 *Proposed Project* (starting on page 2-25) includes an additional description of roads that would be used during implementation of the Proposed Project. These roadways are depicted in greater detail in Volume I Section 2.7.1 *Proposed Project – Proposed Project – Dam and Powerhouse Deconstruction* Figures 2.7-2 (page 2-35), 2.7-3 (page 2-48), and 2.7-4 (page 2-50). This section also references Volume II Appendix B: *Definite Plan* for additional details. The condition of the roads that would be used for construction access is described in Volume I Section 3.22.2.1 *Transportation and Traffic – Environmental Setting –Traffic Flow* (beginning with page 3-1060) and 3.22.2.3 *Transportation and Traffic – Environmental Setting –Road Conditions* (beginning with page 3-1063), which also references Volume II Appendix B: *Definite Plan – Section 5 Dam Removal Approach* (see Sections 5.3, 5.4 and 5.5). Sections 5.3.2, 5.4.2 and 5.5.2 of the *Definite Plan* discuss construction access assessments and related transportation improvements and maintenance. Please also refer to Volume II Appendix B: *Definite Plan – Section 7.4,* which provides a summary of the all pertinent road segments, bridges, and culverts and the associated improvements. Klamath River Renewal Corporation (KRRC) performed a site visit and desktop study to assess the state of road infrastructure expected to be used throughout the Project. Tables in Appendix K show the findings of this assessment and provide additional details regarding roads that would be used.

These roadways are analyzed under Volume I Section 3.22.5 *Transportation and Traffic – Potential Impacts and Mitigation* Potential Impacts 3.22-1 and 3.22-2 (starting on page 3-1069). As noted under Potential Impact 3.17-1 (pages 3-913

to 3-915), and as partially revised by Response to Comment ORG47-56, KRRC has committed to addressing all potential traffic conflicts as part of their final Traffic Management Plan (TMP). KRRC states that the *"Final TMP would be informed by KRRC's contractor's specific measures and methods for construction and input received from relevant local jurisdictions."*

Comment ORG46-348

The DEIR doe s not clearly present the roads included or excluded from the analysis. The local road network should be included in the figure and those roads within the traffic analysis should be clearly indicated. If transportation routing plans have not been completed for use in the DEIR's analysis, mitigation requiring the preparation of these plan s prior to approval of construction permits should identify the allowed construction routes and measures to prohibit use of other local roads.

Response to Comment ORG46-348

Regarding identification of roads included in the analysis and transportation routing plans, please refer to response to comment ORG46-347.

Comment ORG46-349

The scale of the maps that show the four work locations is too regional to identify where the road, bridge, and culvert construction would occur. Add a more appropriately scaled map that clearly presents the locations of the road bridge, and culvert construction to provide a visual perspective on the distribution of this construction across the Area of Analysis.

Response to Comment ORG46-349

Regarding location of road, bridge, and culvert construction where construction would occur, please refer to response to comment ORG46-347. The maps referenced in that response show bridge replacement locations. The road and culvert replacement locations are not precisely known and are therefore not mapped. However, they are described to the extent possible in the text referenced in ORG46-347.

Comment ORG46-350

The list of significance criteria uses the descriptor "substantial" and the term "increased risk" to indicate the threshold of a significant impact (e.g., substantial conflict, substantial increase, substantial safety risks, increased risk of harm to the public). These specific terms must be quantitatively defined in the DEIR.

Response to Comment ORG46-350

Regarding use of the term 'substantial' in the EIR, please refer to Master Response CEQ-3. Similarly, CEQA does not require an EIR to deviate from the common English language usage of the word 'risk' to mean exposure to the chance of injury or loss; a hazard or dangerous chance (Dictionary.com 2019,

Lexico 2019); possibility of loss or injury (Merriam-Webster 2019). An 'increase' in the risk refers to an increase beyond the existing conditions baseline.

Comment ORG46-351

The DEIR incorrectly states that "Once the construction-related activity is complete there will be no traffic generated directly related to the Proposed Project. In reality, there will be traffic related to the Proposed Project through the restoration and monitoring period that follows the construction work. What the DEIR likely meant to say was that there would be no construction-related traffic. The post-construction traffic should be compared to Existing Conditions to allow for an evaluation of long-term impacts that is missing in this section of the DEIR.

Response to Comment ORG46-351

As described in Volume I Section 2.7.4 *Proposed Project – Proposed Project – Restoration Within the Reservoir Footprint* (pages 2-69 to 2-77), construction-related activity includes the restoration activities and associated monitoring. This information is restated on page 3-1069 in paragraph four.

Comment ORG46-352

Delete the final sentence from this paragraph. The DEIR analyzes the Proposed Project's effect on or compatibility with applicable resources, policies, plans, etc. The DEIR does not analyze the effect of a Regional Transportation Plan on the Proposed Project.

Response to Comment ORG46-352

Section 3.22.4 *Transportation and Traffic – Impact Analysis Approach* has been revised to remove the unnecessary sentence noted in the comment. Please refer to Volume III Attachment 1 Section 3.22.4 *Transportation and Traffic – Impact Analysis Approach* for the revisions.

Comment ORG46-353

The term "recreational day" requires definition. The text states "...there is no information on the peak number of recreational trips from recreational use." This analysis should include baseline data from the recreational operators in the area (see comment 3.20-7).

Response to Comment ORG46-353

As stated in the EIR, 'recreational days' is defined by FERC (2007) as follows: **"**A recreation day is defined as one visitor to a recreation area for any reason in a 24-hour period." This definition is also included as a footnote in Volume I Table 3.20-5 (page 3-978).

Please also refer to FERC (2007) (beginning on page 3-431) as well as PacifiCorp (2004c). *Recreation resources, final technical report for relicensing the Klamath Hydroelectric Project (FERC Project No. 2082) February, 2004.*

Comment ORG46-354
The DEIR fails to provide any substantiation for the assumption that peak recreational trips are double the average. A more conservative estimate of impacts would assume more intense impacts (i.e., assuming peak trips are more than double the average daily trips). A 20 percent increase in trips is a less conservative estimate than a 100 percent increase in trips.

Response to Comment ORG46-354
The EIR does not assume that peak recreational trips would be "double the average"; rather, the EIR states that the analysis assumptions only provide a relative comparison between existing conditions (recreational use) and anticipated construction-related traffic under the Proposed Project, in order to provide context for the comparison. Anything more specific would be speculative. The EIR analysis does not use the relative comparison as the basis of a significance determination but rather compares existing average daily traffic (ADT) and level of service (LOS) determinations for roadways compared to estimated added vehicle trips under the Proposed Project. Section 3.22.5 *Transportation and Traffic – Potential Impacts and Mitigation* Potential Impacts 3.22-1 and 3.22-2 (starting on page 3-1069) discuss related traffic impacts with findings of 'significant and unavoidable'.

Comment ORG46-355
The method for calculating VT per Day results should be provided in the DEIR. For example: Total VT / Peak Duration / 30. Using Copco No. 1 as an example, 2,426 / 7 / 30 = ~12 VT per Day, not 15.

Response to Comment ORG46-355
Section 3.22.5 *Transportation and Traffic – Potential Impacts and Mitigation* Table 3.22-6 has been clarified by adding a footnote that defines the average vehicle trips (VT) per day calculation and corrects the resulting VT per day in the table and in the subsequent paragraph. Please refer to Volume III Attachment 1 Section 3.22.5 *Transportation and Traffic – Potential Impacts and Mitigation* for the revisions.

Comment ORG46-356
Revised text regarding FERC licensees only being required to comply with state and local requirements "where possible," remove "where possible."

Response to Comment ORG46-356
Contrary to the assertion in the comment, the referenced phrase notes FERCs preference; not the EIR's determination.

Comment ORG46-357
Change the significance statement to "Significant and unavoidable impact with mitigation" for Potential Impacts 3.22-1 through 3.22-5 because the State Water Board cannot ensure implementation of the mitigation.

Response to Comment ORG46-357
Contrary to the assertion in the comment, at the time of the Draft EIR, the referenced determinations of significant and unavoidable impact were correct as stated in the Draft EIR. However, as Recommended Measure TR-1 is now a mitigation measure, these impacts have been revised accordingly. Please refer to Volume III Attachment 1 Section 3.22.5 *Transportation and Traffic – Potential Impacts and Mitigation* for the revisions.

Comment ORG46-358
The threshold for what constitutes "an unacceptable level of risk" should be defined.

Response to Comment ORG46-358
Volume I Section 3.22.5 *Transportation and Traffic – Potential Impacts and Mitigation* Potential Impact 3.22 page 3-1076 defines a potentially substantial increased risk of harm to bicyclist or pedestrian use as a decrease in the performance and safety of the roadways utilized by the Proposed Project during construction activities. This level of risk is considered unacceptable. The Traffic Management Plan (TMP) identifies a process for assessing and addressing all traffic-related impacts during construction-related activities. Please also refer to Master Response CEQ-3.

Comment ORG46-359
Revised text regarding FERC licensees only being required to comply with state and local requirements " where possible," remove "where possible."

Response to Comment ORG46-359
Contrary to the assertion in the comment, the referenced phrase notes Federal Energy Regulatory Commission's (FERC's) preference and not the determination of the EIR.

Comment ORG46-360
The DEIR analyzes the Proposed Project's effect on or compatibility with applicable resources, policies, plans, etc. The DEIR does not analyze the effect of a General Plan on the Proposed Project; therefore, delete "...does not contain measures or programs that would conflict with the Proposed Project in a manner that would adversely affect the environment. "

Response to Comment ORG46-360
Section 3.22.5 Section 3.22.5 *Transportation and Traffic – Potential Impacts and Mitigation* has been revised to remove the redundant text. Please refer to Volume III Attachment 1 Section 3.22.5 Section 3.22.5 *Transportation and Traffic – Potential Impacts and Mitigation* for the revisions.

Comment ORG46-361

The DEIR does not provide a specific discussion of the cumulative effects of the Proposed Project on suckers or Redband Trout in the upper Klamath River.

Response to Comment ORG46-361

The Draft Environmental Impact Report's (DEIR's) cumulative impacts analysis for redband trout and suckers is encompassed by its discussion of cumulative impacts for aquatic resources generally. As described in Volume I Section 3.24.1.1 *Cumulative Effects – Introduction – Analysis Approach* (page 3-1103), the CEQA guidelines state that when a project's contribution is not cumulatively considerable, then the EIR need only briefly describe supporting reasoning for this conclusion (CEQA Guidelines section 15130(a)(2)). Furthermore, the guidelines state that the "discussion of cumulative impacts shall reflect the severity of the impacts and their likelihood of occurrence, but the discussion need not provide as great detail as is provided for the effects attributable to the project alone (CEQA Guidelines section 15130(b))." Accordingly, the analysis of potential cumulative impacts to suckers or redband trout are adequately covered by the depth and breadth of the analysis in Volume I Section 3.24.3 *Cumulative Effects – Introduction – Analysis Approach* (pages 3-1162 to 3-1166), which considers these species collectively with other aquatic species. There are no cumulatively considerable impacts to aquatic resources – redband trout, suckers, or others – from the Proposed Project when considered with other projects with related potential impacts to aquatic resources.

Comment ORG46-362

Potential Cumulative Impact 3.24-47 Short-term and / or long-term historical and tribal cultural resources effects from the Proposed Project in combination with development projects: The terminology included in the section "Significant and unavoidable short-term ground-disturbing construction-related impacts on archaeological and non-archaeological tribal cultural resources (TCRs)..." implies that impacts from ground disturbance are short-term. The DEIR should be revised to reflect the fact that ground disturbance, regardless of the duration, causes permanent impacts to TCRs, historic-period archaeological sites, and historic resources.

Response to Comment ORG46-362

The "short-term" and "long-term" descriptors have been removed from this impact title and analysis to avoid confusion regarding the duration of ground-disturbance related impacts to historical and tribal cultural resources, which, if they were to occur, would be permanent. Please refer to Volume III Attachment 1 Section 3.24.12 *Cumulative Effects –Historical Resources and Tribal Cultural Resources* Potential Impact 3.24-27 for the revisions.

Comment ORG46-363

The DEIR requires clarification to describe if the cumulative impact analysis addresses effects from the combination of the Proposed Project and wildfire.

Response to Comment ORG46-363

The title of Potential Cumulative Impact 3.24-53 in Section 3.24.15 *Cumulative Effects – Agriculture and Forestry* has been clarified to correct the typographic error (i.e., missing the word "and"). Please refer to Volume III Section 3.24.15 *Cumulative Effects – Agriculture and Forestry* for the revision. Additionally, as stated in the Section 3.24.1.1 *Cumulative Effects – Introduction – Analysis Approach* on page 3-1104, "this cumulative effects analysis considers increased frequencies and intensities of wildfires along with the list of 'projects' that could result in cumulative impacts (Table 3.24-1)."

Comment ORG46-364

A map of pertinent reasonably foreseeable projects should be included and should depict the Proposed Project area.

Response to Comment ORG46-364

Volume I Section 3.24.1.1 *Cumulative Effects – Introduction – Analysis Approach* Table 3.24-1 (pages 3-1106 to 3-1146) presents information on the locations of projects. Some of the planned, approved, or reasonably foreseeable projects listed in Table 3.24-1 have point locations, but many are tributary- or basin-wide, or otherwise geographically non-discrete, and thus would be difficult to clearly present in a figure. In accordance with CEQA, the locations of the listed projects were considered in the discussions of cumulative impacts for each resource, along with the type of project (CEQA Guidelines Section 15130[b][2]).

Comment ORG46-365

Because the City of Yreka's water supply infrastructure is within the Area of Analysis, mention the pipeline here and specify that the City's water supply infrastructure is addressed in Water Supply.

Response to Comment ORG46-365

Section 3.24.18 *Cumulative Effects – Utilities and Service Systems* has been clarified as requested; specific reference to the City of Yreka's water supply infrastructure has been added to the first paragraph. Please refer to Volume III Attachment 1 Section 3.24.18 *Cumulative Effects – Utilities and Service Systems* for the revisions.

Comment ORG46-366

The summary of Proposed Project impacts reiterates several conclusions from the Proposed Project analysis that have been previously commented on in Section 3.19, including the use of BLM VRM Class Ill as the assumed condition of the Area of Analysis for Aesthetics when Class II may be more appropriate and conservative. The cumulative discussion needs to be updated to reflect edits made in the main DEIR discussion.

Response to Comment ORG46-366
Regarding concerns about the CEQA baseline used in the EIR, please refer to responses to comments ORG46-321 and ORG46-323. Additionally, Section 3.24.19 *Cumulative Effects – Aesthetics* has been clarified to reflect the modifications made to Section 3.19 *Aesthetics*. Please refer to Volume III Attachment 1 Section 3.24.19 *Cumulative Effects – Aesthetics* for the revisions.

Comment ORG46-367
The paragraph refers to cumulative impacts from projects not already considered in the utilities and service systems resource area effects and should be deleted.

Response to Comment ORG46-367
The third paragraph in Volume I Section 3.24.19 *Cumulative Effects – Aesthetics* has been deleted in Volume III because it is not related to the aesthetics analysis. Please refer to Volume III Attachment 1 Section 3.24.19 *Cumulative Effects – Aesthetics* for the revisions.

Comment ORG46-368
Overall, this section is confusing and should be rewritten. The aesthetics significance criteria should be the same for potential cumulative impacts as for the Proposed Project and this does not appear to be the case.

Response to Comment ORG46-368
As stated in Vol. I Section 3.24.19 *Cumulative Effects – Aesthetic*s (page 3-1209), the significance criteria for the analysis of potential cumulative aesthetic impacts are the same as those defined for the Proposed Project in Section Vol. III 3.19.3 *Aesthetics – Significance Criteria.*

Comment ORG46-369
As was stated previously (see comment 3.19-1) the conclusion of this analysis again assumes the change from open water vistas to more "natural river, canyon, and valley vistas" is not significant because it is beneficial and visual quality for the public would not be substantially degraded. In making this conclusion, the DEIR assumes everyone would find the natural river and canyon views equal or more positive than the existing open water views, a position that the DEIR fails to substantiate. Further, even if beneficial, the degree of change may still be significant for even Class Ill VRM lands, let alone Class II.

It could also be considered that other reasonably foreseeable projects with scenic-vista effects (other than just the loss of open water) could create cumulative effects but were not discussed here (an example would be timber harvest within the viewshed of a reservoir).

Response to Comment ORG46-369
Regarding the aesthetic change from open water vistas to more natural river, canyon, and valley vistas, please see the response to comment ORG46-321.

Volume I Section 3.24.19 *Cumulative Effects – Aesthetics* Potential Cumulative Impact 3.24-57 (page 3-1209), which is modified in Volume III Attachment 1, relates specifically to open water; therefore, adding an analysis of other projects such as timber harvest would be out of context. Additionally, none of the known forest and wildfire management projects, including timber harvest, identified in Volume I Section 3.24.1 *Cumulative Effects – Introduction – Analysis Approach* Table 3.24-1 (pages 3-1106 to 3-1146) are within the Primary Area of Analysis for aesthetics, which is within the viewshed of Lower Klamath Project reservoirs; therefore, an expanded or new impact assessment to address potential scenic vista effects from forest and wildfire management is not required. However, for completeness, clarifying information relating to forest and wildfire management has been added to Potential Cumulative Impact 3.24-59 in Volume III Section 3.24.19 *Cumulative Effects – Aesthetics*. Please refer to Volume III Attachment 1 Section 3.24.19 *Cumulative Effects – Aesthetics* for the revisions.

Comment ORG46-370

The significance criteria applied to the cumulative impact analysis of aesthetics and the potential impacts analyzed in this section do not mirror the Proposed Project analysis. The analysis brings in elements not previously considered and seems to focus on only a few types of foreseeable projects. The cumulative analysis should consider the residual effects of the Proposed Project in conjunction with other reasonably foreseeable projects to evaluate the contribution of the Proposed Project to overall change. For example, Potential Cumulative Impact 3. 24-58 does not focus on flow and channel morphology, but rather on impacts from other restoration, flow, and water quality projects.

Response to Comment ORG46-370

The approach to the cumulative effects analysis is described in Volume I Section 3.24.1.1 *Cumulative Effects – Introduction – Analysis Approach* (pages 3-1103 to 3-1146). Clarifying language has been added to the impacts in Volume III Attachment 1 Section 3.24.19 *Cumulative Effects – Aesthetics*, including Potential Cumulative Impact 3.24-58, to place greater emphasis on the relevant aesthetics significance criteria. Please refer to Volume III Section 3.24.19 *Cumulative Effects – Aesthetics* for the revisions.

Comment ORG46-371

This section states "Other projects (Table 3.24-1) have the potential to alter river channel morphology and result in a cumulative impact." However, this analysis discusses only the visual impacts related to suspended sediment and does not list or analyze the impacts from any other projects except to mention that other restoration projects would help reduce nutrient loading and seasonal algal blooms.

Further, this section of the DEIR repeats the unsubstantiated conclusion that visual quality impacts related to suspended sediment will be weak to moderate.

With 30 to 50 percent of the estimated 15.1 million cubic yards accumulated sediment flushing during reservoir drawdown, and possibly more with other actions such as the 2017 United States District Court-ordered flushing flows, additional information is needed to support this opinion.

Response to Comment ORG46-371

The reference to "other projects" in the opening paragraph of Section 3.24.19 *Cumulative Effects – Aesthetics* Potential Cumulative Impact 3.24-58 has been revised to include a reference to restoration, flow enhancement, and water quality improvement projects. Please refer to Volume III Attachment 1 Section 3.24.19 *Cumulative Effects – Aesthetics* for the revisions.

The final paragraph in Volume I Section 3.24.19 *Cumulative Effects – Aesthetics* Potential Cumulative Impact 3.24-58 (page 3-1210) assesses the potential cumulative aesthetic impacts of the Proposed Project and other projects in relation to nutrients and algal blooms. Other potentially overlapping restoration projects in the Klamath Basin are listed in Volume I Section 3.24.1.1 *Cumulative Effects – Introduction – Analysis Approach* Table 3.24-1 (pages 3-1106 to 3-1146) and an example of a relevant restoration project is given in the final paragraph of Potential Cumulative Impact 3.24-58 (page 3-1210).

Please also refer to response to comment ORG46-328.

Comment ORG46-372

The discussion of other projects with the potential to create substantial areas of bare sediment and rock should not be constrained to the reservoir footprints but should be considered across the entire aesthetics Area of Analysis.

Response to Comment ORG46-372

The first paragraph of Potential Cumulative Impact 3.24-59 (page 3-1210) in Volume I Section 3.24.19 *Cumulative Effects – Aesthetics* has been revised in Volume III to include consideration of ground disturbing and construction projects within the aesthetics Area of Analysis that could potentially expose bare sediment and rock, rather than consideration of ground disturbing and construction projects only within the reservoir footprints. This change has not affected the significance determination – *no significant cumulative impact*. Please refer to Volume III Attachment 1 Section 3.24.19 *Cumulative Effects – Aesthetics* Potential Cumulative Impact 3.24-59 for the revisions.

Comment ORG46-373

The text indicates the I-5 has an ADT (correct to AADT) of 391 vehicles. That number is incorrect. Page 3-1060 states that I-5 Exit 789 has AADT levels of 20,900 vehicles (peak) and 17,200 vehicles (average). The mainline of I-5 cannot have an AADT less than its off-ramps.

Response to Comment ORG46-373
Contrary to the assertion in the comment, the referenced text discusses the added average daily traffic (ADT) from the project, not the average annual daily traffic (AADT) on Interstate 5.

Comment ORG46-374
In this paragraph, the DEIR explains why the No Project Alternative analysis addresses only short-term effects (up to 5 years). The reason given in the DEIR is that there is significant uncertainty about the long-term conditions in the basin that could affect the No Project Alternative, such as USBR' s operation of the Klamath Irrigation Project, adaptive management of existing projects, and planned restoration activities. The DEIR' s decision not to assess long-term effects for this alternative because of such uncertainty should be applied equally to all alternatives and to other information is used in the DEIR, including information that is used to assess long-term effects of the Proposed Project and other alternatives. For example, the DEIR makes extensive use of the total maximum daily loads (TMDLs), including for modeling results and development of significance criteria for water quality. This is the case even though the DEIR itself states that "...the mechanisms for implementation and the timing required to achieve future TMDL compliance are currently speculative" (DEIR pg. 3-66). The DEIR relies on and makes use of other foreseeable but uncertain information such as that related to potential future salmon production and specific future climate change effects in the basin.

Response to Comment ORG46-374
The manner in which the EIR addresses speculation is consistent with CEQA Guidelines 15145. The Draft EIR also states that projecting one specific No Project scenario for the long term would be speculative, in light of the detailed reasons provided in Volume I Section 4.2.1.1 *Alternatives – No Project Alternative – Introduction – Alternative Description*, and would be contrary to the CEQA Guidelines' mandate to disclose and assess the environmental impacts that would "reasonably be expected to occur in the foreseeable future." The paragraph cited in the comment, in Volume I Section 4.1.1.1 *Alternatives – Alternatives Selection/Overview – Alternative Selection – Alternatives Carried Forward for More Detailed Analysis* on page 4-3, has been revised to be consistent with the reasons provided in Volume I Section 4.2.1.1 *Alternatives – No Project Alternative – Introduction – Alternative Description*. Please refer to Volume III Attachment 1 Section 4.1.1.1 *Alternatives – Alternatives Selection/Overview – Alternative Selection – Alternatives Carried Forward for More Detailed Analysis* for the revisions.

Comment ORG46-375
The DEIR states: "...while infrequent (i.e., less than 1 percent of the time at Iron Gate Dam), daily average flows in the Klamath River exceed the deep flushing flow requirement of 11,250 cfs during some storm events in the period of analysis." Based on the information in the DEIR, it appears that deep flushing

flows would occur significantly more often for No Project conditions compared to the Proposed Project. Because it is theorized that deep flushing flows will decrease effects of disease related to C. shasta, the DEIR analysis should assume that any alternative that incorporates deep flushing flows will have a greater positive effect on disease than those that do not (such as the Proposed Project). This conclusion is not present in the DEIR analysis of alternatives.

Response to Comment ORG46-375
Please note that the court-ordered 2017 deep flushing flow requirements at issue in this comment are no longer in effect as flow requirements.

The EIR considers deep flushing flows with respect to the potential for fish disease in the analysis of the Proposed Project in Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites*, noting that while there has not been enough time to collect data characterizing the efficacy of the flushing flows since they were initiated in 2017, the necessity to use the emergency dilution flows in 2018 and 2019 suggests that the flushing flows are insufficient on their own to resolve the issue of fish disease downstream of Iron Gate Dam. Because polychaete populations are located outside of the main flow along the margins of the river (Bartholomew and Foott 2010), variable flows disrupt this habitat. Therefore, removal of the Lower Klamath Project dams under the Proposed Project would disrupt microhabitat conditions and is expected to reduce polychaete populations (Stocking and Bartholomew 2007, Bartholomew and Foott 2010) and presumably, reduce infection rates within polychaete populations both in the short and long term (Hetrick et al. 2009).

The EIR also considers deep flushing flows with respect to the potential for fish disease in the analysis of the No Project Alternative in Section 4.2.3.1 *Alternatives – No Project Alternative – Aquatic Resources – Key Ecological Attributes – Fish Disease and Parasites,* noting that while the flushing flows have not been occurring over a long enough time to allow collection of enough data on the efficacy of the flushing flows, the necessity to use the emergency dilution flows in 2018 and 2019 suggests that the flushing flows are insufficient on their own to resolve the issue of fish disease downstream of Iron Gate Dam. Therefore, the No Project Alternative would result in continued substantial deleterious effects on salmon because of fish disease and parasites.

Thus, the comment's assertion that any alternative that incorporates deep flushing flows will have a greater positive effect on disease than those that do not (such as the Proposed Project) is not supported by the analyses in the EIR.

Please note that the discussion of flows has been revised in Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species*, Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites*, and Section 4.2.3.1 *Alternatives – No Project Alternative – Aquatic*

Resources – Key Ecological Attributes – Fish Disease and Parasites to clarify how the deep flushing flows were considered in the analysis and to include consideration of the 2019 BiOp Flows, which are now the current operational flow requirement for the Klamath River. Please refer to Volume III Attachment 1 Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species*, Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites*, and Section 4.2.3.1 *Alternatives – No Project Alternative – Aquatic Resources – Key Ecological Attributes – Fish Disease and Parasites* for the revisions. For additional information about how the EIR considers the 2019 BiOp Flows, please refer to Master Response HYD-1.

Comment ORG46-376

The DEIR includes many references to "existing adverse conditions." The DEIR should remove the undefined characterization of "adverse" as the discussion is limited to changes from "existing conditions."

Response to Comment ORG46-376

The term “adverse” provides important context for the discussion, particularly for the general reader. With respect to the comment’s assertion that “adverse” is not defined, neither CEQA nor the Lower Klamath Project EIR identify any reason to deviate from use of the word ‘adverse’ to mean harmful or unfavorable, consistent with the common English language usage of this word.

Comment ORG46-377

The DEIR states "In general, the No Project Alternative would not affect the current ongoing changes to water temperature caused by the reservoirs and by dam operations, as described in Section 3.2.2.2 Water Temperature." Because the No Project analysis does not include long-term effects, the DEIR should clarify that this conclusion, and other conclusions throughout this section, relate only to effects in the short term.

Response to Comment ORG46-377

Please refer to Volume I Section 4.2.2 *Alternatives – No Project Alternative – Water Quality* (page 4-24) introduction that states that the No Project Alternative considers reasonably foreseeable conditions over the period of 0−5 years. Additionally, please refer to the last sentence on page 4-24 that states: “Other potential impacts related to water temperature in the foreseeable short-term (0−5 years) under the No Project Alternative are discussed under a new impact heading, below.”

Comment ORG46-378

The DEIR states "In the Hydroelectric Reach from the Oregon-California state line to the upstream end of Copco No. 1 Reservoir, daily hydropower peaking operations would continue to cause artificially high daily maximum water temperatures and daily variability in water temperatures that occur under existing conditions." This is incorrect. While the diurnal range may be larger under the

No Project Alternative (largely a function of the daily minimum temperature being low in response to J. C. Boyle Powerhouse not operating for some period of the day and dominance of relatively cold spring flow through this reach during this period), the maximum daily water temperature is not predicted to be appreciably higher under the No Project Alternative than the Proposed Project. Peaking flows are high volume and have short transit times. Under the Proposed Project, the flow volumes will be smaller and travel time longer than under the No Project Alternative during the principal heating daytime hours. Even with spring inflow dilution, the maximum daily temperature will not be significantly different.

The DEIR fails to identify one of the clear environmental benefits of the No Project Alternative in the J.C. Boyle Bypass Reach. Under No Project Alternative, the water temperatures at the downstream end of the bypass reach rarely exceed 15°C because most of the water comes from a large spring complex that starts less than a mile downstream from J.C. Boyle Dam. With J.C. Boyle Dam removed and the full flow of the Klamath River passing through this reach, maximum daily water temperatures in summer will be on the order of 22°C to 23°C, that is 7 to 8°C warmer than under the No Project Alternative. Currently, the bypass reach forms a reach-scale thermal refugia spanning several miles of river channel. Dilution of this refugia will probably reduce it to a quarter mile or less without J.C. Boyle Dam in place.

Response to Comment ORG46-378

Volume I Section 4.2.2 *Alternatives – No Project Alternative – Water Quality – Water Temperature* Potential Impact 4.2.2-1 – *Hydroelectric Reach* (page 4-25) is correct when it states "daily hydropower peaking operations would continue to cause artificially high daily maximum water temperatures and daily variability in water temperatures that occur under existing conditions" in the Hydroelectric Reach from the Oregon-California state line to the upstream end of Copco No. 1 Reservoir. In addition to the Klamath River Total Maximum Daily Load (TMDL) model estimating a higher maximum water temperature at the Oregon-California state line during summer (i.e., June through August) and portions of the fall (i.e., October and November) under existing conditions than under the Proposed Project (see EIR Potential Impact 3.2-1, Figure 3.2-7), the Klamath River Water Quality Model (KRWQM) water temperature results indicate that there is a higher maximum water temperature during portions of the year under existing conditions than would occur under the Proposed Project. PacifiCorp (2014) presents Klamath River water temperature results at the Oregon-California state line from an updated version of the KRWQM in Figure 5.2-19 (reproduced below) for the PacifiCorp (2014) Proposed Project (i.e., continued operations of the Lower Klamath Project dams with additional measures to enhance water quality and beneficial uses; the PacifiCorp [2014] Proposed Project is different from the EIR Proposed Project of removal of the J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate dams), Existing Conditions, and a California Temperature Objective (i.e., no more than 5°F [2.8°C] increase hypothetical without-Project water temperatures [based on model simulations]; labeled as "Objective").

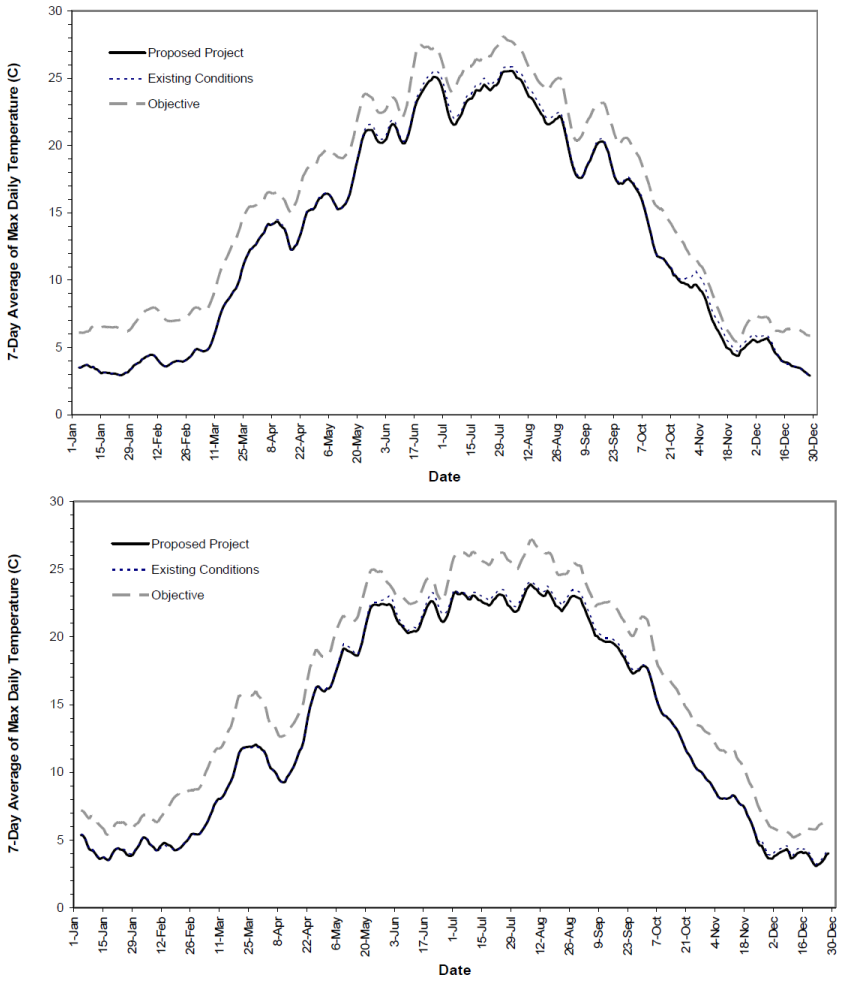


Figure 5.2-19 from PacifiCorp (2014). Time-Series of the 7-Day Average of Maximum Water Temperature (in Degrees C) for the Year 2000 (Top Plot) and 2001 (Bottom Plot) in the Klamath River at the Oregon-California State Line, Compared to the California Temperature Objective (i.e., No More Than 5ºF [2.8ºC] Increase Above Hypothetical Without-Project Water Temperatures [Based on Model Simulations]).

PacifiCorp (2014) Figure 5.2-19 does not present a direct comparison of Klamath River water temperatures at Oregon-California state line under existing conditions with the dams in place and under hypothetical without-Project conditions (i.e., removal of J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate dam and powerhouse developments), but the "Objective" water temperature shown is the hypothetical without-Project conditions shifted up 2.8 degrees Celsius (ºC). A comparison of the PacifiCorp (2014) Figure 5.2-19 Klamath River water temperatures at the Oregon-California state line under existing conditions and the "Objective" water temperatures shifted down by 2.8ºC would highlight the influence of J.C. Boyle Reservoir daily peaking operations on water temperature at the Oregon-California state line since the shifted "Objective" water

temperatures would represent the estimated without Project (i.e., Proposed Project) water temperature conditions. Higher 7-day average of maximum daily temperatures under existing conditions than under the shifted "Objective" water temperature would demonstrate that peaking operations increase the temperature in the Klamath River at the Oregon-California state line.

As shown in Figure ORG46-378-1 below, the 7-day average of the maximum daily Klamath River Water Quality Model (KRWQM) Klamath River water temperatures at the Oregon-California state line under existing conditions and the "Objective" water temperatures shifted down by 2.8°C (i.e., blue lower dashed line) are not identical, with water temperature under existing conditions (i.e., J.C. Boyle Reservoir peaking operations) higher or lower than the shifted "Objective" water temperatures depending on the time of year. The 7-day average of the maximum daily KRWQM Klamath River water temperature at the Oregon-California state line under existing conditions is typically higher than the shifted "Objective" water temperatures representing conditions under the Proposed Project during late-spring to mid-summer (i.e., May to July) and late fall (i.e., November to December), supporting the conclusion that peaking operations increase the maximum water temperature during these periods. However, the 7-day average of the maximum daily KRWQM Klamath River water temperature at the Oregon-California state line under existing conditions is generally similar or lower than the shifted "Objective" water temperatures during other months, indicating J.C. Boyle Reservoir peaking operations are either reducing or not influencing the 7-day average of the maximum daily water temperature at the Oregon-California state line.

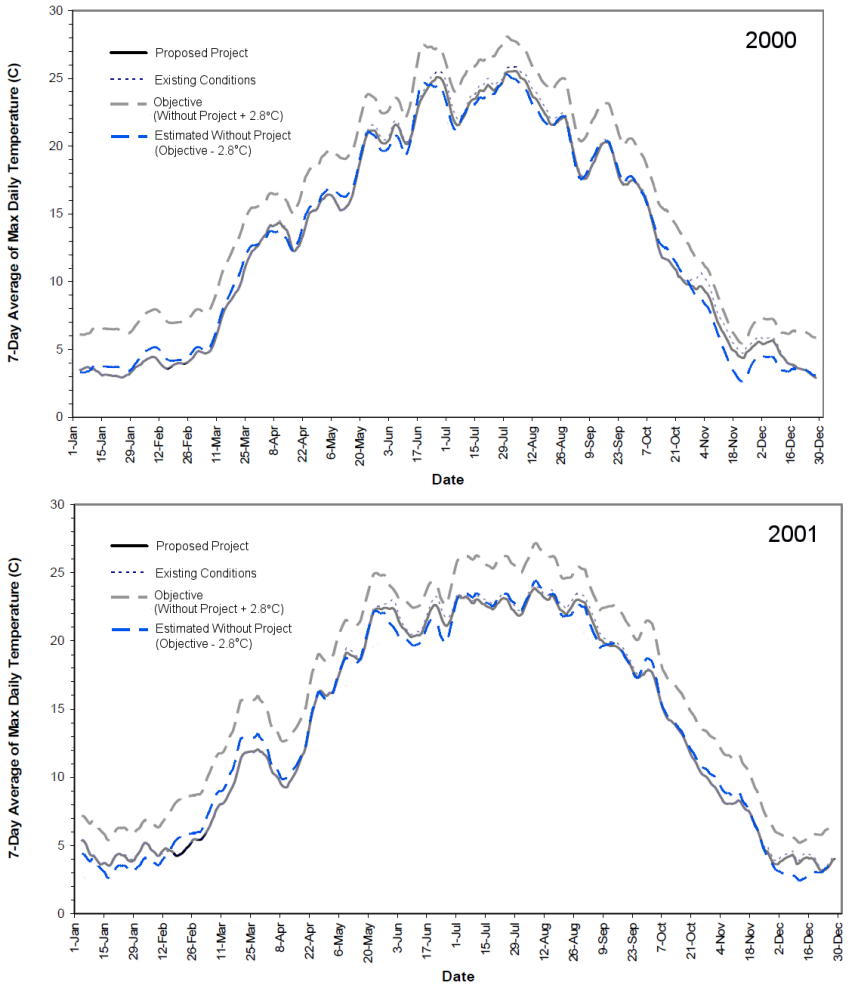


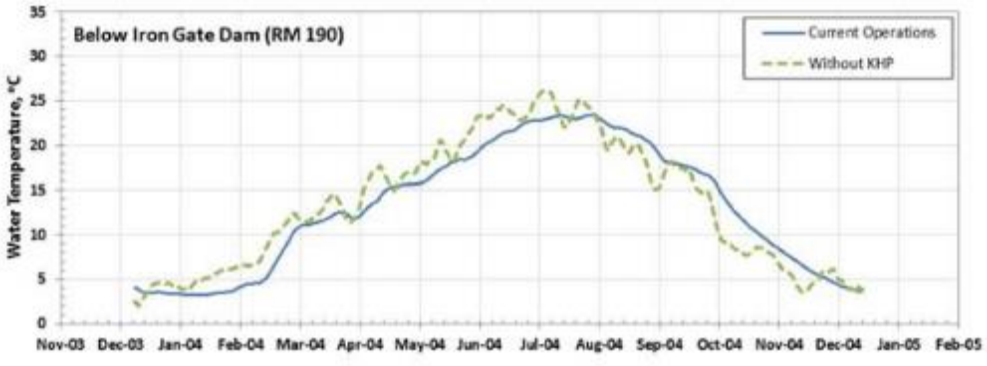
Figure ORG46-378-1 modified Figure 5.2-19 from PacifiCorp (2014). Time-Series of the 7-Day Average of Maximum Water Temperature (°C) for the Year 2000 (Top Plot) and 2001 (Bottom Plot) in the Klamath River at the Oregon-California State Line, Compared to the California Temperature Objective (i.e., No More Than 5°F [2.8°C] Increase Above Hypothetical Without-Project Water Temperatures [Based on Model Simulations]) (grey upper dashed line) and the Estimated Without Project (i.e., California Temperature Objective Shifted 2.8°C Down) (blue lower dashed line).

Please see Volume III Attachment 1 Section 3.2.1 *Water Quality – Area of Analysis* for a summary of the water quality Area of Analysis under the Proposed Project and Volume I Section 4.2.1.2 *Alternatives – No Project Alternative – Alternative Description – Alternatives Analysis Approach* (page 4-24) for an explanation that the Area of Analysis under the No Project Alternative is the same as under the Proposed Project, unless otherwise indicated. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Section 4.2.2 *Alternatives – No Project Alternative – Water Quality – Water Temperature* Potential Impact 4.2.2-1 – *Hydroelectric Reach* (page 4-25) has been modified to clarify the periods when the TMDL model and 2004/2005 KRWQM water temperature results indicate that daily hydropower peaking operations cause artificially high daily maximum water temperatures under existing conditions at the Oregon-California state line compared to the Proposed Project. Water temperatures in the J.C. Boyle Bypass Reach were not specifically discussed in Potential Impact 4.2.2-1 – *Hydroelectric Reach* (page 4-25) since the water temperature at the Oregon-California state line would represent the net influence of the Lower Klamath Project and J.C. Boyle hydropower peaking operations on water temperature in California and conditions upstream of the Oregon-California state line (RM 214.1) were only considered in the EIR analysis to the extent they influence water temperature downstream in California. However, Potential Impact 4.2.2-1 – *Hydroelectric Reach* has been modified to also clarify potential changes in water temperature in the J.C. Boyle Bypass Reach upstream of the Oregon-California state line (RM 214.1).

Comment ORG46-379

The DEIR describes adverse conditions, but not beneficial conditions under the No Project Alternative. For example, the 7DADMax temperatures (as per USEPA 2003) will be notably cooler under No Project in the reach downstream of Iron Gate Dam from later winter to mid-summer than would occur under the Proposed Project. For example, the graph below shows modeled annual time-series of 7DADMax water temperatures (in °C in the Klamath River downstream of Iron Gate Dam (RM 190.1) for the model year 2004, which was a "moderate" hydrological year (adapted from PacifiCorp 2014). The graph shows model results for two scenarios that represent: (1) existing operations of the Klamath Hydroelectric Project (Current Operations); and (2) the hypothetical absence of Klamath Hydroelectric Project facilities (without Project), which is akin to the Proposed Project.



Response to Comment ORG46-379

Section 4.2.2 *Alternatives – No Project Alternative – Water Quality – Water Temperature* Potential Impact 4.2.2-1 – *Middle and Lower Klamath River and*

Klamath River Estuary has been revised to clarify that water temperatures downstream of Iron Gate Dam under the No Project Alternative would remain cooler than the 7-day average maximum daily water temperatures downstream of Iron Gate Dam under the Proposed Project. Please refer to Volume III Attachment 1 Section 4.2.2 *Alternatives – No Project Alternative – Water Quality – Water Temperature* Potential Impact 4.2.2-1 – *Middle and Lower Klamath River and Klamath River Estuary* for the revisions.

Comment ORG46-380

The DEIR states "Overall, there would be no change from existing, adverse conditions for water temperature in the Hydroelectric Reach, the Middle and Lower Klamath River, the Klamath River Estuary, or the Pacific Ocean nearshore environment…" The word "adverse" should be deleted from this statement, and other similar statements throughout this section, because water temperature conditions are not adverse at most times and locations. Also, water temperature is simply water temperature, and may create "adverse" conditions for a receptor sensitive to changes in water temperature, but there is no such thing as "adverse conditions for water temperature."

Response to Comment ORG46-380

Volume I Section 4.2.2 *Alternatives – No Project Alternative – Water Quality – Water Temperature* Potential Impact 4.2.2-1 – *Middle and Lower Klamath River and Klamath River Estuary h*as been revised to clarify that existing adverse conditions refer to the discharge of elevated water temperature from Copco No. 1 and Iron Gate Reservoirs during late summer/fall that cause exceedances of the Thermal Plan water quality standards. Please refer to Volume III Attachment 1 Section 4.2.2 *Alternatives – No Project Alternative – Water Quality – Water Temperature* Potential Impact 4.2.2-1 for the revisions.

Comment ORG46-381

The DEIR states "The No Project Alternative would continue to result in the same small annual decreases in total phosphorus (TP) and total nitrogen (TN) through the Hydroelectric Reach as occurs under existing conditions..." The word "small" should be deleted from this statement. These decreases, particularly in phosphorous from a biostimulatory perspective are notable. Nutrient retention in Iron Gate and Copco reservoirs has been calculated and the actual data should be used in the evaluation of the Proposed Project and its alternatives (see Asarian and Kann 2005; Kann and Asarian 2007). The process wherein the reservoirs result not only in retention of nutrients, but also increased passage time so that many nutrients leave the reservoir late in or after the primary production season is not addressed in the DEIR.

Response to Comment ORG46-381

Section 4.2.2 *Alternatives – No Project Alternative – Water Quality – Nutrients* Potential Impact 4.2.2-4 – *Hydroelectric Reach* (page 4-28) has been revised to clarify the specific calculated annual nutrient retention amounts for the Lower

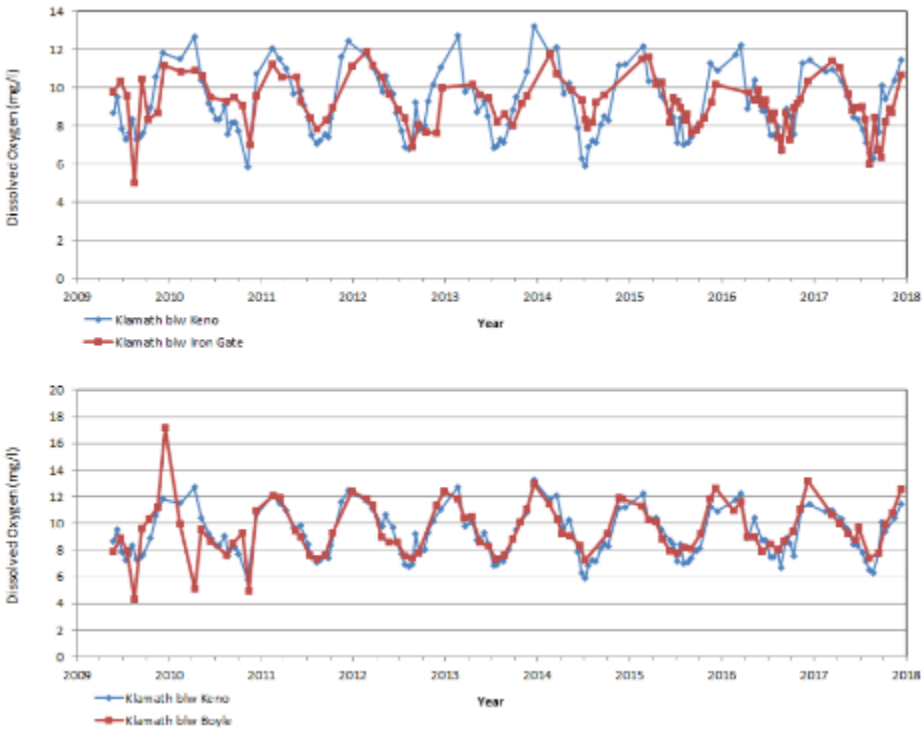
Klamath Project dams (Asarian et al. 2009) that the EIR considers to be relatively small. While these annual nutrient retention amounts are cited in PacifiCorp (2014a), the magnitudes of the most recent annual nutrient retention for Copco No. 1 and Iron Gate reservoirs in Asarian et al. (2009) differ from previous studies because earlier studies either analyzed nutrient data from only part of a year or used an improved method for estimating nutrient retention in the reservoirs. Please refer to Volume III Attachment 1 Section 4.2.2 *Alternatives – No Project Alternative – Water Quality – Nutrients* Potential Impact 4.2.2-4 – *Hydroelectric Reach* for the revisions.

Section 4.2.2 *Alternatives – No Project Alternative – Water Quality – Nutrients* Potential Impact 4.2.2-4 – *Hydroelectric Reach* (page 4-28) does explain that seasonal total phosphorus (TP), and to a lesser degree total nitrogen (TN), increases would occur during summer and fall due to releases of ortho-phosphorus and ammonium from Copco No. 1 and Iron Gate reservoir sediments. Section 4.2.2 *Alternatives – No Project Alternative – Water Quality – Nutrients* Potential Impact 4.2.2-4 – *Hydroelectric Reach* (page 4-28) has been revised to provide further clarifying details about the magnitude and timing of seasonal nutrient retention and releases from Copco No. 1 and Iron Gate reservoirs. Please refer to Volume III Attachment 1 Section 4.2.2 *Alternatives – No Project Alternative – Water Quality – Nutrients* Potential Impact 4.2.2-4 – *Hydroelectric Reach* for the revisions.

For additional discussion of seasonal nutrient releases from the Lower Klamath Project reservoirs, please refer to responses to comments ORG46-34, ORG46-96, and ORG46-98.

Comment ORG46-382

The DEIR states "The No Project Alternative in the Klamath River would result in no change from existing, adverse conditions in the reasonably foreseeable short-term (0-5 years) with respect to large summertime variations in dissolved oxygen in the Hydroelectric Reach and dissolved oxygen concentrations in the Middle Klamath River immediately downstream of Iron Gate Reservoir that fall below the Basin Plan minimum dissolved oxygen criteria (Section 3.2.2.5 Dissolved Oxygen)." This statement does not consider that dissolved oxygen conditions upstream of the Klamath Hydroelectric Project are generally worse than water quality conditions downstream of J.C. Boyle Dam and Iron Gate Dam. See data below taken from Interim Measure 15 monitoring results, which indicate dissolved oxygen downstream of these dams is generally better than or no worse than upstream water quality conditions.



Response to Comment ORG46-382

A simple time series comparison of the relative dissolved oxygen conditions at different locations in the Klamath River under existing conditions (e.g., upstream of the Hydroelectric Reach with the dissolved oxygen conditions downstream of J.C. Boyle or Iron Gate Dam) oversimplifies the discussion because it does not explicitly consider the details of how the presence and operations of the Lower Klamath Project facilities in the Klamath Hydroelectric Reach affect dissolved oxygen in the Klamath River on a seasonal basis. These details are presented in Section 3.2.2.5 *Water Quality – Environmental Setting – Dissolved Oxygen*. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

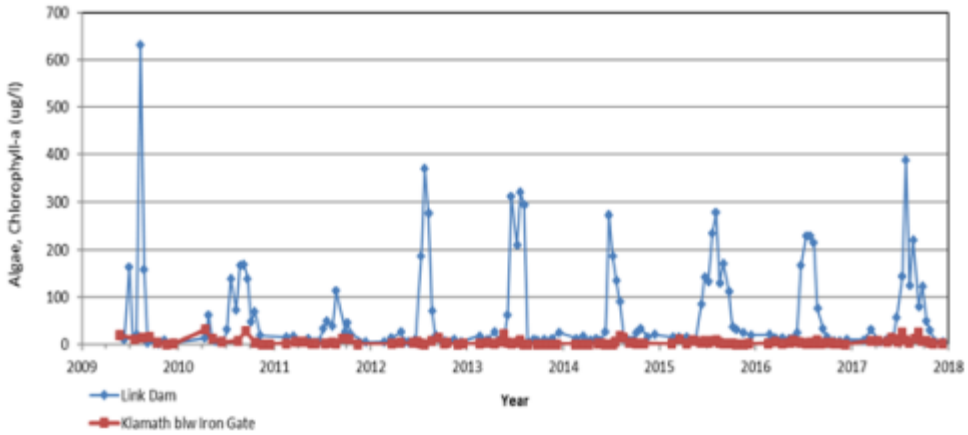
As analyzed in Volume I Section 4.2.2 *Alternatives – No Project Alternative – Water Quality – Water Temperature* Potential 4.2.2-5 (pages 4-30 to 4-31), there would be no change from existing conditions under the No Project Alternative in the Hydroelectric Reach, including the dissolved oxygen conditions entering the Hydroelectric Reach from upstream.

Comment ORG46-383

The DEIR states "the No Project Alternative would continue to result in the same pH values that exceed the Basin Plan instantaneous maximum pH objective of 8.5 s.u. and large daily fluctuations in the Hydroelectric Reach in Copco No. 1 and Iron Gate reservoirs during summertime periods of intense algal blooms (see Section 3.2.2.6 pH)." The DEIR goes on to state "Under the No Project Alternative, existing conditions for pH would continue to occur for periods of high photosynthesis, particularly when large phytoplankton blooms are transported

from Iron Gate Reservoir into the Middle and Lower Klamath River, with the most extreme pH exceedances typically occurring from Iron Gate Dam to approximately Seiad Valley." The DEIR should explain that the Klamath River is weakly buffered, a condition that is largely a function of watershed geology, not reservoir dynamics. Even modest amounts of primary production will create conditions both with and without the Proposed Project, where elevated pH would occur throughout much of the Klamath River, particularly the river upstream of Seiad Valley, during summer. Because there is a large contribution of nutrients from upstream sources (e.g., Upper Klamath Lake, Keno Reservoir), primary production will occur at levels sufficient to generate pH values that exceed Basin Plan targets.

Contrary to what is stated in the DEIR, phytoplankton blooms washing out of Iron Gate Reservoir are not a major contribution to elevated pH downstream. While they may appear extensive, they are small compared to, for example, blooms washing out of Upper Klamath Lake (see chlorophyll-a figure below for conditions downstream of Link River Dam and Iron Gate Dam). Modeling has indicated that phytoplankton contributions to the river are minor compared to periphyton and macrophytes (Deas 2000). Finally, algae speciation data indicate that river samples are often dominated by species associated with the upstream periphyton and not necessarily reservoir species.



Response to Comment ORG46-383

Section 4.2.2 *Alternatives – No Project Alternative – Water Quality – Water Temperature* Potential Impact 4.2.2-6 has been revised to clarify that the Klamath River is a weakly buffered system susceptible to photosynthesis-driven pH variations. Please refer to Volume III Attachment 1 Section 4.2.2 *Alternatives – No Project Alternative – Water Quality – pH* for the revisions.

Further, the Klamath River is a weakly buffered system, as noted by the comment, so it is susceptible to pH variations from photosynthesis and respiration. While the chlorophyll-*a* concentrations measured at the Link River Dam upstream of the Hydroelectric Reach are greater than those measured downstream of Iron Gate Dam, indicating a relatively higher density of

phytoplankton cells and associated photosynthesis, pH variations may occur even from relatively small changes in the photosynthesis and respiration in a weakly buffered system such as the Klamath River.

While modeling may indicate that phytoplankton have a relatively small contribution to the pH in the river under typical conditions, existing models do not appear to sufficiently replicate the observed dynamics of algal blooms. Currently, the influence of algal blooms on pH conditions in the Klamath River is better represented by measurements of existing conditions in the Klamath River during algal blooms. While algae speciation data provide estimates of the abundance of various algae types, algae speciation data alone do not quantify the relative contribution of phytoplankton on pH conditions in the Klamath River. During 2012, measurements were made at three locations in the Klamath River (i.e., Seiad Valley, Weitchpec, and Turwar) to estimate the relative contributions of phytoplankton and periphyton and benthic organisms to stream metabolism. While stream metabolism was estimated in dissolved oxygen per square meter per day, photosynthesis and respiration by phytoplankton and periphyton and benthic organisms influence the variations in dissolved oxygen, and these same processes would influence variations in pH. As such, the relative contribution of phytoplankton and periphyton and benthic organisms estimated from the stream metabolism in dissolved oxygen per square meter per day are suggestive of the relative contribution of these organisms to pH variations in the Klamath River. Periphyton and other benthic organisms were found to be responsible for approximately 89 percent of the variations in dissolved oxygen per square meter per day (i.e., stream metabolism) when phytoplankton blooms are not occurring in the reservoirs or being subsequently transported downstream into the river (Genzoli and Hall 2016). However, phytoplankton blooms in the reservoirs during September through mid-October 2012 and the transport of suspended phytoplankton into the Middle and Lower Klamath River shifted the stream metabolism from being primarily due to periphyton and other benthic organisms to a mixture of periphyton, other benthic organisms, and phytoplankton. During phytoplankton bloom conditions, the relative contribution of phytoplankton to stream metabolism increased to 55 percent at some river sites (Genzoli and Hall 2016). Thus, in-reservoir phytoplankton blooms being transported downstream of Iron Gate Dam would potentially contribute significantly to the pH variations and elevated pH in the Middle and Lower Klamath River under the No Project Alternative. Overall, Volume I Section 4.2.2 *Alternatives – No Project Alternative – Water Quality – pH* Potential Impact 4.2.2-6 (pages 4-32 to 4-33) is accurate to state that existing conditions for pH would continue to occur under the No Project Alternative and the large pH variations (0.5 to 1.5 standard units [s.u.]) observed under existing conditions would likely continue to occur during periods of high photosynthesis, especially when large phytoplankton blooms are transported from Iron Gate Reservoir into the Middle and Lower Klamath River.

Comment ORG46-384

The DEIR states "Downstream of Iron Gate Dam, chlorophyll-a and algal toxin trends generally would be similar to existing conditions under the No Project Alternative, with releases of chlorophyll-a and algal toxins (i.e., microcystin) in the lower Klamath Hydroelectric Project reservoirs to the Middle and lower Klamath River, and eventually the Klamath River Estuary." The DEIR fails to acknowledge that in 2015 PacifiCorp installed and continues to test a barrier curtain to reduce releases of blue-green algae from Iron Gate Dam to downstream Klamath River reaches (see Watercourse 2016; PacifiCorp 2017b). While PacifiCorp is still testing this prototype curtain and operational refinements are ongoing, there are a range of conditions where water quality monitoring indicates that the barrier curtain does successfully segregate surface waters in Iron Gate Reservoir and result in retention of blue-green algae in the reservoir. Testing and refinement of curtain design and operations is ongoing.

Response to Comment ORG46-384

Volume I Section 4.2.2 *Alternatives – No Project Alternative – Water Quality – Chlorophyll-a* Potential Impact 4.2.2.7 has been revised to clarify that existing conditions include the intake barrier/thermal curtain and testing and refinement of the curtain designs and operations are ongoing. The intake barrier/thermal curtain tested in 2014 was referred to as a prototype and the current intake barrier/thermal curtain installed in 2015 has not been described as a prototype in published, publicly available PacifiCorp reports on its operation and performance since then (PacifiCorp 2016a, 2017a, 2018a). Please refer to Volume III Attachment 1 Section 4.2.2 *Alternatives – No Project Alternative – Water Quality – Chlorophyll-a* for the revisions.

Comment ORG46-385

The DEIR states "Under the No Project Alternative, the effects of ongoing and future upstream water quality improvements under the TMDLs would improve water temperatures downstream of Keno Dam, as described in Section 3.2.2.2 Water Temperature." PacifiCorp is not aware of any actions contemplated under the TMDL implementation plans that are reasonably projected to bring water temperatures downstream of Keno Dam into compliance with water temperature standards. Further, the TMDL requires further reductions in water temperature standards when anadromous fish have access to Keno Reservoir, which will further challenge attainment of water quality standards. Water quality improvements to achieve TMDL requirements are not reasonably certain to occur and thus the DEIR should not rely upon them as assumed future conditions(see Section 3 Thematic Comments).

Response to Comment ORG46-385

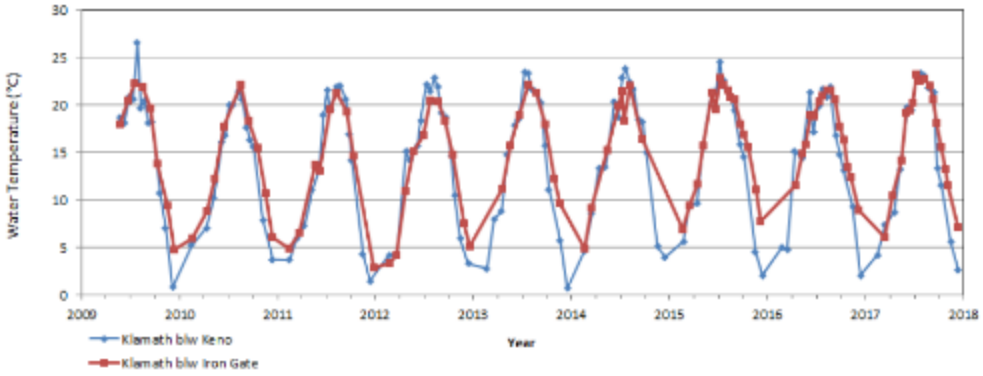
Volume I Section 4.2.3.1 *Alternatives – No Project Alternative – Aquatic Resources – Key Ecological Attributes – Water Temperature* has been revised to clarify that the No Project Alternative, which is analyzed for the reasonably foreseeable short-term (0−5 years), would not affect the current ongoing changes

to water temperature caused by the reservoirs and by dam operations. Please refer to Volume III Attachment 1 Section 4.2.3.1 *Alternatives – No Project Alternative – Aquatic Resources – Key Ecological Attributes – Water Temperature* for the revisions.

With respect to the comment regarding anadromous fish access to Keno Reservoir when water temperatures are elevated, please refer to Volume III Attachment 1 Section 3.3.5 *Aquatic Resources – Potential Impacts and Mitigation Measures* Potential Impact 3.3-7, which includes a detailed discussion of the potential impediments to fish passage from water quality conditions in Keno Reservoir/Lake Ewauna, and includes analysis of the potential implications if passage is not improved there.

Comment ORG46-386

The DEIR states "The river's thermal regime downstream from the reservoirs would continue to be out of phase with the natural temperature regime (Hamilton et al. 2011)." The DEIR should consider actual water quality monitoring data, which does not support this statement. See below water quality monitoring data collected under Interim Measure 15, which compares water temperatures downstream of Keno Dam to water temperatures downstream of Iron Gate Dam. While Iron Gate Dam and Reservoir may contribute to a temperature lag, the overall river water temperatures down stream of Iron Gate are aligned with water temperatures upstream of the Klamath Hydroelectric Project that fish would encounter if dams are removed.



Response to Comment ORG46-386

Existing conditions water quality monitoring data cannot be used to evaluate whether the timing of the thermal regime of the river is altered by reservoir releases because the reservoirs are constantly influencing the water temperature in the river and data cannot be collected about the natural temperature regime without the reservoirs. It is incorrect to compare the water temperature downstream of Keno Dam and Iron Gate Dam to evaluate whether the water temperature downstream of Iron Gate Dam is out of phase with the natural temperature regime in the Klamath River since the water temperature downstream of Keno Dam is influenced by releases from the Keno

Impoundment/Lake Ewuana; thus, the water temperature downstream of Keno Dam also is not representative of the natural temperature regime. Section 3.2.2.2 *Water Quality – Environmental Setting –Water Temperature* Figure 3.2-3, Hamilton et al. (2011) Figure 8, and PacifiCorp (2004a-1, 2005a, 2008a, 2014a) present the Klamath River Water Quality Model (KRWQM) water temperature results showing the Klamath River water temperature under existing condition out of phase with the Klamath River water temperature under hypothetical conditions without J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate dams. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

The comment's assertion that fish would encounter the water temperatures shown in the figure for the locations downstream of Keno Dam if the dams were to be removed is correct only once fish reach that location. Further downstream, fish would encounter water temperatures that would be influenced by multiple factors including the cold-water springs in the J.C. Boyle Peaking Reach; tributary inputs; and the elimination of the thermal effects previously created by the reservoirs and from hydropower peaking operations.

Comment ORG46-387

The DEIR states "Bartholow et al. (2005) and PacifiCorp (2004b) showed that the reservoirs delay seasonal thermal signatures by 18 days." This is an oversimplification or misrepresentation of what the PacifiCorp source indicates. PacifiCorp model results (see PacifiCorp 2004a, 2008, 2014) show that the delay is actually 18 days or less in the river from Iron Gate Dam to the confluence with the Shasta River (RM 176). The effects of the Klamath Hydroelectric Project reservoirs on water temperatures downstream of Iron Gate Dam (RM 190) progressively diminish until reaching a downstream location where effects are absent. The DEIR should clarify this statement accordingly.

Response to Comment ORG46-387

Bartholow et al. (2005) state that the annual temperature cycle downstream of Iron Gate Dam (river mile [RM] 193.1) shifted an average of about 18 days earlier in the year with Iron Gate Dam in place, with the phase shift of the annual temperature cycle a longer duration during the fall low-flow period (3 to 4 weeks) and shorter in the higher-flow spring and early summer (2 to 3 weeks). PacifiCorp (2004a-1) specifically states the thermal lag effect (i.e., the shift in the thermal signature) is still evident in the Klamath River just above the Shasta River, but is greatly diminished by Seiad Valley and generally absent by the Salmon River. PacifiCorp (2008a, 2014) both conclude that the impact of the thermal lag diminishes by approximately 50 percent by the Shasta River and continues to diminish in the downstream direction.

Section 4.2.3.1 *Alternatives – No Project Alternative – Aquatic Resources – Key Ecological Attributes – Water Temperature – Middle and Lower Klamath River* has been revised to clarify the duration and extent of the delay in the seasonal thermal signature downstream of Iron Gate Dam and correct a typo so the

PacifiCorp (2004b) citation refers to the PacifiCorp (2004a) rather than PacifiCorp (2004b). Please refer to Volume III Attachment 1 Section 4.2.3.1 *Alternatives – No Project Alternative – Aquatic Resources – Key Ecological Attributes – Water Temperature – Middle and Lower Klamath River* for the revisions.

Comment ORG46-388

In this paragraph, the DEIR indicates that "the No Project Alternative would result in continued substantial deleterious effects on salmon because of fish disease and para sites." This statement is referring to the reach "below Iron Gate Dam." However, the reach "below Iron Gate Dam" is not specifically defined in this section of the DEIR, and therefore the DEIR is erroneously leading the reader to conclude that the reach extends to the ocean (see Major Issue 2.8). Data presented in Bartholomew and Foott (2010) show that polychaete numbers and infection rates are low for the Iron Gate Dam to just above the Shasta River reach; the mainstem reach that has the highest number of adult spawners. Thus, in relation to stream reaches downstream of the Shasta River, polychaetes are not abundant nor does the river reach from Iron Gate to the Shasta River produce high infection rates. The DEIR should clarify and correct this point.

Response to Comment ORG46-388

Section 4.2.3.1 *Alternatives – No Project Alternative – Aquatic Resources – Key Ecological Attributes – Fish Disease and Parasites* has been revised to clarify where the highest rates of infection would occur under the No Project Alternative. Please refer to Volume III Attachment 1 Section 4.2.3.1 *Alternatives – No Project Alternative – Aquatic Resources – Key Ecological Attributes – Fish Disease and Parasites* for the revisions.

Comment ORG46-389

The DEIR states "Conditions under the No Project Alternative would continue to contribute to elevated concentrations of disease parasites and would provide the conditions required for the cross infection of fish and polychaetes," and then states "These interacting factors could decrease the viability of Chinook and Coho salmon populations in the future." Aside from the observation that the DEIR previously indicated that the analysis of long-term effects was too uncertain to evaluate, the assumption that continued Project operations could decrease the viability of Chinook stocks in the future from disease is not supported by any data or analysis. The Hetrick et al. (2009) and Hamilton et al. (2011) references cited to support these statements only provide speculative and anecdotal information on this topic. Further, this analysis is supposed to be reviewing the potential effects of the No Project Alternative on Essential Fish Habitat (EFH), yet there is no discussion of the important elements of EFH, how the No Project Alterative would affect those elements.

Response to Comment ORG46-389
EIR Section 4.2.3.1 *Alternatives – No Project Alternative – Aquatic Resources – Key Ecological Attributes – Fish Disease and Parasites* has been revised to clarify the effects on Chinook and coho salmon Essential Fish Habitat (EFH) quality under continued operations, and to address the comment regarding citations of Hetrick et al. (2009) and Hamilton et al. (2011). Please refer to Volume III Attachment 1 Section 4.2.3.1 *Alternatives – No Project Alternative – Aquatic Resources – Key Ecological Attributes – Fish Disease and Parasites* for the revisions.

Comment ORG46-390
For both the No Project and Continued Operation with Fish Passage alternatives, the DEIR analysis mistakenly assumes that flow variability would be less than the Proposed Project. PacifiCorp currently operates Iron Gate Dam in such a manner that flows can and do change daily based on direction from USBR and various upper basin hydrologic conditions. In addition, when daily target flows are relatively steady, PacifiCorp runs a diurnal fluctuation program at Iron Gate powerhouse that fluctuates flows within the day. Discharges from Iron Gate Dam could be adjusted to create conditions that attract adults into fish passage facilities or, provide a wider range of daily flows for potential use in scouring or desiccating polychaete habitat. Several other measures or adaptive management components could be incorporated into future dam operations alternatives as evidenced by the FERC (2007) EIS for the Klamath Hydroelectric Project.

Response to Comment ORG46-390
Section 4.2.3.2 *Alternatives – No Project Alternative – Aquatic Resources – Aquatic Resource Potential Impacts, Impacts, and Mitigation* Potential Impact 4.2.3-7 has been revised to clarify what is meant by dampened flow. Please refer to Volume III Attachment 1 Section 4.2.3.2 *Alternatives – No Project Alternative – Aquatic Resources – Aquatic Resource Potential Impacts, Impacts, and Mitigation* for the revisions.

Please also refer to responses to comments ORG46-226 and 228 and Master Response FLD-1.

Comment ORG46-391
The DEIR should describe the existing losses of Shortnose and Lost River suckers and that according to the USFWS (2013) these are "sink" populations that contribute little to the overall population status and recovery. This will help make the linkage to the conclusion presented. The reference to PacifiCorp (2013) is incorrect and it is not clear from the DEIR what the source of the statements are regarding either loss of suckers through turbine entrainment or via stranding downstream of J.C. Boyle Powerhouse as a result of peaking operations.

Table 3. Estimates of Maximum Annual Sucker Mortality under Current Operations at Link River Dam and the Klamath Hydroelectric Project Facilities Due to Turbines, Spillways, Flow Lines, Reservoir Fluctuations, and Stranding Estimates are derived using USFWS (2013a) approach to estimating sucker mortality. (Appendix A). PacifiCorp does not agree that these estimates necessarily reflect take associated with its activities.

				Facility				
Life Stage	*East Side & West Side[A]*	*Link River[B]*	*Keno*	*J.C. Boyle*	*Copco No. 1*	*Copco No. 2*	*Iron Gate*	*Total*
Estimated Annual Mortality[C] Due to Turbine, Spillway, and Flow Line Operations								
Larvae	*731,161*	*38,995*	*8,208*	*9,500*	*13, 268*	*9,951*	*733*	*811,815*
Juveniles	*66*	*594*	*65*	*77*	*6*	*5*	*0*	*814*
Adults	*4*	*1*	*0*	*0*	*0*	*0*	*0*	*5*
Total	*731,231*	*39,590*	*8,273*	*9,577*	*13, 274*	*9,956*	*733*	*812,634*
Estimated Annual Mortality[C] Due to Reservoir Fluctuations and Stranding Effects								
Eggs	*0*	*0*	*0*	*10,000*	*0*	*0*	*0*	*10,000*
Larvae	*0*	*1,000*	*400*	*3,00*	*200*	*20*	*100*	*4,720*
Juvenile	*0*	*100*	*20*	*205*	*50*	*0*	*0*	*375*
Adult	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Total	*0*	*1,100*	*420*	*13,205*	*250*	*20*	*100*	*15,095*

[A] *The estimates for mortality at the East Side and West Side facilities are based on passage or entrainment through the East Side and West Side turbines or flow lines. Under current operations, the East Side and West Side turbines are offline during the August–October peak entrainment period as explained in the text, but relatively small amounts of water pass (approximately 80 cfs total) through the lines.*

[B] *Mortality estimates in this column are based on spill releases at Link River Dam, which are attributable to Reclamation's operations.*

[C] *Annual mortality is defined as the estimated number of individuals killed from the encounters with the listed operations sources. Total mortality includes losses resulting from spill at Link River dam. Spillway mortality associated with Link River dam is attributable to Reclamation operations.*

Response to Comment ORG46-391

The EIR refers to the sucker populations in the Hydroelectric Reach as "sink populations." Volume III Attachment 1 Section 3.3.2.1 *Aquatic Species–Environmental Setting – Aquatic Species – Fish – Resident Riverine Fish Species – Lost River and Shortnose Suckers* identifies the Lost River and shortnose suckers located in the Lower Klamath Project reservoirs as a "sink population." Additionally, Volume III Attachment 1 Section 3.3.5.9 *Aquatic Resources – Potential Impacts and mitigation – Aquatic Reosurce Impacts* Potential Impact 3.3-13 details the population in the Upper Klamath River Hydroelectric Reach as being a "sink population" that is not likely to be self-sustaining due to low recruitment.

The PacifiCorp (2013) Interim Operations Habitat Conservation Plan for Lost River and Shortnose Suckers reference is correct, and it does include information regarding loss of suckers through turbine entrainment or via stranding. For example, Table 3 in PacifiCorp (2013), included below, summarizes estimates of sucker mortality at each Klamath River Hydroelectric Project Facility due to turbines, spillways, flow lines, reservoir flucations, and stranding.

TABLE 3

Estimates of Maximum Annual Sucker Mortality under Current Operations at Link River Dam and the Klamath River Hydroelectric Project Facilities Due to Turbines, Spillways, Flow Lines, Reservoir Fluctuations, and Stranding

Estimates are derived using the USFWS (2013a) approach to estimating sucker mortality (Appendix A). PacifiCorp does not agree that these estimates necessarily reflect take associated with its activities.

Life Stage	Facility							
	East Side & West Side[A]	Link River[B]	Keno	J.C. Boyle	Copco No. 1	Copco No. 2	Iron Gate	Total
Estimated Annual Mortality[C] Due to Turbine, Spillway, and Flow Line Operations								
Larvae	731,161	38,995	8,208	9,500	13,268	9,951	733	811,815
Juveniles	66	594	65	77	6	5	0	814
Adults	4	1	0	0	0	0	0	5
Total	731,231	39,590	8,273	9,577	13,274	9,956	733	812,634
Estimated Annual Mortality[C] Due to Reservoir Fluctuations and Stranding Effects								
Eggs	0	0	0	10,000	0	0	0	10,000
Larvae	0	1,000	400	3,000	200	20	100	4,720
Juvenile	0	100	20	205	50	0	0	375
Adult	0	0	0	0	0	0	0	0
Total	0	1,100	420	13,205	250	20	100	15,095

A. The estimates for mortality at the East Side and West Side facilities are based on passage or entrainment through the East Side and West Side turbines or flow lines. Under current operations, the East Side and West Side turbines are offline during the August – October peak entrainment period as explained in the text, but relatively small amounts of water pass (approximately 80 cfs total) through the flow lines.

B: Mortality estimates in this column are based on spill releases at Link River dam, which are attributable to Reclamation's operations.

C. Annual mortality is defined as the estimated maximum number of individuals killed from the encounters with the listed operations sources. Total mortality includes losses resulting from spill at Link River dam. Spillway mortality associated with Link River dam is attributable to Reclamation operations.

Comment ORG46-392

The DEIR is missing a discussion of the status of the Redband Trout population and how (or if) it would change under the No Project Alternative. The existing Redband Trout populations in the Project area continue to be a valuable, wild, self-sustaining resource. In fact, the J.C. Boyle peaking reach trout fishery has been designated as an "Outstandingly Remarkable Value" (ORV) under the Wild and Scenic Rivers Act, in recognition of the "exceptional trout fishery," with a catch rate among the highest in the states of Oregon and California. The Redband Trout population in the J.C. Boyle peaking reach supports a high-quality recreational fishery (PacifiCorp 2004b). Annual angler catch rates in the Oregon portion of the peaking reach from 1979 to 1984 averaged 0.77 Redband Trout per hour. These catch rates are comparable to or exceed those of other high-quality trout streams in Oregon including the Deschutes and Metolius rivers (City of Klamath Falls 1986). Annual angler catch rates in the California portion of the peaking reach were slightly lower, averaging 0.59 rainbow trout per hour during 1974 to 1977, 1981, and 1982. CDFG (2000) reported that the upper Klamath River Wild Trout Area had the highest overall catch rate among the wild trout rivers it monitors in California. Although somewhat dated, the above sources are still appropriate for characterizing the recreational fishery in the J.C. Boyle peaking reach because basic supporting conditions (e.g., physical habitat, flow, and water quality) are unchanged. More recent in formation suggests that the upper Klamath River, including the J.C. Boyle Peaking Reach, remains a high-quality Redband Trout fishery (Mueller 2011). The DEIR' s failure to analyze the substantial benefits to Redband Trout fishery from existing operations (No Project) is particularly notable given the DEIR's characterization of the "adverse" existing conditions ascribed to the Klamath Hydroelectric Project, and suggests a conclusion-oriented bias in the DEIR's alternatives analysis.

Response to Comment ORG46-392

With respect to the status of the redband trout population, please refer to the Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species – Resident Riverine Fish Species – Rainbow and Redband Trout* for a discussion of the status of the redband trout population. The redband trout population in the Upper Klamath Basin is one of the largest and most functional adfluvial redband trout population of Oregon's interior basins (Hamilton et al. 2011).

With respect to how the redband trout population is predicted to be altered under the No Project Alternative, please refer to Volume I Section 4.2.3.2 Alternatives – *No Project Alternative – Aquatic Resource Potential Impacts, Impacts, and* Mitigation Potential Impact 4.2.3-14 (pages 4-55 and 4-56) for a description of the predicted effects of the redband trout population under the No Project Alternative. Several key factors from existing conditions would continue under the No Project Alternative including: 1) limited genetic exchange and movement by redband trout between reaches; 2) lack of habitat connectivity for redband trout in the Klamath River; 3) continued fish entrainment and mortality rates at

Klamath Hydroelectric Project (KHP) facilities; and 4) continued productivity impacts in the J.C. Boyle Peaking Reach and J.C. Boyle Bypass Reach.

Comment ORG46-393

The DEIR states that "Migration over the Copco No. 1 and 2 dams is in the downstream direction only, as there is no fishway. These conditions would remain unchanged under the No Project Alternative and the Redband Trout population would continue to suffer the effects of restricted habitat connectivity." However, the DEIR provides no evidence to support the assertion that there is any effect from restricted habitat connectivity. If this is a documented limiting factor for Redband Trout in this system, the DEIR needs to provide that information. As described in the previous comment above (see comment 4.2-18), the existing Redband Trout populations in the reach from Copco No. 1 Reservoir upstream to J.C. Boyle Dam continue to be a valuable wild, self-sustaining resource, and support a high-quality recreational fishery (PacifiCorp 2004b; CDFW 2000; Mueller 2011).

Response to Comment ORG46-393

Section 4.2.3.2 *Alternatives – No Project Alternative – Aquatic Resources – Aquatic Resource Potential Impacts, Impacts, and Mitigation* Potential Impact 4.2.3-14 (page 4-55) discusses the effects of restricted habitat connectivity on redband trout populations from loss of genetic exchange and lack of access to productive spawning habitat in Spencer Creek from the J.C. Boyle Bypass and Peaking Reaches, based on the analysis and reporting of NMFS 2006, and support the conclusions in the EIR.

Comment ORG46-394

The DEIR states that "It is estimated that 'several tens of thousands of resident fish' are annually entrained at 'each of the Projects' facilities (NMFS 2006a), and it is likely that these entrainment and mortality rates would continue under the No Project Alternative." However, the DEIR does not accurately present a reference for NMFS 2006a such that this assertion can be verified nor does the document indicate how many of these entrained fish are Redband Trout. The DEIR needs to support the assertion that entrainment is a documented limiting factor for Redband Trout in this system.

Response to Comment ORG46-394

Section 4.2.3.2 *Alternatives – No Project Alternative – Aquatic Resources – Aquatic Resource Potential Impacts, Impacts, and Mitigation* – Potential Impact 4.2.3-14 (page 4-55) has been modified to address the typographical error. Please refer to Volume III Attachment 1 Section 4.2.3.2 *Alternatives – No Project Alternative – Aquatic Resources – Aquatic Resource Potential Impacts, Impacts, and Mitigation* – Potential Impact 4.2.3-14 for the revisions.

Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species – Fish – Resident Riverine Fish Species* has been revised to clarify the impact of

entrainment on redband trout. Please refer to Volume III Attachment 1 Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species – Fish – Resident Riverine Fish Species* for the revisions.

In addition, Section 4.2.3.2 *Alternatives – No Project Alternative – Aquatic Resources – Aquatic Resource Potential Impacts, Impacts, and* Mitigation – Potential Impact 4.2.3-14 has been revised to clarify the potential for redband trout entrainment and mortality. Please refer to Volume III Attachment 1 Section 4.2.3.2 *Alternatives – No Project Alternative – Aquatic Resources – Aquatic Resource Potential Impacts, Impacts, and* Mitigation – Potential Impact 4.2.3-14 for the revisions.

Comment ORG46-395

The DEIR states that "The health and productivity of Redband Trout in the J.C. Boyle Peaking Reach and J.C. Boyle Bypass Reach would continue to be affected under the No Project Alternative." The DEIR fails to present any evidence to support the assertion that the health and productivity of the population is or has been affected. The DEIR assert s only that factors thought to be related to trout health and productivity are affected by the Lower Klamath Hydroelectric Project. If all of the assertions in this section were true, there would be no Redband Trout in the J.C. Boyle Peaking or Bypass reaches. In fact, the reach from Copco No. 1 Reservoir upstream to J.C. Boyle Dam supports a valuable, wild, self-sustaining Redband Trout population, which provides a high-quality recreational fishery (PacifiCorp 2004b, CDFW 2000, Mueller 2011). It is also unclear from the DEIR why there is such an extensive discussion of conditions upstream of the Oregon/ California border. The DEIR's unsubstantiated conclusion of an adversely impacted red trout fishery from existing operations (No Project) ascribed to the Klamath Hydroelectric Project, and suggests a conclusion-oriented bias in the DEIR' s alternatives analysis which fails to adequately inform decision-makers and the public about the actual existing conditions and potential impacts associated with the Proposed Project.

Response to Comment ORG46-395

Section 4.2.3.2 *Alternatives – No Project Alternative – Aquatic Resources – Aquatic Resource Potential Impacts, Impacts, and* Mitigation Potential Impact 4.2.3-14 (page 4-56) discuss constraints on redband trout health and productivity in the J.C. Boyle Peaking Reach and J.C. Boyle Bypass Reach under existing conditions, including risk of entrainment and mortality at Lower Klamath Project facilities as reported in NMFS (2006), along with fish stranding and displacement, reduced fry habitat, and reduced macroinvertebrate production based on analysis and reporting by Hamilton et al. (2011). It has been reported by Hamilton et al. (2011) that productivity under existing conditions is limited by the Lower Klamath Project due to reduced redband trout spawning and rearing habitat.

Please also refer to response ORG46-396.

Comment ORG46-396

With respect to the J.C. Boyle peaking reach, the DEIR states that "All of these conditions could result in substantial declines in redband trout abundance in this reach." The analysis for the No Project Alternative is limited to 0 to 5 years, and it is unclear how existing conditions would result in a substantial decline in Redband Trout abundance over this short timeframe. There is no documentation of any decline of the fishery (in fact, the opposite appears to be the case, see previous comments),and therefore the DEIR misrepresents the effects or continued operations.

Response to Comment ORG46-396

With respect to redband trout populations, Section 4.2.3.2 *Alternatives – No Project Alternative – Aquatic Resources – Aquatic Resource Potential Impacts, Impacts, and* Mitigation Potential Impact 4.2.3-14 has been revised to clarify the expected conditions under the No Project Alternative. Please refer to Volume III Attachment 1 Section 4.2.3.2 *Alternatives – No Project Alternative – Aquatic Resources – Aquatic Resource Potential Impacts, Impacts, and* Mitigation Potential Impact 4.2.3-14 for the revisions.

Comment ORG46-397

The DEIR seems to be missing a word or phrase for clarity "Under the No Project Alternative, diversion of water at continue to alter flows downstream, as occurs under existing conditions." Assume this may be "at Copco 2" between 'diversion of water' and 'continue'.

Response to Comment ORG46-397

Section 4.2.3.2 *Alternatives – No Project Alternative – Aquatic Resources – Aquatic Resource Potential Impacts, Impacts, and Mitigation* Potential Impact 4.2.3-14 has been revised to clarify the location being discussed. Please refer to Volume III Attachment 1 Section 4.2.3.2 *Alternatives – No Project Alternative – Aquatic Resources – Aquatic Resource Potential Impacts, Impacts, and Mitigation* for the revisions.

Comment ORG46-398

The DEIR states that "Reduced redband trout abundance and distribution upstream of Iron Gate Dam attributable to Lower Klamath Hydroelectric Project features and operations would continue under the No Project Alternative." The Redband Trout population would be reduced relative to what, historical conditions? As with this entire impact discussion there is no evidence presented to support this assertion. Also, analysis of the effects of the alternative should be made in comparison to baseline conditions which are those present in 2016 when the NOP was published, not some poorly defined pre-dam condition as seems to be the assertion in this discussion.

Response to Comment ORG46-398
With respect to redband trout populations, Section 4.2.3.2 *Alternatives – No Project Alternative – Aquatic Resources – Aquatic Resource Potential Impacts, Impacts, and Mitigation* – Potential Impact 4.2.3-14 has been revised to clarify the expected conditions of redband trout populations under the No Project Alternative. Please refer to Volume III Attachment 1 Section 4.2.3.2 *Alternatives – No Project Alternative – Aquatic Resources – Aquatic Resource Potential Impacts, Impacts, and Mitigation* Potential Impact 4.2.3-14 for the revisions.

Comment ORG46-399
The DEIR states that "Apparent phenotypic changes in the redband trout in these reaches would likely be maintained or continue under the No Project Alternative, such as declines in size (Jacobs et al. 2007, as cited in Hamilton et al. 2011) and condition factor (ODFW 2003, as cited in Hamilton et al. 2011)." As described in previous comments, the existing Redband Trout populations in the reach from Copco No. 1 Reservoir upstream to J.C. Boyle Darn continue to be a valuable, wild, self-sustaining resource, and support a high-quality recreational fishery (PacifiCorp 2004b; CDFW 2000; Mueller 2011). The existing Redband Trout caught in the J.C. Boyle Bypass Reach tend to be smaller than those caught in the upstream Keno Reach and the downstream J.C. Boyle Peaking Reach (PacifiCorp 2004b; Tinniswood and Smith 2003; Starcevich et al. 2006). Nonetheless, average condition factor and relative weight indicate that trout in the J.C. Boyle Bypass Reach are average to above-average in condition and plumpness relative to other populations (PacifiCorp 2007). PacifiCorp (2004b) assessed condition factor of fish in the Klamath Hydroelectric Project reaches. Gamperl et al. (2002) report that average condition factors for studied Redband Trout populations in southeastern Oregon were 1.03 to 1.10. While some seasonal variation was present, PacifiCorp (2004) found that condition factor values averaged 1.3 for Redband Trout in the J.C. Boyle Peaking Reach (and 1.2 in the J.C. Boyle Bypass Reach) during all seasons, indicating average to above average (i.e., healthy) robustness or physiological condition compared to other populations in southeastern Oregon. Similar to condition factor, Tinniswood and Smith (2003) assessed relative weight of Redband Trout in the J.C. Boyle Peaking Reach. As with condition values, the relative weight values calculated by Tinniswood and Smith (2003) indicate that Redband Trout in the peaking reach are average to above average in condition compared to other populations. The DEIR should be revised to reflect the actual status of this Redband Trout population. (see comment 3.3-39).

Response to Comment ORG46-399
Section 4.2.3.2 *Alternatives – No Project Alternative – Aquatic Resources – Aquatic Resource Potential Impacts, Impacts, and Mitigation* Potential Impact 4.2.3-14 has been clarified as requested. Please refer to Volume III Attachment 1 Section 4.2.3.2 *Alternatives – No Project Alternative – Aquatic Resources – Aquatic Resource Potential Impacts, Impacts, and Mitigation* Potential Impact 4.2.3-14 for the revisions.

In addition, please refer to response to comment ORG46-392 and ORG46-398 which address the status of the redband trout population.

Comment ORG46-400

The DEIR states, "..J.C. Boyle Reservoir provides no storage and the dam typically operates in spill mode at flows above plant capacity (i.e., approximately 6,000 cfs; Table 2-1 in USBR 201 2)." This statement is incorrect. J.C. Boyle Reservoir does provide storage, which is relied upon to support hydropower peaking operations and to reregulate flows from the upstream Keno Dam. It appears that the DEIR intended to state that Keno Dam provides no storage and operates in spill mode. There is no powerhouse at J.C. Boyle Dam, yet capacity is limited by the flow rate through the power canal to about 2,800 cfs, not the 6,000 cfs listed in the DEIR. Because J.C. Boyle Development is operated as a power peaking facility, there is often some available storage in J.C. Boyle Reservoir. On the other hand, Keno Reservoir is typically operated for agricultural supply to within a tenth of a foot, greatly limiting the available storage to approximately 250 acre-feet.

Response to Comment ORG46-400

Volume I Section 4.2.6 *Alternatives – No Project Alternative – Flood Hydrology* Potential Impact 4.2.6.2 has been revised to correct the storage capacity for J.C. Boyle Reservoir. The same revisions have been made in Volume I Section 3.6.5.2 *Flood Hydrology – Potential Impacts and Mitigation – River Floodplain* Potential Impact 3.6-4. Please refer to Volume III Attachment 1 Section 4.2.6 *Alternatives – No Project Alternative – Flood Hydrology* and Section 3.6.5.2 *Flood Hydrology – Potential Impacts and Mitigation – River Floodplain* for the revisions.

Comment ORG46-401

Total storage in J.C. Boyle, Copco, and Iron Gate reservoirs is only about 109,000 acre-feet. Even including Keno Reservoir (not part of the lower Klamath Hydroelectric Project), the 169,000 acre-feet of storage presented in the DEIR is simply not possible.

Response to Comment ORG46-401

Volume I Section 4.2.6 *Alternatives – No Project Alternative – Flood Hydrology* Potential Impact 3.6-6 has been revised to correct the total storage capacity for the Lower Klamath Project. Note that the source of the reservoir storage information in the EIR is Klamath River Renewal Corporation's (KRRC's) Definite Plan (AECOM et al. 2017), where the data have been adjusted from those reported in FERC 2007 and USBR 2012a based on available data (e.g., as-built drawings, aerial photographs, topographic information). Volumes reflect the total storage volume following dam construction. Storage volumes have decreased over time due to sediment deposition in the reservoirs. The same revisions have been made in Volume I Section 3.6.5.3 *Flood Hydrology – Potential Impacts and*

Mitigation – Risks of Dam Failure Potential Impact 3.6-6. Please refer to Volume III Attachment 1 Section 4.2.6 *Alternatives – No Project Alternative – Flood Hydrology* and Section 3.6.5.3 *Flood Hydrology – Potential Impacts and Mitigation – Risks of Dam Failure* for the revisions.

Comment ORG46-402

The DEIR states that "The dams are inspect ed regularly and the probability of failure has been found to be low." The DEIR is correct in that PacifiCorp routinely evaluates facility conditions as required by FERC and the California Division of Safety of Dams; however, PacifiCorp does not analyze the probability of failure for these facilities.

Response to Comment ORG46-402

The EIR statement in question does not indicate that PacifiCorp analyzes the probability of dam failure for the Lower Klamath Project.

Please note that Section 3.6.5.3 *Flood Hydrology – Potential Impacts and Mitigation – Risks of Dam Failure* Potential Impact 3.6-6 has been revised to clarify the discussion of risks of dam failure under existing conditions, during reservoir drawdown, and dam deconstruction; as well as the most recent (2019) Division of Safety of Dams ratings and hazard classifications for the three California dams. Please refer to Volume III Attachment 1 Section 3.6.5.3 *Flood Hydrology – Potential Impacts and Mitigation – Risks of Dam Failure* Potential Impact 3.6-6 for the revisions.

Comment ORG46-403

The DEIR states that for the Partial Removal Alternative that "...unless otherwise indicated, use the same definitions of short term and long term as described for each resource area analyzed for the Proposed Project." This approach contrasts with the No Project Alternative analysis, which addresses only short-term effects (up to 5 years). The DEIR should clarify why this approach was taken for this alternative but not the other, since the same uncertainty about the long-term conditions in the basin that the DEIR claims to affect the No Project Alternative would also seem to affect the Partial Removal Alternative. This arbitrary limitation for the No Action Alternative generates confusion and will mislead the public and decision-makers as they compare the relative effects of the alternatives or verify the determinations made by the lead agency.

Response to Comment ORG46-403

The EIR can describe short- and long-term impacts for a Partial Removal Alternative because there is sufficient information to determine what such an alternative would look like in the future without undue speculation. The EIR discloses that some of the remaining features under this alternative would likely require ongoing maintenance, including periodic repair and replacement of fencing and repainting/recoating facilities (Volume I Section 4.3.1.1 *Alternatives – Partial Removal Alternative – Introduction – Alternative Description* [pages 4-75

to 4-83]). Please also refer to response to comment ORG46-374 for a discussion of why projecting one specific No Project scenario for the long term would be speculative.

Comment ORG46-404

The discussion of impacts to aquatic resources for the Partial Removal Alternative would be the same as Proposed Project relative to resident fisheries (particularly Redband Trout, endangered suckers, and reservoir fish). Please see comments made in reference to the Proposed Project analysis of Aquatic Resources in DEIR Section 3.3.

Response to Comment ORG46-404

Please refer to Volume I Section 4.3.3.2 *Alternatives – Partial Removal Alternative – Aquatic Resources – Aquatic Resource Potential Impacts, Impacts, and Mitigation* (page 4-85) which explains that, as with the Proposed Project, reservoir drawdown associated with dam removal under the Partial Removal Alternative could directly impact aquatic species. In addition, the removal of dams and reservoirs could alter the availability and quality of habitat, resulting in direct and indirect effects on aquatic species. Although the Partial Removal Alternative would leave some Lower Klamath Project structures in place (Table 4.3-1 through Table 4.3-6), the entirety of each dam would be removed to ensure a free-flowing Klamath River and year-round volitional fish passage under all river stages and flow conditions. Under the Partial Removal Alternative, hatchery operations would continue with reduced production for eight years following dam removal, as described for the Proposed Project (Section 2.7.6 *Proposed Project – Proposed Project – Hatchery Operations*). Although there would be some decrease in construction-related activities under the Partial Removal Alternative due to some Lower Klamath Project structures remaining in place, the degree of difference would not be sufficient to significantly reduce water quality impacts identified for the Proposed Project. Therefore, the potential impacts to aquatic resources, and the potential mitigation measures, would be the same as those described for the Proposed Project (Section 3.3.5 *Aquatic Resources – Potential Impacts and Mitigation* Potential Impacts 3.3-1 through 3.3-24).

Please refer to response to PacifiCorp's comments on the aquatic resources section of the Proposed Project for information regarding any more specific concerns raised. Please see Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment ORG46-405

This section concludes with the statement "Therefore, potential impacts and beneficial effects on these resources and any associated mitigation measures under the Partial Removal Alternative would be the same as those described for the Proposed Project." Without a quantification of the number of historical resources (e.g., tribal, archaeological, and historic built environment), it is difficult to assess the relative level of impact between reasonable alternatives. While the

Partial Removal Alternative will still have a significant impact, it may be that a much smaller number of historical resources will be adversely affected by the Proposed Project. This discussion should be clarified to allow the reader to understand the magnitude of difference between the alternatives.

Response to Comment ORG46-405
Please refer to the first paragraph in Volume I Section 4.3.12 *Alternatives – Partial Removal Alternative – Historical and Tribal Cultural Resources* (pages 4-91 and 4-92), which is located just above the sentence referenced in the comment. The first paragraph specifically identifies which structures would be retained under the Partial Removal Alternative as compared to the Proposed Project, as well as describing the historic significance of these structures. Tables 4.3.1, 4.3.3 and 4.3.5 compare the partial removal and Proposed Project alternatives with regard to retention of potentially historic structures. As stated in Section 4.3.12 *Alternatives – Partial Removal Alternative – Historical and Tribal Cultural Resources* (pages 4-91 and 4-92) retaining some historic-period archaeological resources or tribal cultural resources (TCRs) under this alternative would reduce some impacts, it would not change the significance related to either historic-period archaeological resources or tribal cultural resources compared with those described for the Proposed Project because the impact will remain significant and unavoidable. This section has been revised to clarify the estimated number of TCR's that would potentially not be impacted under this alternative as compared with the Proposed Project. Please refer to Volume III Attachment 1 Section 4.3.12 *Alternatives – Partial Removal Alternative – Historical and Tribal Cultural Resources* for the revisions.

Comment ORG46-406
The DEIR states that for the Continued Operations with Fish Passage Alternative "the potential impacts for each environmental resource area are analyzed both in the short term and the long term, and unless otherwise indicated, use the same definitions of short term and long term as described for each resource area analyzed for the Proposed Project." This approach contrasts with the No Project Alternative analysis, which addresses only short-term effects (up to 5 years). The DEIR should clarify why this approach was taken for this alternative but not the other, since the same uncertainty about the long-term conditions in the basin that the DEIR claims to affect the No Project Alternative would also seem to affect the Continued Operations with Fish Passage Alternative. The confusion that this generates regarding conclusions leaves the reader unable to compare the relative effects of the alternatives or verify the determinations made by the lead agency.

Response to Comment ORG46-406
The EIR can describe short- and long-term impacts for a Continued Operations with Fish Passage Alternative because there is sufficient information to determine what such an alternative would look like in the future without undue speculation. The National Marine Fisheries Service (NMFS) has drafted

mandatory fish ladder conditions. Should the fish ladders be built, and a Federal Energy Regulatory Commission (FERC) operating license granted, it is not speculative to assume that they would persist for the long term. FERC licenses run from 30 to 50 years. Please also refer to Volume I Section 4.1.1.1 *Alternatives – Alternatives Selection/Overview – Alternatives Selection – Alternatives Carried Forward for More Detailed Analysis – Continued Operations with Fish Passage Alternative* (pages 4-3 to 4-5).

In contrast, should the Proposed Project not move forward, it is relatively certain that the existing condition – continued operation of the hydroelectric project under the current terms of annual licenses issued by FERC – would continue for the short term. However, because that condition is not feasible in the long term, it would be misleading to analyze a long-term scenario for a temporary condition that will not persist. Therefore, it is proper to refer to other alternatives for an assessment of the potential long-term consequences of the Proposed Project not being implemented. Please also refer to response to comment ORG46-374 and Volume I Section 4.2.1.1 *Alternatives – No Project Alternative – Introduction – Alternative Description* (pages 4-15 to 4-23) for discussion of the detailed reasons that analysis of long-term impacts under this alternative would be speculative.

Comment ORG46-407

The DEIR includes many references to "existing adverse conditions." The DEIR should remove the biased term "adverse" and limit discussion to changes from "existing conditions."

Response to Comment ORG46-407

In addition to meeting CEQA's requirements to identify and analyze potentially significant impacts from the proposed project, this EIR is intended to inform the State Water Board's decision with respect to potential issuance of a water quality certification for the proposed project under the federal Clean Water Act (CWA). Unlike CEQA, which is concerned primarily with new impacts as compared to baseline conditions, section 401 of the Clean Water Act authorizes issuance of a water quality certification only if the issuing authority (here, the State Water Board) finds that discharges from a facility (here, the project) will not result in violations of water quality standards. In that context, identifying and evaluating existing conditions of water quality standards is an important component of the State Water Board's consideration of the conditions that may be necessary to certify the approval of the project will not cause violations of water quality standards.

Additionally, an EIR is a public information document, and including accurate information about existing conditions enhances rather than detracts from that purpose. Use of this phrase is intended to provide appropriate and helpful context for the general reader to understand the nature of the existing condition in light of the CEQA requirement to consider the baseline condition as existing

conditions (CEQA Guidelines Section 15125(a)). Please also refer to responses to comments ORG46-376, ORG46-430, ORG46-447, ORG46-453, and ORG46-465.

Comment ORG46-408

The DEIR states "...there are three actions under the Continued Operations with Fish Passage Alternative that would potentially modify water temperatures in the Klamath River and the Lower Klamath Hydroelectric Project reservoirs relative to existing conditions in both the short term and long term: 1) increased minimum flows in the J.C. Boyle Bypass Reach and limited peaking operations at J.C. Boyle Powerhouse ; 2) increased minimum flows for the Copco No. 2 Bypass Reach ; 3) and implementation of a Reservoir Management Plan." Subsequently, the DEIR's analysis concludes "There is currently no reasonable proposal to achieve the temperature allocations in the Klamath TMDLs with the Lower Klamath Hydroelectric Project dams remaining in place, despite the modest improvements achieved to date through implementation of the Reservoir Management Plan" (DEIR pg. 4-106). There are a couple of issues with these statements:

1. The DEIR should recognize that the Reservoir Management Plan was prepared as a draft document and has not been finalized or implemented. PacifiCorp assumes the Reservoir Management Plan would receive considerable additional work if pursued in the future including considerable additional consultation needed with the State Water Board and other stakeholders. Therefore, it would be reasonable for the DEIR to assume that the final Reservoir Management Plan will incorporate reservoir operations and technologies sufficient to meet State Board approval. Such reservoir operations and technologies are described in the current draft Reservoir Management Plan but have not been fully evaluated and designed. However, studies to date and other Klamath Hydroelectric Project analogues indicate that such reservoir operations and technologies are available to be designed and implemented, and would be very effective and feasible.

2. With regard to the Klamath River TMDL, there is a robust record suggesting that the Klamath River TMOLs are technically flawed (as explained in comment 3.2-34). Because of this the TMDL does not accurately reflect existing condition s or likely results of aggressive reservoir management for temperature, dissolved oxygen, nutrient loading, or other water quality concerns.

3. In light of the known and well-documented flaws with the TMDLs and the uncertainties about the effects of the Reservoir Management Plan, the DEIR cannot accurately or definitively say that there is "no reasonable proposal to achieve the temperature allocations." The DEIR is inconsistent in how it deals with uncertain future conditions in the alternatives analysis (see comment 3.3-66) and with respect to the Proposed Project.

Response to Comment ORG46-408
As specified in Volume I Section 4.4.1.1 *Continued Operations with Fish Passage Alternative – Introduction – Alternative Description* (pages 4-99 to 4-101), the Continued Operations with Fish Passage Alternative includes the design and implementation of a Reservoir Management Plan, as described in the 2014 water quality certification application for Klamath Hydroelectric Project (KHP) operations. Volume I Section 4.4.1.1 *Continued Operations with Fish Passage Alternative – Introduction – Alternative Description* (pages 4-99 to 4-101) also specifies that no Klamath Hydroelectric Settlement Agreement (KHSA) Interim Measures (IMs) would continue under the Continued Operations with Fish Passage Alternative, but actions consistent with IMs designed for water quality improvements are analyzed in this alternative as part of the current Reservoir Management Plan.

While the comment notes that reservoir operations and technologies described in the current Reservoir Management Plan have not been fully evaluated and designed, implementation of KHSA IMs in the past several years have only produced modest improvements in water temperature (PacifiCorp 2017, 2018a) and none of the implemented KHSA IMs achieved the Klamath River Total Maximum Daily Load (TMDL) temperature allocations. The comment asserts that studies to date and other Klamath Hydroelectric Project analogues indicate reservoir operations and technologies are available to be designed and implemented to help meet the Klamath River TMDLs, but there are currently no additional proposed reservoir operations and/or technologies that have been demonstrated to achieve the Klamath River TMDL temperature allocations and the assertion that there are operations and technologies that can achieve the temperature allocations in the Klamath River TMDLs is unsupported and speculative. Any proposed operations and technologies to achieve the temperature allocations in the Klamath River TMDLs (e.g., selective withdrawal of cold water from the bottom of the reservoir) would also need to demonstrate that other Klamath River TMDL allocations and water quality objectives (e.g., dissolved oxygen) would also be met when achieving the Klamath River TMDL temperature allocations. Since the KHSA IMs implemented in the past several years have not been able to achieve Klamath River TMDL temperature allocations, it has not been demonstrated that the current Reservoir Management Plan measures could achieve Klamath River TMDL temperature allocations, and there are no additional proposed operations and/or technologies that have been shown could achieve the temperature allocations in the Klamath River TMDLs. The EIR analysis is correct to conclude that there is currently no reasonable proposal to achieve the temperature allocations in the Klamath TMDLs with the Lower Klamath Project dams remaining in place and it is not reasonable to make the unsupported and speculative assumption in the EIR analysis that a future final Reservoir Management Plan could incorporate reservoir operations and technologies to achieve Klamath River TMDL temperature allocations along with the other Klamath River TMDL allocations and water quality objectives (e.g., dissolved oxygen).

Volume I Potential Impact 4.2.2-1 (pages 4-103 to 4-108) has been revised to clarify that the modest improvements in water temperature have been exhibited through implementation of KHSA IMs that could be incorporated into the final Reservoir Management Plan, rather than through implementation of the Reservoir Management Plan. Please refer to Volume III Attachment 1 Section 4.4.2.1 *Continued Operations with Fish Passage Alternative – Water Quality – Water Temperature* Potential Impact 4.2.2-1 for the revisions.

As summarized in North Coast Regional Board (2010) Table 5.1 (pages 5-1 to 5-2), the Klamath River TMDLs water temperature numeric target is the estimated natural water temperature at the reservoir tailrace – expressed as monthly average water temperature, with the allocation limited to the water temperature increase expected to naturally occur in the river reach occupied by the reservoirs. As such, the Klamath River TMDL numeric target and allocation for water temperature can be evaluated using Klamath River TMDL model or any other model that estimates water temperature downstream of the reservoirs under existing conditions and under dam removal conditions (i.e., quantifying the temperature increase expected to naturally occur in the river reach occupied by the reservoirs). PacifiCorp (2014) Figure 5.2-21 does not present a direct comparison of Klamath River water temperatures downstream of Iron Gate Dam under existing conditions with the dams in place against a hypothetical without-Project conditions involving the removal of J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate dam and powerhouse developments. However, the "California Temperature Objective" (hereafter referred to as "Objective") water temperature shown in PacifiCorp (2014) Figure 5.2-21 is the hypothetical without-Project conditions shifted up by 2.8^{o}C. A comparison of the PacifiCorp (2014) Figure 5.2-21 Klamath River water temperatures downstream of Iron Gate Dam under existing conditions with the "Objective" water temperatures shifted down by 2.8^{o}C would demonstrate the influence of Iron Gate Dam on downstream water temperature as the shifted "Objective" water temperatures represent the estimated water temperature without the Project facilities (i.e., dam removal) water temperature. Higher 7-day average of maximum daily temperatures under existing conditions than under the shifted "Objective" water temperature demonstrate that releases from Iron Gate Dam increase the temperature in the Klamath River downstream of Iron Gate Dam and that water temperature in this reach would not meet the TMDL water temperature allocation.

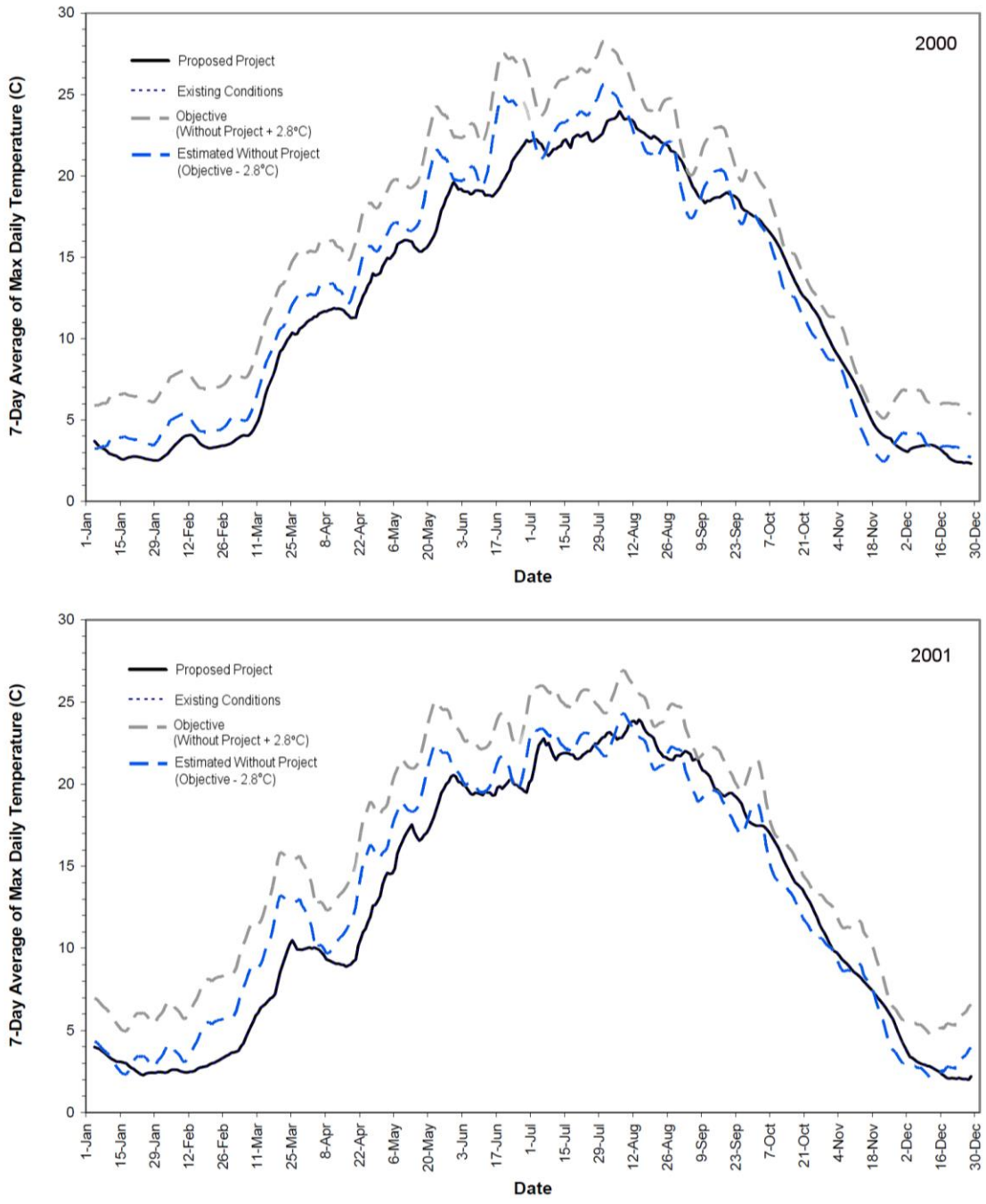


Figure ORG46-408-1 modified Figure 5.2-21 from PacifiCorp (2014). Time-Series of the 7-Day Average of Maximum Water Temperature (°C) for the Year 2000 (Top Plot) and 2001 (Bottom Plot) in the Klamath River downstream of Iron Gate Dam, Compared to the "California Temperature Objective" (i.e., No More Than 5°F [2.8°C] Increase Above Hypothetical Without-Project Water Temperatures [Based on Model Simulations]) (grey upper dashed line) and the Estimated Without Project (i.e., "California Temperature Objective" Shifted 2.8°C Down) (blue lower dashed line).

As shown in Figure ORG46-408-1 above, the 7-day average of the maximum daily Klamath River Water Quality Model (KRWQM)-modeled Klamath River water temperatures downstream of Iron Gate Dam under existing conditions and the "Objective" water temperatures shifted down by 2.8°C (i.e., blue lower dashed line) are not identical, with water temperature under existing conditions higher or lower than the shifted "Objective" water temperatures depending on the time of year. Thus, PacifiCorp's KRWQM (2014) water temperature results indicate that there is an increase above the water temperature expected to naturally occur in the river reach occupied by the reservoirs, so Iron Gate Dam does not meet the TMDL water temperature allocation. While PacifiCorp's KRWQM (2014) water temperature model results may not incorporate "aggressive reservoir management" for water temperature, current implementation KHSA IMs or actions identified in the current Reservoir Management Plan have not been shown to sufficiently achieve the temperature allocations in the Klamath TMDLs with the Lower Klamath Project dams remaining in place (PacifiCorp 2017, 2018a) and the assertion that there are other aggressive reservoir management operations or technologies that would achieve the temperature allocations in the Klamath River TMDLs is unsupported and speculative, as previously discussed. Thus, there is currently no reasonable proposal to achieve the temperature allocations in the Klamath TMDLs with the Lower Klamath Project dams remaining in place.

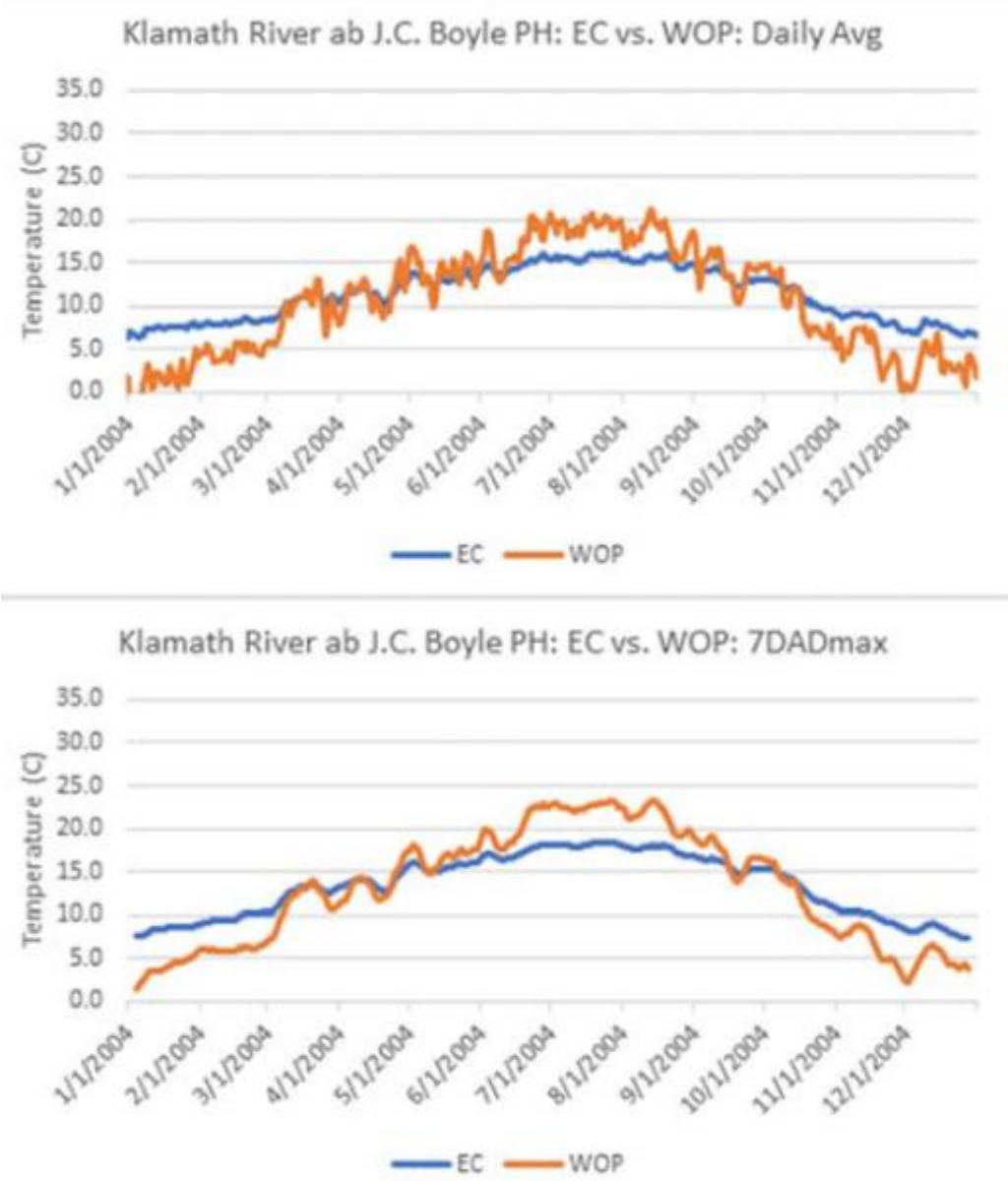
For additional discussion of the Klamath River TMDLs, please refer to Master Response WQ-5.

Comment ORG46-408.1

The DEIR inconsistently discusses the magnitude of the water temperature change in the J.C. Boyle Bypass Reach across alternatives, and the detail and accuracy of the discussions are inconsistent. Currently, the DEIR implies that thermal refugia benefits would be relatively equal for each alternative. This is not the case. Modeling results show substantive differences in water temperature in the J.C. Boyle Bypass Reach between the No Project and Proposed Project alternatives. These differences are evident in modeling performed for the Existing Conditions scenario (that includes the Klamath Hydroelectric Project) and a Without-Project (WOP) scenario (that assumes the Klamath Hydroelectric Project is absent). Results from this modeling are shown in the figure below and fairly represent the No Project and Proposed Project alternatives as assumed in the DEIR.

As can be seen in the modeling results, water temperature under the Existing Condition scenario (which is representative of the DEIR's No Project Alternative) would be on average much cooler than the WOP scenario (which is representative of the DEIR's Proposed Project) in most months (middle panel in figure). Water temperature under the Existing Condition scenario (which is representative of the DEIR's No Project) also would have lower daily temperature variability (top panel), and would have cooler 7DADMax values (bottom panel).

Under Existing Conditions (which is representative of the DEIR's No Project Alternative), the J.C. Boyle Bypass Reach would continue to provide over 4 miles of thermal refugia for both juvenile and adult fish. According to the DEIR, thermal refugia under the Proposed Project would be located only around the areas where springs actually enter the channel in the upstream end of the reach. Additionally, under Existing Conditions, water temperatures would continue to be more protective for USEPA 7DADMax temperature criteria for salmon/trout core juvenile rearing, egg incubation, Steelhead smoltification, and adult holding. Therefore, the J.C. Boyle bypass reach will be important as a thermal refuge for maintaining anadromous fish production in the basin given the expected effects of climate change and uncertainty of achieving TMDLs. The DEIR needs to standardize the discussion of water temperature outcomes for each alternative and make those evaluations in comparison to standards and thresholds presented in USEPA (2003) and Carter (2008).
Modeling Results Figure



Response to Comment ORG46-408.1

The discussion of J.C. Boyle Bypass Reach water temperature conditions in Volume I Section 4.4.2.1 *Continued Operations with Fish Passage Alternative – Water Quality – Water Temperature* (pages 4-102 to 4-108), and specifically the discussion on page 4-103 referenced by the comment, are about water temperature under the Continued Operations with Fish Passage Alternative and they should not be confused with a discussion of water temperature under the No Project Alternative since the J.C. Boyle Dam and Powerhouse operations under these two alternatives are different. As summarized in Volume I Section 4.2.1.1 *No Project Alternative – Introduction – Alternative Description* (pages 4-15 to 4-23), J.C. Boyle Dam peaking operations and flow in the J.C. Boyle Bypass Reach under the No Project Alternative would be the same as existing conditions. As summarized in Volume I Section 4.4.1.1 *Continued Operations with Fish*

Passage Alternative – Introduction – Alternative Description (pages 4-99 to 4-101), at least 40 percent of J.C. Boyle Reservoir inflow would be released downstream through the J.C. Boyle Bypass Reach to increase minimum flows in the this reach under the Continued Operations with Fish Passage Alternative. Additionally, the generation of peaking power at the J.C. Boyle Power Plant under the Continued Operations with Fish Passage Alternative would be limited to one day per week, as water supplies allow, with the weekly peaking power flows also being used for recreation (i.e., whitewater boating) flows. Power generation would be suspended and all inflow to J.C. Boyle Reservoir would be released down the J.C. Boyle Bypass Reach under a seasonal high flow event that would occur for seven full days in later winter/spring when inflows to J.C. Boyle first exceed 3,300 cubic feet per second (cfs) (DOI 2007; NMFS 2007b; FERC 2007). The flow and peaking operations in the J.C. Boyle Bypass and Peaking Reach are sufficiently different between the No Project Alternative and the Continued Operations with Fish Passage Alternative that water temperature modeling of conditions under No Project Alternative would not be representative of conditions under the Continued Operations with Fish Passage Alternative.

Water temperature in the J.C. Boyle Bypass Reach was not specifically discussed in Volume I Section 4.2.2.1 *Continued Operations with Fish Passage Alternative – Water Quality – Water Temperature* Potential Impact 4.2.2-1 – *Hydroelectric Reach* (pages 4-103 to 4-106) since the water temperature at the Oregon-California state line would represent the net influence of the Lower Klamath Project and J.C. Boyle hydropower peaking operations on water temperature in California and conditions upstream of the Oregon-California state line (river mile [RM] 214.1) were only considered in the EIR analysis to the extent that they influence water temperature downstream in California. Please see Volume III Attachment 1 Section 3.2.1 *Water Quality – Area of Analysis* for a summary of the water quality Area of Analysis under the Proposed Project and Volume I Section 4.4.1.2 *Continued Operations with Fish Passage Alternative – Introduction – Alternatives Analysis Approach* (page 4-101) for an explanation that the Area of Analysis under the Continued Operations with Fish Passage Alternative is the same as under the Proposed Project, unless otherwise indicated. Please refer to Volume I Section 4.4.3.3 *Continued Operations with Fish Passage Alternative – Aquatic Resources – Water Quality* (pages 4-126 to 4-128) for a discussion of the water temperature in the J.C. Boyle Bypass Reach under Continued Operations with Fish Passage Alternative since the aquatic resources Area of Analysis extends upstream of the Oregon-California state line due to the potential for aquatic resources in California to utilize upstream habitats like those found in the J.C. Boyle Bypass Reach.

While the water temperature at the Oregon-California state line would represent the net influence of the Lower Klamath Project and J.C. Boyle hydropower peaking operations on water temperature in California, Potential Impact 4.2.2-1 – *Hydroelectric Reach* (Volume I Section 4.2.2.1 *Continued Operations with Fish Passage Alternative – Water Quality – Water Temperature*) has been revised to

clarify potential changes in water temperature upstream of the Oregon-California state line (RM 214.1) in the J.C. Boyle Bypass Reach and the upper portion of the J.C. Boyle Peaking Reach along with the potential changes in water temperature downstream of the Oregon-California state line in the lower portion of the J.C. Boyle Peaking Reach. Potential Impact 4.2.2-1 – *Hydroelectric Reach* also has been modified to clarify the discussion of J.C. Boyle Bypass Reach water temperature. Please refer to Volume III Attachment 1 Section 4.2.2.1 *Continued Operations with Fish Passage Alternative – Water Quality – Water Temperature* for the revisions.

Additional analysis of the water temperature in this reach with respect to aquatic resources under the Continued Operations with Fish Passage Alternative is discussed in Volume I Section 4.4.3.3 *Continued Operations with Fish Passage Alternative – Aquatic Resources – Water Quality* (pages 4-126 to 4-128).

Comment ORG46-409

The DEIR states "Results from testing of a powerhouse intake barrier/ thermal curtain in Iron Gate Reservoir under Interim Measure 11 indicate that modest water temperature improvement is possible using this technique." Previously, on page 3-23, the DEIR states "Results from the intake barrier/thermal curtain indicate that modest 1-2°C (1.8–3.6°F) water temperature improvement is possible (PacifiCorp 2017b)." The DEIR should define the term "modest" in this context, as an improvement of up to 2°C is significant when considered relative to water temperature objectives and aquatic biota preferences.

Response to Comment ORG46-409

The comment misquotes Volume I Section 4.4.2.1 *[Continued Operations with Fish Passage] Water Temperature* (page 4-102 to 4-108), selectively truncating the sentence quoted to exclude the final part of the sentence explaining that the results of the testing of a powerhouse intake barrier/thermal curtain are discussed below.

Section 4.4.2.1 *[Continued Operations with Fish Passage] Water Temperature* has been modified to clarify the magnitude of modest water temperature improvements from the powerhouse intake barrier/thermal curtain by incorporating details from Section 3.2.2.2 *Water Quality – Environmental Setting – Water Temperature* comparing the magnitude of the water temperature improvement from the intake barrier/thermal curtain relative to compliance with the Thermal Plan and the Klamath River Total Maximum Daily Load (TMDL) temperature requirements in the Middle Klamath River. Please refer to Volume III Attachment 1 Section 4.4.2.1 *[Continued Operations with Fish Passage] Water Temperature* for the revisions.

Comment ORG46-410

The DEIR states that "Areas adjacent to the coldwater springs in the Bypass Reach would continue to serve as thermal refugia for aquatic species because

the springs themselves would not be affected by the Continued Operations with Fish Passage Alternative." While thermal refugia would remain, the size and temperature condition in this refugia would be altered. The DEIR does not state any thermal refugia criterion, but if minimum flows downstream of J.C. Boyle Dam are increased, water temperatures in the bypass would increase several degrees Celsius (see comment 4.4-4). The DEIR should state quantitative values for temperature and assess the potential impact in relation to those values taking into account how dilution can affect the refugia.

Response to Comment ORG46-410

Section 3.3.5.4 *Aquatic Resources – Potential Impacts and Mitigation – Water Temperature* provides a discussion of the occurrence of cold-water tributaries and springs that act as thermal refugia when temperatures reach levels stressful to salmonids. Please see Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*. Please refer to Volume I Section 4.4.3.3 *Continued Operations with Fish Passage Alternative – Aquatic Resources – Water Quality* (pages 4-126 to 4-128) for a discussion of water temperature in the J.C. Boyle Bypass Reach under Continued Operations with Fish Passage Alternative.

Data and/or model results are not currently available to quantify changes in the area of thermal refugia under the Continued Operations with Fish Passage Alternative compared to existing conditions. While it can be qualitatively estimated that the area of thermal refugia would decrease as more warm water from J.C. Boyle Reservoir flows down the J.C. Boyle Bypass Reach and mixes with the colder flow from the groundwater springs, vertical or lateral water temperature variations that would determine the area of thermal refugia cannot be quantified since available water temperature modeling provides only spatially averaged water temperature at locations in the Klamath River.

Please refer to response to comment ORG46-408.1 for a discussion of revisions that have been made to Volume I Potential Impact 4.2.2-1 – *Hydroelectric Reach* (pages 4-103 to 4-106) to clarify the anticipated response of the area of thermal refugia area to changes in flow, as well as the limitations of available data and modeling to estimate changes in the area of thermal refugia, under the Continued Operations with Fish Passage Alternative compared to existing conditions.

Comment ORG46-411

The DEIR states "In the remainder of the Hydroelectric Reach (i.e., Copco No. 1 and Iron Gate reservoirs) water temperatures would be the same as those described under the existing condition (see Section 3.2.2.2 Water Temperature), where spring, summer, and fall water temperatures would continue to be influenced by the thermal mass of Copco No. 1 and Iron Gate reservoirs, and the seasonal stratification patterns of the two reservoirs." The DEIR further states "Of the seven water quality improvement actions described in the Reservoir Management Plan, selective withdrawal and intake control is most focused on water temperature improvements. With respect to this approach, PacifiCorp has

estimated that the maximum useable cool water volume in Copco No. 1 Reservoir in summer (approximately 3,100 acre-feet at less than 14°C and 4,800 acre-feet at less than 16°C (PacifiCorp 2014b), which if selectively withdrawn from the reservoirs, would decrease water temperatures immediately downstream of Copco No. 1." This statement is incorrect for Copco 1 Reservoir as discussed in this alternative. Because there would be a change in Klamath River inflow temperature under this alternative, the thermal stratification in Copco 1 Reservoir would be different than in the cited source material. Currently, Copco 1 Reservoir receives a wide range of inflow temperatures over the course of a 24-hour period. The cold inflows that traverse the reach overnight are largely made up of spring inflow and warmer inflows are associated with daytime peaking. Each flow has a unique density with colder flows being denser than warmer flows. The DEIR does not evaluate the change in thermal structure of Copco 1 Reservoir or the potential associated impact on thermal stratification, time of turnover, primary production, outflow temperatures, or other water quality conditions. This dynamic is likely to have a notable effect on the coldwater pool estimates for release to the Klamath River downstream of Copco 1 Dam.

Response to Comment ORG46-411

In PacifiCorp (2004a-1), the Klamath River Water Quality Model (KRWQM) was used to model existing conditions, Steady Flow conditions (i.e., no peaking flows) with the dams remaining in place, and without-Project conditions that included the removal of Keno Dam in addition to removal of J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate dams. Steady Flow conditions model results provide an estimate of water temperature changes under the Continued Operations With Fish Passage Alternative as these results highlight how eliminating peaking operations would alter Klamath River water temperatures in the Hydroelectric Reach. While modeled Steady Flow conditions are not identical to the flow conditions under the Continued Operations With Fish Passage Alternative (e.g., under the Continued Operations With Fish Passage Alternative peaking flows would occur once a week, as water supplies allow), a comparison of water temperatures under Steady Flow conditions with the water temperature under existing conditions would characterize the general variations and trends in water temperature under Continued Operations With Fish Passage Alternative. Water temperature would be more similar to existing conditions than Steady Flow conditions during the limited time periods when steady flow is not maintained (e.g., peaking flows). Water temperatures in the J.C. Boyle Bypass and Peaking reaches under Continued Operations With Fish Passage Alternative would also likely be slightly warmer than water temperature under Steady Flow conditions since the Continued Operations With Fish Passage Alternative includes a provision to have 40 percent of the inflow to J.C. Boyle Reservoir flow through the J.C. Boyle Bypass Reach, while the Steady Flow conditions modeling does not direct any more water down the J.C. Boyle Bypass Reach.

As detailed in PacifiCorp (2004a-1) Figures 4.8-33 and 4.8-34 and reproduced below, diel water temperature variations in the J.C. Boyle Peaking Reach under

Steady Flow conditions are less than under existing conditions with the influence of peaking operations diminishing downstream of the J.C. Boyle Powerhouse. Diel water temperature variations in the J.C. Boyle Peaking Reach are consistently less, the maximum water temperatures are lower, and the minimum water temperatures are higher. Upstream of Copco No. 1 Reservoir, water temperature differences between Steady Flow models and existing conditions are less consistent, as the influence of peaking on water temperature diminishes. In the first week of July 2000 upstream of Copco No. 1 Reservoir, the maximum water temperature was typically approximately 2°C or less under Steady Flow conditions, but the minimum water temperature ranged from approximately 1°C colder to approximately 1°C warmer under Steady Flow conditions compared to existing conditions. In the first week of July 2001 upstream of Copco No. 1 Reservoir, the maximum water temperature was typically greater (1°C or less) under Steady Flow than under existing conditions, but the minimum water temperature was consistently 2 to 3°C less under Steady Flow than under existing conditions. Maximum and minimum water temperatures would be likely to increase slightly under the Continued Operations With Fish Passage Alternative compared to those modeled under Steady Flow conditions due to more flow in the J.C. Boyle Bypass Reach under this alternative. Overall, the water temperature results of the PacifiCorp (2004a-1) KRWQM upstream of Copco No. 1 Reservoir indicate that ceasing peaking operations (i.e., Steady Flow conditions) would produce more natural diel water temperature variations in the Klamath River than under existing conditions, but this would potentially result in maximum and minimum water temperatures entering Copco No. 1 Reservoir increasing or decreasing by approximately 2°C or less depending on the local meteorological conditions.

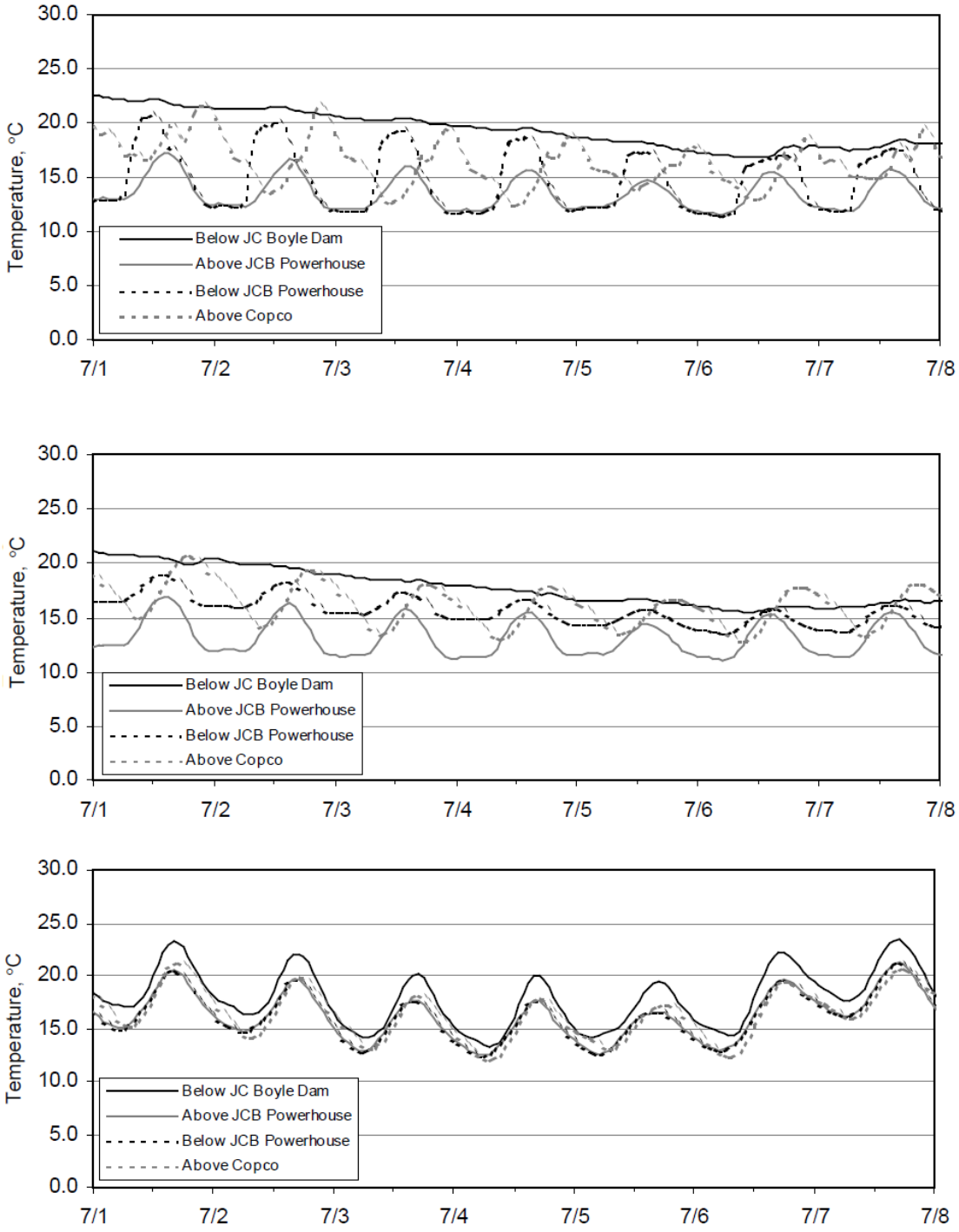


Figure 4.8-33 from PacifiCorp (2004a-1). J.C. Boyle Bypass and Peaking Reach Water Temperature, 2000: EC [Existing Conditions] (Top), SF [Steady Flow] (Middle), and WOP [Without-Project] (Bottom). Note: Without-Project (WOP) Conditions Modeled in PacifiCorp (2004a-1) Include the Removal of Keno, J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate Dams.

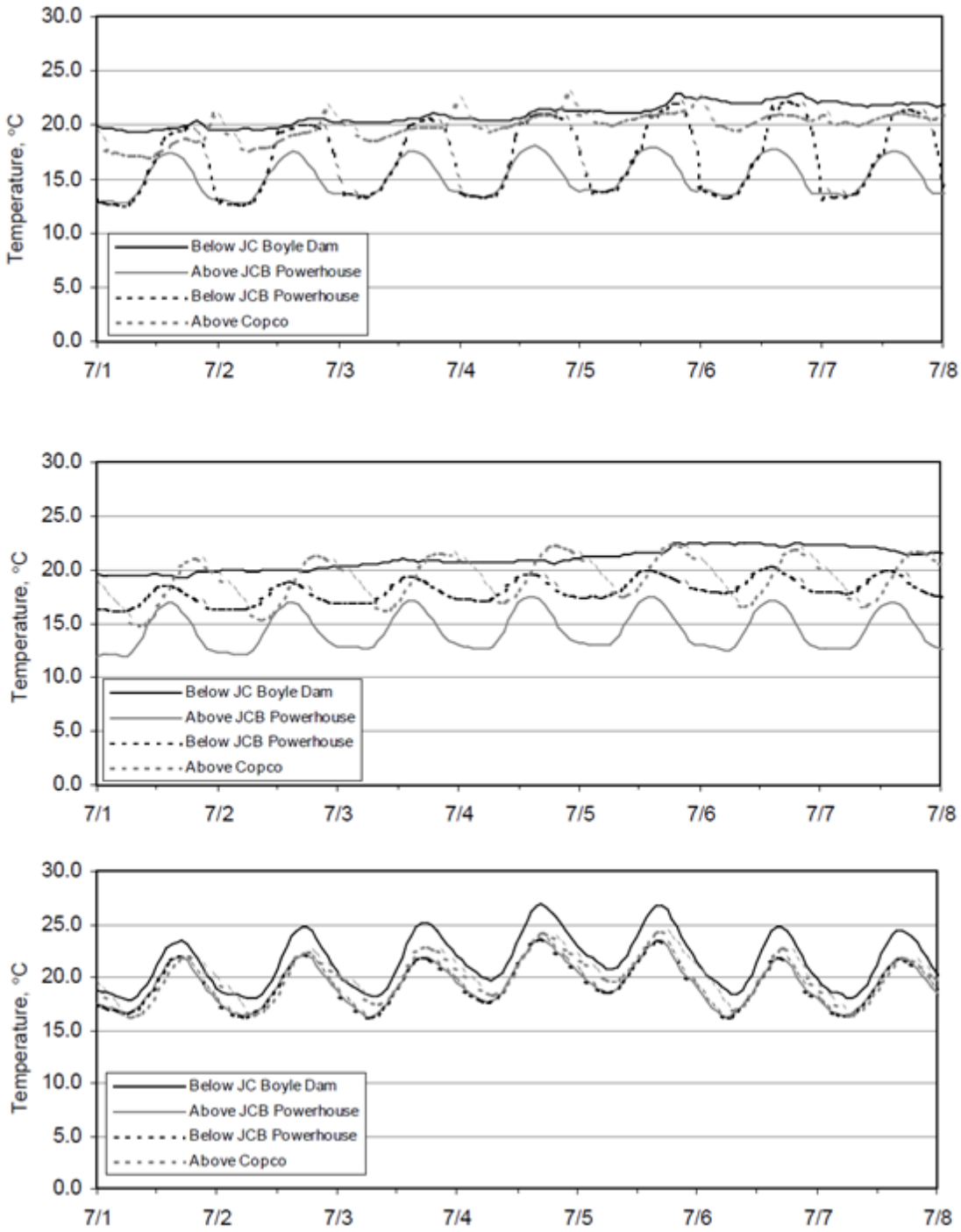


Figure 4.8-34 from PacifiCorp (2004a-1). J.C. Boyle Bypass and Peaking Reach Water Temperature, 2001: EC [Existing Conditions] (Top), SF [Steady Flow] (Middle), and WOP [Without-Project] (Bottom). Note: Without-Project (WOP) Conditions Modeled in PacifiCorp (2004a-1) Include the Removal of Keno, J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate Dams.

As detailed in PacifiCorp (2004a-1) Figure 4.8-38 and reproduced below, water temperatures under Steady Flow conditions and existing conditions upstream of Copco No. 1 Reservoir are generally similar on a daily average basis (Figure 4.8-38), with an approximately 2°C or less difference between the Steady Flow (SF) and existing conditions (EC) water temperature (i.e., "SF – EC"). The magnitude of the difference between the water temperature under Steady Flow and existing conditions varies between years. In 2000, the difference between Steady Flow and existing conditions water temperature is typically less than 1°C without a consistent bias (i.e., cooler or warmer). In 2001, the water temperature under Steady Flow conditions tended to be warmer than existing conditions during fall and winter (i.e., November to March) and cooler than existing conditions during summer and early fall (i.e., July to October). The increased flow in the J.C. Boyle Bypass Reach under the Continued Operations With Fish Passage Alternative compared to Steady Flow conditions would likely shift the actual magnitude of the difference between the water temperature under this alternative and existing conditions closer to those calculated for the "WOP-EC" ("without Project" minus existing conditions) in PacifiCorp (2004a-1) Figure 4.8-38 below. Please note that "without Project" conditions in PacifiCorp (2004a-1) involve the removal of Keno, J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate dams. The magnitude of the difference between the water temperature under the Continued Operations With Fish Passage Alternative and existing conditions potentially would be shifted slightly warmer, but the general trends would be similar to those calculated between Steady Flow and existing conditions.

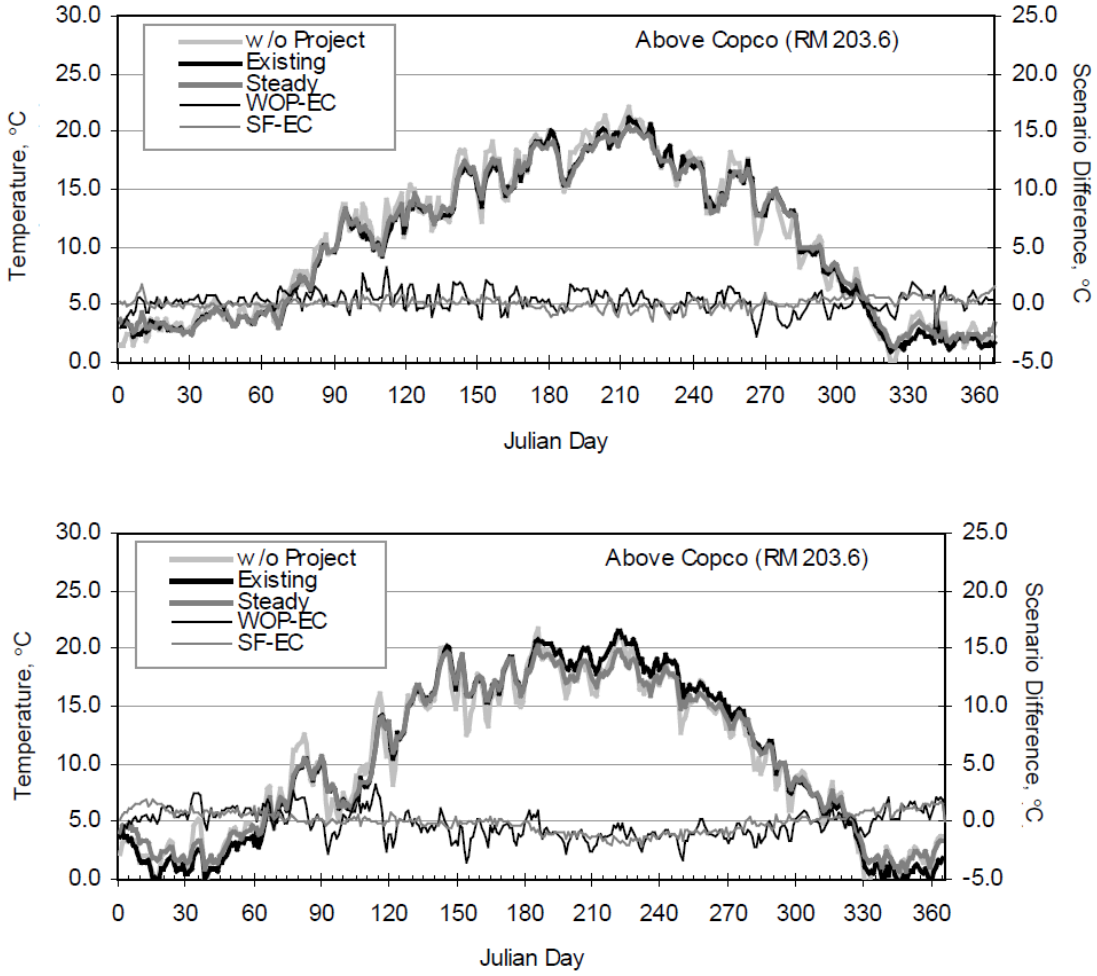


Figure 4.8-38 from PacifiCorp (2004a-1). EC [Existing Conditions] Versus SF [Steady Flow] and WOP [Without Project] Mean Daily Water Temperature in the J.C. Boyle Peaking Reach Above Copco No. 1 Reservoir for 2000 (top) and 2001 (bottom). Note: Without Project (WOP) Conditions Modeled in PacifiCorp (2004a-1) Include the Removal of Keno, J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate Dams.

As detailed in PacifiCorp (2004a-1) Figure 4.8-49 and reproduced below, the water temperature at Copco No. 1 Dam under Steady Flow conditions generally would be similar to conditions under existing conditions, but the water temperature in summer and early fall (i.e., approximately July to October) would be approximately 1°C or less under Steady Flow conditions than under existing conditions and the water temperature in late fall to winter (i.e., December to March) would be less than 1°C under Steady Flow than under existing conditions. Additionally, KRWQM results in PacifiCorp (2004a-1) Section 4.8.6.2 *Temperature* Table 4.8-1 (Water Resources FTR page 4-62) indicate that the onset of stratification date, the fall turnover date, the duration of stratification, the maximum water temperature difference, and the minimum hypolimnetic (i.e.,

bottom) water temperature in Copco No. 1 Reservoir would be the same under Steady Flow and existing conditions. PacifiCorp (2004a-1) KRWQM results indicated that the date of maximum stratification would potentially occur earlier during some years (e.g., 10 days in 2001) under Steady Flow than under existing conditions. Potential water temperature increases under the Continued Operations With Fish Passage Alternative conditions compared to the Steady Flow conditions would not be expected to alter this since general trends in the magnitude of the change in water temperature entering Copco No. 1 Reservoir under Steady Flow conditions compared to existing conditions, and under the without Project (i.e., w/o Project or WOP) compared to existing conditions, were similar.

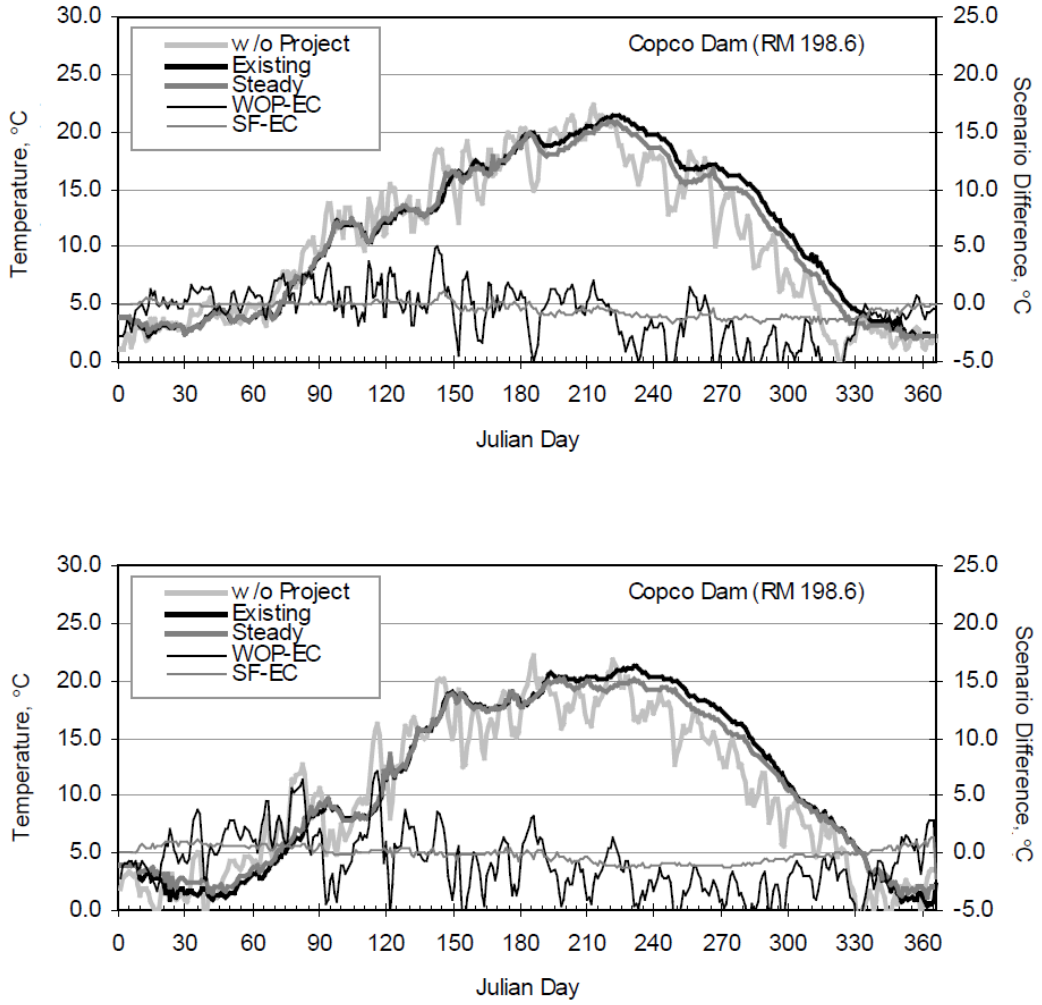


Figure 4.8-49 from PacifiCorp (2004a-1). EC [Existing Conditions] Versus SF [Steady Flow] and WOP [Without Project] Mean Daily Water Temperature Below Copco No. 1 Dam for 2000 (Top) and 2001 (Bottom). Note: Without Project (WOP) Conditions Modeled in PacifiCorp (2004a-1) Include the Removal of Keno, J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate Dams.

Overall, the PacifiCorp (2004a-1) KRWQM results indicate that the water temperature upstream and downstream of Copco No. 1 Reservoir, along with the thermal structure of Copco No. 1 Reservoir, would be generally similar under Steady Flow conditions and existing conditions, but there potentially would be approximately 2°C or less differences in the water temperature during some periods. Water temperature in the J.C. Boyle Peaking Reach and Copco No. 1 Reservoir under the Continued Operations With Fish Passage Alternative typically would be similar to or slightly warmer than water temperature under Steady Flow conditions since peaking operations are typically eliminated and more flow would occur through the J.C. Boyle Bypass Reach under this alternative's conditions, but the limited peaking operations under the Continued Operations With Fish Passage Alternative (i.e., one day per week, as water supplies allow) would result in water temperature being more similar to PacifiCorp (2004a-1) KRWQM existing conditions results than Steady Flow conditions during peaking operations. The thermal structure of Copco No. 1 Reservoir was similar for PacifiCorp (2004a-1) KRWQM Steady Flow and existing conditions, so the overall thermal structure of Copco No. 1 Reservoir would be expected to be similar under the Continued Operations With Fish Passage Alternative and the existing conditions. The specific usable cool water volume in Copco No. 1 Reservoir in summer would potentially vary compared to existing conditions due to the changes in Klamath River water temperature upstream of Copco No. 1 Reservoir, but the total volume would likely remain similar or potentially slightly increase compared to existing conditions based on PacifiCorp (2004a-1) KRWQM results under Steady Flow conditions that show either a range of minimum water temperatures from approximately 1°C colder to approximately 1°C warmer or consistently cooler minimum water temperatures.

Section 4.4.2.1 *Continued Operations With Fish Passage Alternative – Water Quality – Water Temperature* Potential Impact 4.2.2-1 has been revised according to the above discussion. Please refer to Volume III Attachment 1 Section 4.4.2.1 *Continued Operations With Fish Passage Alternative – Water Quality – Water Temperature* Potential Impact 4.2.2-1 for the revisions.

Comment ORG46-412

The DEIR states "As for the J.C. Boyle Peaking Reach, elimination of any artificial temperature signal in the Copco No. 2 Bypass Reach under existing conditions would better conform with the California." This statement is unclear and appears to be missing words.

Response to Comment ORG46-412

Please refer the next page of the Volume 1 Section 4.4.2.1 *Alternatives – Continued Operations with Fish Passage Alternative – Water Quality – Water Temperature* (page 4-105) for the rest of the sentence. The entire sentence is: "As for the J.C. Boyle Peaking Reach, elimination of any artificial temperature signal in the Copco No. 2 Bypass Reach under existing conditions would better

conform with the California Thermal Plan's prohibition on elevated temperature discharges (Table 3.2-4) and would be beneficial."

Comment ORG46-413

The DEIR states "The anticipated increases in water temperatures due to climate change would occur over a timescale of decades and would act in opposition to improvements expected from actions taken in furtherance of TMDL implementation throughout the Upper Klamath Basin, such as increased riparian shading and decreased diversion from cold springs (ODEQ 2010)." The DEIR should clarify how "increased riparian shading and decreased diversion from cold springs" in Oregon in the Upper Klamath Basin apply to the Klamath Hydroelectric Project area in California and include temperatures downstream of Iron Gate Dam. Additionally, the DEIR should recognize that the ODEQ (2010) temperature TMDL was withdrawn and is currently being revised by ODEQ, so this policy may not be an appropriate source for predicting future upstream water quality.

Response to Comment ORG46-413

An increase in riparian shading would reduce the amount of solar radiation heating the Klamath River and its tributaries, while a decrease in the diversions from cold springs would increase the thermal mass of cool water in the Klamath River and its tributaries. Both of these processes in the Upper Klamath Basin would potentially influence the water temperature in the Klamath River at the Oregon-California state line since they would alter the heat exchange processes that control water temperature in the Klamath River. The reference to the Upper Klamath and Lost Subbasins Temperature Total Maximum Daily Load (TMDL) has been updated to reflect the final TMDL (ODEQ 2019).

Volume I Section 4.4.2.1 *Continued Operations with Fish Passage – Water Quality – Water Temperature* Potential Impact 4.2.2-1 (pages 4-103 to 4-108) has been revised to clarify the location where upstream changes would potentially alter water temperature in the California portion of the Klamath River and to include references to pollutant management strategies for water temperature included in the final TMDL (ODEQ 2019). Please refer to Volume III Attachment 1 Section 4.4.2.1 *Continued Operations with Fish Passage – Water Quality – Water Temperature* for the revisions.

Comment ORG46-414

The DEIR states "While full implementation of the Klamath TMDLs is anticipated to result in late summer/fall reductions in water temperature in the range of 2–10°C immediately downstream from Iron Gate Dam (North Coast Regional Board 2010)." This statement is misleading. In the table below are the monthly average water temperature targets downstream of Iron Gate Dam from the Klamath River TMDL (North Coast Regional Board 2010, Table 5-4 pg. 5-18). None of these targets are 10°C lower than existing conditions (from year 2000 TMDL simulation).

Table 5.4: Temperature numeric targets for Iron Gate and Copco Reservoir tailrace waters

	May	June	July	August	September	October
Copco 1&2	14.8 °C 58.7 °F	18.5 °C 65.3 °F	19.7 °C 67.5 °F	19.3 °C 66.8 °F	15.4 °C 59.7 °F	10.5 °C 50.9 °F
Iron Gate	15.1 °C 59.1 °F	18.7 °C 65.6 °F	19.9 °C 67.9 °F	19.5 °C 67.1 °F	15.5 °C 60 °F	10.6 °C 51 °F
	November	**December**	**January**	**February**	**March**	**April**
Copco 1&2	3.5 °C 38.3 °F	2.2 °C 35.9 °F	2.9 °C 37.3 °F	5.9 °C 42.7 °F	9.4 °C 48.9 °F	11.7 °C 53 °F
Iron Gate	3.4 °C 38.2 °F	2.1 °C 35.8 °F	2.9 °C 37.2 °F	5.9 °C 42.6 °F	9.4 °C 48.9 °F	11.5 °C 52.7 °F

The DEIR states "...there is currently no reasonable proposal to achieve the temperature allocations in the Klamath TMDLs with the Lower Klamath Project dams remaining in place." However, as PacifiCorp has previously noted the temperature allocations in the Klamath TMDLs are questionable because of the error in heat budget assumption in the riverine section of the TMDL models. Should the shortcomings of the Klamath TMDL be addressed and an accurate temperature load allocation for Iron Gate Reservoir be determined, PacifiCorp is confident that a revised detailed Reservoir Management Plan would be developed to achieve the TMDL target.

Response to Comment ORG46-414

The quoted language is not referring to monthly average water temperatures, which are the focus of the table referenced in the comment.

Volume I Section 4.4.2.1 *Continued Operations with Fish Passage – Water Quality – Water Temperature* (page 4-102) has been revised to clarify that multiple studies have quantified the thermal lag caused by the reservoirs immediately downstream of Iron Gate Dam and that the Klamath River water temperature Total Maximum Daily Load (TMDL) allocates a zero water temperature increase above natural water temperatures for Copco No. 1 and Iron Gate reservoirs. Please refer to Volume III Attachment 1 Section 4.4.2.1 *Continued Operations with Fish Passage – Water Quality – Water Temperature* for the revisions.

Volume I Section 4.4.2.1 *Continued Operations with Fish Passage – Water Quality – Water Temperature* Potential Impact 4.2.2-1 (page 4-105) has been revised to clarify that numerous studies have identified the thermal lag created by the reservoirs during summer/fall, which is the reason for citing the 2 to 10°C water temperature range downstream of Iron Gate Dam. Please refer to Volume III Attachment 1 Section 4.4.2.1 *Continued Operations with Fish Passage – Water Quality – Water Temperature* for the revisions.

Please also refer to Master Response WQ-5 for discussion of the appropriateness of using the Klamath River TMDLs and the Klamath River TMDL model results in the analysis, and response to comment ORG46-408 for discussion of the potential for reservoir operations and technologies to achieve the temperature allocations in the Klamath TMDLs.

Comment ORG46-415

The DEIR states "One of the purposes of the curtain is to isolate warmer, less dense near-surface waters while withdrawing cooler, denser, and deeper waters from the reservoir for release to the Klamath River downstream (PacifiCorp 2018c). The other purpose is to isolate surface waters that have high concentrations of blue-green algae (cyanobacteria) such that extensive summer and fall blooms are not readily released downstream to the Middle and Lower Klamath River (see further discussion in Potential Impact 4.2.2-4)." The DEIR should clarify that the principal purpose of the curtain is to isolate surface waters with blue-green algae (cyanobacteria) and reduce their release into the Klamath River downstream. The isolation or warmer surface waters and release of cooler water is a beneficial but secondary purpose of the curtain.

Response to Comment ORG46-415

The Volume I Section 4.4.2.1 *Continued Operations With Fish Passage – Water Quality – Water Temperature* Potential Impact 4.2.2-1 – *Middle and Lower Klamath River and Klamath River Estuary* (pages 4-106 to 4-108) discussion of the intake barrier/thermal curtain has been updated to clarify that the primary purpose of the intake barrier/thermal curtain was for managing blue-green algae releases to the Klamath River. The intake barrier/thermal curtain tested in 2014 was referred to as a prototype and the current intake barrier/thermal curtain installed in 2015 has not been described as a prototype in published, publicly available PacifiCorp reports on its operation and performance since then (PacifiCorp 2016a, 2017a, 2018a). Please refer to Volume III Attachment 1 Section 4.4.2.1 *Continued Operations With Fish Passage – Water Quality – Water Temperature* for the revisions.

Comment ORG46-416

The DEIR acknowledges that nutrient reduction measures in response to the Klamath River TMDLs "necessary to achieve significant reductions are, at this point, unknown" and that reductions and subsequent effects "are likely to require decades to achieve." The DEIR should also point out that, even under the full-compliance TMDL scenario, very large fluxes of organic matter would still be periodically released into the river from Upper Klamath Lake (ODEQ 2002, 2019; Walker 2001). According to studies upon which the Upper Klamath Lake TMDL analysis was based, very large fluxes would still occur 2 out of every 8 years after the TMDL measures are achieved (ODEQ 2002). These large nutrient and organic matter fluxes from Upper Klamath Lake are not considered in the DEIR's analysis.

Response to Comment ORG46-416
Please refer to response to comment ORG46-125, which explains that the episodic large fluxes of organic matter and associated nutrients from Upper Klamath Lake constitute part of the existing conditions. Volume I Section 4.4.2.2 *Continued Operations With Fish Passage Alterative – Water Quality – Suspended Sediments* Potential Impact 4.2.2-2 (pages 4-109 to 4-111) considers these episodic large fluxes of organic matter and associated nutrients from Upper Klamath Lake as part of existing conditions when it concludes that the Continued Operations with Fish Passage Alternative would result in no change from existing conditions with respect to interception, decomposition, retention, and/or dilution of algal-derived (organic) suspended material originating from Upper Klamath Lake (in Oregon) within J.C. Boyle Reservoir and the Hydroelectric Reach to Copco No. 1 Reservoir (Section 3.2.2.3 *Water Quality – Environmental Setting – Suspended Sediments* and Appendix C.2.1.1; please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality* and Appendix C).

Volume I Section 4.4.2.2 *Continued Operations With Fish Passage Alterative – Water Quality – Suspended Sediments* Potential Impact 4.2.2-2 (pages 4-109 to 4-111) has been revised to clarify that episodic large fluxes of algal-derived (organic) suspended material would still likely enter the Hydroelectric Reach from upstream even after Total Maximum Daily Load (TMDL) nutrient allocations are achieved because Upper Klamath Lake is a naturally productive lake that has become hyper-productive (hyper-eutrophic) due to anthropogenic (human) inputs of nutrients. Please refer to Volume III Attachment 1 Section 4.4.2.2 *Continued Operations With Fish Passage Alterative – Water Quality – Suspended Sediments* Potential Impact 4.2.2-2 for the revisions.

Comment ORG46-417
The DEIR indicates that nutrient reduction measures in Oregon and California TMDLs could decrease algal-derived (organic) suspended material in Copco No. 1 and Iron Gate reservoirs by decreasing nutrient availability. However, in the next sentence, the DEIR states that these nutrient reduction measures "...are, at this point, unknown and reductions and subsequent effects on the Lower Klamath Project reservoirs are likely to require decades to achieve." This paragraph illustrates an important shortcoming with the DEIR's analyses, namely that uncertainty is a critical consideration, especially related to the potential for significant water quality improvements given that the main nutrient source of the Klamath River is Upper Klamath Lake, and Upper Klamath Lake is hypereutrophic, a condition that will not change for decades if ever. The DEIR does not consistently address how this uncertainty is addressed (in this alternative and others as has been noted in other comments).

Response to Comment ORG46-417
Please refer to Master Response WQ-5 for a discussion of how the analysis of potential impacts to water quality under the Continued Operations With Fish Passage Alternative consistently considers the possibility of full implementation

of the Klamath River Total Maximum Daily Loads (TMDLs) in the long term and whether PacifiCorp has put forth reasonable proposals to achieve these TMDLs with the Lower Klamath Project dams remaining in place. The uncertainty about whether there are sufficient measures that can be implemented to achieve Klamath River TMDL allocations with the Lower Klamath Project dams remaining in place is specifically acknowledged in the EIR by the discussion that the measures necessary to achieve significant reductions are, at this point, unknown and reductions and subsequent effects on the Lower Klamath Project reservoirs are likely to require decades to achieve. Further discussion of potential measures to achieve Klamath River TMDL allocations and their potential impact on water quality parameters is not included in the analysis since this would be speculation.

Section 3.2.4 *Water Quality – Impact Analysis Approach* summarizes how the Klamath River TMDLs and the Klamath River TMDL model results are used in the analysis of the Proposed Project and its alternatives. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Please also refer to Volume II Appendix D Section D.1.2 *Available Numeric Models for Analysis of the Proposed Project and Alternatives – Klamath River TMDL Model* (pages D-1 to D-7) for a summary of the Klamath River TMDL model, including where to find more information on the model assumption, limitations, and sources of uncertainty.

Comment ORG46-418

The DEIR states "...continued seasonal phytoplankton blooms in Copco No. 1 and Iron Gate reservoirs that subsequently die and settle to the bottom, would continue to build up nutrients and organic matter in the reservoir sediments. This layer of nutrients would continue to be recycled into the water column (through internal nutrient loading, see Figure 3.2-2) during periods of stratification and low dissolved oxygen and would continue to stimulate large seasonal phytoplankton blooms in the reservoirs that are then released to the Middle and Lower Klamath River." The DEIR erroneously assumes that mixing from the bottom of the reservoir into the epilimnion is somehow occurring during periods of stratification when mixing is the least likely to occur. This error is then magnified by the unsubstantiated conclusion in the DEIR that downstream releases of nutrients could occur that can lead to phytoplankton blooms in the river. Late in the year when destratification does occur and deeper water s can mix throughout the water column, release of nutrients to the river has a low chance of generating an algal bloom. This is because complete destratification and a return to isothermal conditions typically occurs in Iron Gate Reservoir during November or December, after the growth season for phytoplankton.

Response to Comment ORG46-418

The comment incorrectly asserts that the EIR assumes mixing from the bottom of the reservoir into the epilimnion during thermal stratification. Volume I Section

4.2.2.2 *Continued Operations With Fish Passage – Water Quality – Suspended Sediments* Potential Impact 4.2.2-2 (pages 4-109 to 4-111) does not assume that there is mixing from the bottom of the reservoir into the epilimnion when the reservoir is stratified. As discussed in Section 3.2.2.1 *Water Quality – Environmental Setting – Overview of Water Quality Processes in the Klamath Basin*, low dissolved oxygen conditions in the lower portion of a reservoir (i.e., below the thermocline) during periods of thermal stratification can release nutrients contained in the bottom reservoir sediments back into the water column. Thermal stratification inhibits mixing across the thermocline, but diffusion and limited mixing within the lower portion of Copco No. 1 and Iron Gate reservoirs create a concentration gradient below the thermocline as nutrients are released under low dissolved oxygen conditions (Raymond 2009a). While nutrient concentrations remain low above the thermocline (i.e., in the epilimnion), nutrient concentrations increase below the thermocline with the highest nutrient concentration occurring near the bottom sediments (Raymond 2009a). Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

As summarized in Volume I Section 3.4.2.1 *Phytoplankton and Periphyton – Environmental Setting – Phytoplankton* (pages 3-392 to 3-403), cyanobacteria [blue-green algae] cells alter their buoyancy to remain near the water surface to obtain light for photosynthesis (Walsby et al. 1997). Cyanobacteria [blue-green algae] cells also alter their buoyancy to access nutrients below the thermocline; they decrease their buoyancy under nitrogen and phosphorous limitation to vertically migrate below the thermocline and obtain nutrients contained in the hypolimnion, and they increase their buoyancy to vertically migrate back above the thermocline to obtain light for photosynthesis (Moisander et al. 2009; Paerl and Otten 2015; Paerl et al. 2018). As such, nutrients released from reservoir sediments during low dissolved oxygen conditions when the reservoirs stratify can stimulate large seasonal phytoplankton blooms without physical mixing occurring across the thermocline.

The comment also incorrectly asserts that Volume I Section 4.2.2.2 *Continued Operations With Fish Passage Alternative – Water Quality – Suspended Sediments* Potential Impact 4.2.2-2 (pages 4-109 to 4-111) says that the downstream release of nutrients could lead to phytoplankton blooms in the river. There is no statement in Potential Impact 4.2.2-2 that nutrient releases from the reservoirs would stimulate phytoplankton blooms in the Middle or Lower Klamath River. As quoted in the comment, Potential Impact 4.2.2-2 explains that nutrients released from reservoir sediments during periods of thermal stratification and low dissolved oxygen "would continue to stimulate large seasonal phytoplankton blooms in the reservoirs that are then released to the Middle and Lower Klamath River." Note that Volume I Section 4.4.2.2 *Continued Operations With Fish Passage Alternative – Water Quality – Suspended Sediments* Potential Impact 4.2.2-2 (pages 4-109 to 4-111) and Volume I Section 4.4.2.3 *Continued Operations With Fish Passage Alternative – Water Quality – Nutrients* Potential Impact 4.2.2-4 (pages 4-112 to 4-115) state that large seasonal phytoplankton

blooms in the reservoirs would be released to the Middle and Lower Klamath River. Please refer to Volume I Section 3.4.2 *Phytoplankton and Periphyton – Environmental Setting* (pages 3-392 to 3-422) for additional discussion of the release of phytoplankton blooms from Iron Gate Dam into the Middle and Lower Klamath River under existing conditions.

While Volume I Section 4.4.2.2 *Continued Operations with Fish Passage Alternative – Water Quality – Suspended Sediments* Potential Impact 4.2.2-2 (pages 4-109 to 4-111) does not discuss the potential for Iron Gate Dam to release nutrients from reservoir sediments during periods of thermal stratification and low dissolved oxygen, there are data from the reservoirs and downstream of Iron Gate Dam that indicate total phosphorous may be released between August and November. Please refer to Volume III Attachment 1 Appendix C, Section C.3.1.1 *Nutrients – Upper Klamath Basin – Hydroelectric Reach* for further information regarding the seasonal release of nutrients from in-reservoir production under existing conditions.

Lastly, Iron Gate Reservoir releases containing nutrients from reservoir sediments would potentially provide nutrients for phytoplankton, periphyton, and macrophyte growth downstream of Iron Gate Dam. However, it should be noted that the water velocity and constant mixing in the Middle and Lower Klamath River creates an environment that is not supportive of phytoplankton growth (Genzoli and Kann 2017) and growth and/or reproduction of phytoplankton cells within calm, slow-moving habitats along shorelines, protected coves, and backwaters along the Klamath River that would be suitable habitat for phytoplankton growth have not been documented. Habitat conditions are suitable for periphyton and macrophyte growth in the Middle and Lower Klamath River (Eilers 2005; Stillwater Sciences 2009; PacifiCorp 2014a; Asarian et al. 2014, 2015). As such, reservoir releases containing nutrients from reservoir sediments would potentially stimulate phytoplankton growth downstream of Iron Gate Dam, but releases of nutrients from reservoir sediments would be more likely to stimulate the growth of periphyton and macrophytes.

Comment ORG46-419

The DEIR states "Other Reservoir Management Plan studies have included consideration of in-reservoir oxygenation systems for Keno, J.C. Boyle, and Iron Gate reservoirs (MEI 2007, PacifiCorp 2014, 2018); however, results of the aforementioned studies do not indicate that these approaches, either individually or in combination, would allow the reservoirs to meet Klamath TMDL targets for nutrients (TP and TN) for the tailraces of Copco No. 2 and Iron Gate dams, where these targets numerically interpret the narrative biostimulatory substances objective for the Klamath River (see Section 3.2.3.1 Thresholds of Significance - Nutrients)." It is unrealistic for the DEIR to presume that in-reservoir activities need to be sufficient to meet TMDL targets. It should be obvious that in-reservoir activities would have to be supported by TMDL compliance efforts elsewhere in the Klamath River Basin, most of which are not the responsibility of PacifiCorp.

Such compliance efforts elsewhere, particularly in the Upper Klamath Basin and Upper Klamath Lake (in Oregon), would be crucial given the enormous nutrient and organic matter loads emanating from those sources. In this context, the DEIR should further describe that Upper Klamath Lake water quality impairments are of such magnitude that it is uncertain if or when TMDL compliance will be achieved a fact acknowledged by ODEQ (2002) in the TMDL for Upper Klamath Lake.

Response to Comment ORG46-419
The Total Maximum Daily Load (TMDL) allocations assigned to the Lower Klamath Project are for the reservoir-induced contributions to changes in nutrients/organic matter in the Hydroelectric Reach of the Klamath River. Please refer to Volume I Section 4.4.2.3 *[Continued Operations with Fish Passage] Water Quality – Nutrients* Potential Impact 4.2.2-4 (page 4-114), which describes how the Draft EIR considers nutrient reduction measures in Oregon's Upper Klamath River and Lost River TMDLs, and nutrient reduction measures in California's Lower Lost River TMDLs and Klamath River TMDLs, as part of the analysis of continued nutrient cycling in Copco No. 1 and Iron Gate reservoirs and opportunity for seasonal nutrient release to the Hydroelectric Reach and the Middle Klamath River.

Comment ORG46-420
The DEIR states that "There is currently no reasonable proposal to achieve the Klamath TMDLs targets for nutrients (TP and TN) for the tailraces of Copco No. 2 and Iron Gate dams…" In reality, there is "currently no reasonable proposal to achieve the Klamath TMDLs targets for nutrients (TP and TN)" at any location upstream of the Klamath Hydroelectric Project in the Klamath Basin in California or Oregon, or for that matter, downstream of Iron Gate Dam, even should the Klamath Hydroelectric Project dams be removed. Thus, this statement is gratuitous, has no useful basis for comparison of alternatives, and appears designed to mislead decision-makers and the public by mischaracterizing the effects of the Klamath Hydroelectric Project on existing water quality conditions in the Klamath River Basin.

Response to Comment ORG46-420
Please refer to response to comment ORG46-419. As this statement refers to the reservoir-related contributions to nutrients, it provides useful information to the public for comparison of alternatives.

Comment ORG46-421
The DEIR indicates that no reservoir management method to date has succeeded in improving dissolved oxygen in Lower Klamath reservoirs and in discharge from those reservoirs. However, the DEIR should recognize that PacifiCorp's Reservoir Management Plan was prepared as a draft document and has never been finalized or implemented. This means that none of the actions potentially capable of supporting higher dissolved oxygen concentrations in the

reservoirs have been implemented. It would be logical for the DEIR to assume that the Reservoir Management Plan would receive considerable additional work if pursued in the future including considerable consultation with the State Water Board and other stakeholders. Therefore, it would be reasonable for the DEIR to assume that the final Reservoir Management Plan will incorporate reservoir operations and technologies sufficient to meet State Water Board approval. Such reservoir operations and technologies are described in the current draft Reservoir Management Plan but have not been fully evaluated and designed. However, studies to date and other Klamath Hydroelectric Project analogues indicate that such reservoir operations and technologies are available to be designed and implemented, including for oxygenation, and would be very effective and feasible. For example, proven oxygenation technologies have demonstrated substantive saturation of hypolimnetic dissolved oxygen in at least three dozen projects where anoxia had previously prevailed (Cooke et al. 2005; Singleton and Little 2006; Beutel and Horne 1999; Gantzer at al. 2009; Singleton et al. 2007; Mobley et al. 2012).

Response to Comment ORG46-421

The introduction in Volume I Section 4.4.2.4 *Alternatives –Continued Operations with Fish Passage – Water Quality – Dissolved Oxygen* (pages 4-115 to 4-116) provides a summary overview of the dissolved oxygen conditions in the Hydroelectric Reach, Middle and Lower Klamath River, and the Klamath River Estuary under the Continued Operations with Fish Passage Alternative. It thus does not go into detail about potential revisions to the Reservoir Management Plan that would incorporate operations and technologies to meet dissolved oxygen water quality standards. Please refer to Potential Impact 4.2.2-5 (pages 4-116 to 4-120) for a more detailed analysis of the impact of current operations and technologies on dissolved oxygen conditions and the potential impact of other operations and technologies proposed in the current Reservoir Management Plan on dissolved oxygen conditions in the long term under the Continued Operations with Fish Passage Alternative.

The references provided in the comment (Cooke et al. 2005, Singleton and Little 2006, Buetel and Horne 1999, Gantzer et al. 2009, Singleton et al. 2007, Mobley et al. 2012) describe numerous projects that increase dissolved oxygen in the bottom waters of lakes and reservoirs, and the State Water Board is aware that operations and technologies that would improve reservoir dissolved oxygen concentrations to meet Basin Plan minimum dissolved oxygen criteria exist. However, PacifiCorp has stated that it is not prepared to proceed with oxygen diffuser systems in the reservoirs and that further studies are necessary to determine whether other cost-effective technologies would sufficiently improve dissolved oxygen conditions (PacifiCorp 2014a).

The introduction in Volume I Section 4.4.2.4 *Alternatives –Continued Operations with Fish Passage – Water Quality – Dissolved Oxygen* (pages 4-115 to 4-116) has been revised to clarify details about the operations and technologies

proposed in the most recent revision of the Reservoir Management Plan (PacifiCorp 2014) and to clarify that the final Reservoir Management Plan could potentially include additional operations and technologies to improve dissolved oxygen concentrations to meet Basin Plan minimum dissolved oxygen criteria. Please refer to Volume III Attachment 1 Section 4.4.2.4 *Continued Operations with Fish Passage – Water Quality – Dissolved Oxygen* for the revisions.

Comment ORG46-422

The DEIR states that "Overall, while results from the Reservoir Management Plan feasibility investigations of in-reservoir oxygenation and deployment of an intake barrier/thermal curtain suggest that improvement in dissolved oxygen is possible in the reservoirs (PacifiCorp 2017b, 2018b), these studies have not resulted in water quality improvements at Copco No. 1 or Iron Gate reservoirs that meet TMDL requirements for dissolved oxygen in the reservoirs, nor have they otherwise sufficiently improved Lower Klamath Project impacts to dissolved oxygen in the Middle Klamath River immediately downstream of Iron Gate Dam." The DEIR should clarify two things:

1. Because of the KHSA and implementation of the elements associated with that agreement, forward progress on finalization of the Reservoir Management Plan and actual implementati on of that plan, inclu ding reservoir oxygenation, was not necessary. To say that PacifiCorp has not implemented any of the Reservoir Management Plan elements is an oversimplification.

2. The barrier curtain is a prototyp e and testing continues as initial results show promise.

Elsewhere throughout the DEIR, Klamath TMDL implementation has been presumed to achieve water quality improvement even though specific TMDL measures and actions are not defined let alone having been subjected to a feasibility analysis like reservoir oxygenation. The DEIR should be consistent in its assumptions and analysis and therefore also assume that reservoir water quality management actions can be implemented and be effective for improving dissolved oxygen in the reservoirs and the river downstream of Iron Gate Dam.

Response to Comment ORG46-422

Please refer to Volume I Section 4.4.1.1 *Alternatives – Continued Operations with Fish Passage Alternative – Introduction – Alternative Description* (page 4-101) which states that under Continued Operations with Fish Passage, no Klamath Hydropower Settlement Agreement (KHSA) Interim Measures (IMs) would continue, although actions consistent with IMs designed for water quality improvements are analyzed in this alternative as part of the Reservoir Management Plan (Volume I Section 4.4.2 *Alternatives – Continued Operations with Fish Passage Alternative – Water Quality*). In examining the Continued Operations with Fish Passage alternative, the CEQA analysis is required to disclose the expected reasonable measures for ongoing operations, including

disclosing that there is currently no reasonable proposal to achieve the Total Maximum Daily Load (TMDL) allocations.

It is reasonable and appropriate to use a finer lens in examining the ability of PacifiCorp's most recent (2014) Reservoir Management Plan to achieve a particular load allocation than the EIR uses to describe the entire suite of projects contemplated for implementation of the TMDLs. The feasibility of an alternative to achieve a project objective is appropriate to analyze in greater detail than a projected long-term future compliance with TMDLs based on a range of ongoing and future activities not related to the Proposed Project. Thus, the EIR examines the Reservoir Management Plan provided by PacifiCorp as part of the revised *Clean Water Act Section 401 Water Quality Certification Application for the Klamath Hydroelectric Project and Update on Implementation of the Klamath Hydroelectric Settlement Agreement* (PacifiCorp 2014a) as a reasonable indication of potential solutions to address water quality impairments associated with J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate dams. Regarding the request to characterize the Reservoir Management Plan (PacifiCorp 2014a) as a draft plan, please refer to response to comment ORG46-408.

Contrary to the comment's assertion, the EIR does not state or imply that PacifiCorp has not implemented any of the Reservoir Management Plan elements. As one example, Volume I Section 4.4.2.3 *Alternatives – Continued Operations with Fish Passage Alternative – Water Quality – Nutrients* states that PacifiCorp has proposed a design for a demonstration wetlands facility adjacent to the Upper Klamath River, evaluated five potential sites, and developed construction costs and a monitoring plan (PacifiCorp 2018b). This section goes on to state that PacifiCorp has not implemented the demonstration facility, although PacifiCorp has continued to fund pilot studies of diffuse source (i.e., small distributed) treatment wetlands for reducing nutrient transport into Upper Klamath Lake, which would eventually help to improve water quality conditions downstream in the Klamath River.

Additionally, the EIR identifies in turn which of the seven water quality improvement actions described in the Reservoir Management Plan (PacifiCorp 2014) is most focused on water temperature, suspended materials, nutrients, dissolved oxygen, pH, chlorophyll-*a*, and/or algal toxins, and then discusses whether, given existing information, a particular action or set of actions presented in the Reservoir Management Plan (PacifiCorp 2014) is likely to meet TMDL requirements or otherwise sufficiently improve each of the aforementioned water quality parameters based on results from the Reservoir Management Plan techniques employed to date.

The comment's assertion that "because of the KHSA and implementation of elements associated with that agreement, forward progress on finalization of the Reservoir Management Plan and actual implementation of that plan was not necessary", does not remove the State Water Board's obligation under CEQA to

disclose the expected reasonable measures for ongoing operations, including disclosing that there is currently no reasonable proposal to achieve the TMDL allocations.

With respect to the comment regarding the intake barrier/thermal curtain, this apparatus was referred to as a prototype in 2014; however, the current intake barrier/thermal curtain installed in 2015 has not been described as a prototype in more recently published, publicly available PacifiCorp reports on its operation and performance (PacifiCorp 2016a, 2017a, 2018a). Section 4.4.2.4 *Alternatives – Continued Operations with Fish Passage Alternative – Water Quality – Dissolved Oxygen* Potential Impact 4.2.2-5 *Hydroelectric Reach* has been revised to clarify that while the primary purpose of the powerhouse intake barrier/thermal curtain installed in Iron Gate Reservoir was to reduce transport of extensive summer and fall blue-green algae (cyanobacteria) blooms downstream of the reservoir to the Middle and Lower Klamath River, results from deployment of the apparatus in 2016 indicate that the presence of the curtain can reduce dissolved oxygen concentrations in reservoir discharge water (PacifiCorp 2017), and that the curtain was completely rolled up during portions of 2017 to maximize dissolved oxygen concentrations for aquatic life (PacifiCorp 2018a). Please refer to Volume III Attachment 1 Section 4.4.2.4 *Alternatives – Continued Operations with Fish Passage Alternative – Water Quality – Dissolved Oxygen* Potential Impact 4.2.2-5 *Hydroelectric Reach* for the revisions.

With respect to the comment's broader assertion that the Draft EIR is not consistent with respect to assumptions and analysis of TMDL compliance across the Proposed Project and the alternatives, the EIR states repeatedly in the Proposed Project and alternatives analyses that it would be speculative at this point to identify either the mechanisms necessary to implement the TMDLs or the timing required to achieve full compliance, including Section 3.2.5 *Water Quality – Potential Impacts and Mitigation* Potential Impact 3.2-1 (water temperature), Potential Impact 3.2-8 (nutrients), 3.2-10 (dissolved oxygen), 3.2-11 (pH). Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*. For the Proposed Project, the EIR also indicates that removal of the Lower Klamath Project Reservoirs would rapidly and substantially move the Klamath River downstream of Iron Gate Dam towards achieving TMDL compliance for water temperature (Potential Impact 3.2-1). Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

For the No Project Alternative, which is analyzed for the reasonably foreseeable period of 0−5 years, Volume I Section 4.2 *Alternatives – No Project Alternative* (specifically pages 4-15 to 4-16) states that efforts aimed at meeting Klamath River TMDLs are not analyzed for the No Project Alternative because the basin response to the restoration measures to meet the total maximum daily loads (TMDLs) during the short term is too speculative. Because water quality improvement measures in Oregon and California due to the Klamath TMDLs would result in long-term changes in water quality, these potential changes are

analyzed as part of the Proposed Project and other alternatives. Please note that Section *4.2.3.1 Alternatives – No Project Alternative – Aquatic Resources – Key Ecological Attributes – Water Quality* and *4.2.3.1 Alternatives – No Project Alternative – Aquatic Resources – Key Ecological Attributes – Water Temperature* have been revised to clarify how the EIR considers TMDL attainment for the No Project Alternative. Please refer to Volume III Attachment 1 Section *4.2.3.1 Alternatives – No Project Alternative – Aquatic Resources – Key Ecological Attributes – Water Quality* and *4.2.3.1 Alternatives – No Project Alternative – Aquatic Resources – Key Ecological Attributes – Water Temperature* for the revisions. Please also refer to response to comment ORG46-385 for changes made to the EIR regarding TMDL implementation assumptions relevant to the No Project Alternative.

For the Continued Operations With Fish Passage Alternative, which is analyzed for both the short term and long term, the EIR analysis considers the possibility of full implementation of the California Klamath River TMDLs in the long term and whether PacifiCorp has put forth reasonable proposals to achieve the TMDLs with the Lower Klamath Project dams remaining in place. As noted above, it is reasonable and appropriate to use a finer lens in examining the ability of PacifiCorp's most recent (2014) Reservoir Management Plan to achieve a particular load allocation than the EIR uses to describe the entire suite of projects contemplated for implementation of the TMDLs, including projects in the Upper Klamath Basin and Upper Klamath Lake. The feasibility of an alternative to achieve a project objective is appropriate to analyze in greater detail than a projected long-term future compliance with TMDLs based on a range of ongoing and future activities not related to the Proposed Project.

Thus, this analysis includes consideration of improvements achieved to date through implementation of various approaches described in the most recent version of PacifiCorp's Reservoir Management Plan (2014). The EIR also considers whether long-term climate change-induced changes in water quality would partially offset any projected TMDL improvements. For specific details, please refer to each TMDL-related water quality parameter analyzed under the Continued Operations with Fish Passage Alternative (i.e., Volume I Section 4.4.2.1 *Water Temperature* [pages 4-102 to 4-103], Section 4.4.2.2 *Suspended Sediments* [pages 4-108 to 4-109], Section 4.4.2.3 *Nutrients* [page 4-112], Section 4.4.2.4 *Dissolved Oxygen* [pages 4-115 to 4-116], Section 4.4.2.5 *pH* [page 4-120], Section 4.4.2.6 *Chlorophyll-a and Algal Toxins* [pages 4-122 to 4-123]), as well as the impact analyses themselves (Potential Impact 4.2.2-1 [pages 4-103 to 4-108], Potential Impact 4.2.2-2 [pages 4-109 to 4-111], Potential Impact 4.2.2-4 [pages 4-112 to 4-115], Potential Impact 4.2.2-5 [pages 4-116 to 4-120], Potential Impact 4.2.2-6 [pages 4-121 to 4-122], Potential Impact 4.2.2-7 [pages 4-123 to 4-124]. Additionally, Section 4.4.1.2 *Alternatives – Continued Operations with Fish Passage Alternative – Alternative Analysis Approach* has been revised to clarify how TMDL compliance was considered in the short term for each of the aforementioned water quality parameters. Please refer to Volume

III Attachment 1 Section 4.4.1.2 *Alternatives – Continued Operations with Fish Passage Alternative – Alternative Analysis Approach* for the revisions.

With respect to the comment's broader assertion that the Draft EIR is not consistent with respect to assumptions and analysis of TMDL compliance across the Proposed Project and the alternatives, the EIR states repeatedly in the Proposed Project and alternatives analyses that it would be speculative at this point to identify either the mechanisms necessary to implement the TMDLs or the timing required to achieve full compliance.

Comment ORG46-423

Regarding the DEIR discussion in "4.4.2.5 pH," the DEIR should clarify that the seasonal (summer and fall) pH challenges are geologic in nature and going to occur whether there is a reservoir or river in place for reaches upstream of Iron Gate Dam where macrophytes and periphyton can grow. The DEIR omits any mention of this important fact: long-term pH condition cannot be reduced or mitigated, and existing pH conditions will be exacerbated by climate change. See comments 3.2-5, 3.2-23, 4.2-9.

Response to Comment ORG46-423

The Klamath River is a naturally weakly buffered system (i.e., low alkalinity typically less than 100 milligrams per liter [mg/L] as calcium carbonate [CaCO3]; PacifiCorp [2004a], Karuk Tribe of California [2010]), so it is susceptible to photosynthesis-driven daily and seasonal swings in pH. Please also refer to ORG46-87, ORG46-106, and ORG46-383 for further discussion of the weakly buffered conditions in the Klamath River. However, seasonal pH variations in the Hydroelectric Reach in Copco No. 1 and Iron Gate reservoirs during summertime periods of intense algal blooms would not occur under dam removal conditions. Please refer to Volume III Attachment 1 Section 3.2.5.5 *Water Quality – Potential Impacts and Mitigation – Dissolved Oxygen* Potential Impact 3.2-11 for analysis of the pH under the Proposed Project, including the potential pH variations associated with periphyton colonization and growth in the Hydroelectric Reach. Please also refer to ORG46-149 for further discussion of pH variations under the Proposed Project.

Volume I Section 4.4.2.5 *[Continued Operations with Fish Passage] Water Quality – pH* (pages 4-120 to 4-122) has been revised to clarify that the Klamath River is a weakly buffered system susceptible to photosynthesis-driven pH variations. Please refer to Volume III Attachment 1 Section 4.4.2.5 *[Continued Operations with Fish Passage] Water Quality – pH* for the revisions.

The comment is incorrect to assert that long-term pH conditions in the Klamath River cannot be improved or mitigated. While the weakly buffered nature of the Klamath River would always make it suspectable to photosynthesis-driven pH variations, nutrient reductions associated with measures in Oregon and

California's Total Maximum Daily Loads (TMDLs) would likely be beneficial to pH over time since nutrient reductions would likely reduce phytoplankton, periphyton, and macrophyte growth and associated photosynthesis that drives pH variations in the Klamath River. As discussed in Volume I Section 4.2.2 *Alternatives – No Project Alternative – Water Quality – pH* Potential Impact 4.2.2-6 (pages 4-121 to 4-122), the specific actions necessary to achieve significant nutrient reductions are, at this point, unknown and sufficient reductions to reduce pH variations in the Klamath River are likely to require decades to achieve.

Volume I Potential Impact 4.2.2-6 (pages 4-121 to 4-122) acknowledges warmer water temperatures under climate change would further exacerbate the seasonal phytoplankton blooms that occur in the Hydroelectric Reach under existing conditions. While pH variations are linked to periods of high photosynthesis associated with phytoplankton blooms and periphyton growth in Section 3.2.2.6 *Water Quality – Environmental Setting – pH* (please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*), Volume I Section 3.4.2 *Phytoplankton and Periphyton – Environmental Setting* (pages 3-392 to 3-421), and Volume I Section 4.4.2.5 *Continued Operations with Fish Passage Alternative – Water Quality- pH* (pages 4-120 to 4-122), it is not explicitly stated in Potential Impact 4.2.2-6 (pages 4-121 to 4-122) that the potential increase in seasonal phytoplankton blooms due to warmer water temperatures under climate change would produce larger or more frequent pH variations that exceed pH standards. Thus, Potential Impact 4.2.2-6 (pages 4-121 to 4-122) has been revised to clarify that the warmer water temperatures under climate change would exacerbate seasonal phytoplankton blooms in the reservoirs, increasing pH variations and potentially resulting in more frequent exceedances of pH objectives in the Hydroelectric Reach in the long term compared to existing conditions. Please refer to Volume III Attachment 1 Section 4.4.2.5 *Continued Operations with Fish Passage Alternative – Water Quality- pH* for the revisions.

Comment ORG46-424

The DEIR states "Warmer water temperatures under climate change would further exacerbate seasonal phytoplankton blooms in the Hydroelectric Reach, which would then be transported downstream, and overall there is currently no reasonable proposal to achieve TMDL targets and meet applicable water quality standards for water temperature, nutrients and dissolved oxygen, which would also continue to result in elevated chlorophyll-a concentrations and periodically high algal toxin concentrations in the surface waters of Copco No. 1 and Iron Gate reservoirs during summer and fall months." Aside from the generally confusing sentence structure, the DEIR should clarify that in-reservoir compliance with TMDL targets would have to be supported by TMDL compliance efforts elsewhere in the Klamath River Basin, most of which are not the responsibility of PacifiCorp. Such compliance efforts elsewhere particularly in the Upper Klamath Basin and Upper Klamath Lake, would be crucial given the enormous nutrient and organic matter loads emanating from those sources. In

this context, the DEIR should further describe that Upper Klamath Lake water quality impairments are of such a magnitude that it is uncertain if or when TMDL compliance will be achieved. That said, elsewhere throughout the DEIR, Klamath TMDL implementation has been presumed to achieve water quality improvement even though specific TMDL measures and actions are not defined. Thus, the DEIR should be consistent and also assume that water quality management actions can be implemented in the Klamath Hydroelectric Project area and be effective for improving chlorophyll-a concentrations and periodically high algal toxin concentrations in the reservoirs and the downstream river.

Response to Comment ORG46-424
For a discussion of how the EIR handles the speculative nature of the mechanisms necessary to implement the Total Maximum Daily Loads(TMDLs) and the timing required to achieve full compliance in the analyses of the Proposed Project and alternatives, please refer to response to comment ORG46-422. Please also refer to response to comment ORG46-385 for changes made to the EIR regarding TMDL implementation assumptions relevant to the No Project Alternative.

The comment asserts that the EIR should "further describe that Upper Klamath Lake water quality impairments are of such a magnitude that it is uncertain if or when TMDL compliance will be achieved". Please note that Section 3.2 *Water Quality* describes the existing conditions that affect water quality in the Klamath River. For example, in Section 3.2.2.4 the draft EIR notes that Upper Klamath Lake and the Lost River Basin are two major sources of nutrients to the Area of Analysis. Please also note that on page 4-124 of Volume I Section 4.4.2 *Alternatives – Continued Operations with Fish Passage – Water Quality*, which is the focus of the comment, the text states that nutrient reduction measures in Oregon and California's TMDLs would, over time, be beneficial with respect to decreasing these water quality constituents, although the measures to achieve such reductions remain unclear, and the improvements could require decades.

Volume I Section 4.4.2.6 *Alternatives – Continued Operations with Fish Passage Alternative – Water Quality – Chlorophyll-a and Algal Toxins* Potential Impact 4.2.2-7 (page 4-124) has been grammatically clarified. Please refer to Volume III Attachment 1 Section 4.4.2.6 *Alternatives – Continued Operations with Fish Passage Alternative – Water Quality – Chlorophyll-a and Algal Toxins* for these revisions.

Comment ORG46-425
The DEIR's statement regarding the 2017 United States District Court order to USBR that addresses flushing flows is lacking detail. Although stating the flows are incorporated into the Continued Operations with Fish Passage Alternative, the DEIR does not appear to have included any modeling of these flows. The DEIR also does not analyze the effectiveness of these flows to reduce polychaete abundance. The DEIR should indicate whether these Court ordered

flows have achieved their objectives and been effective to date because this information would be important in accurately assessing the relative effects of alternatives to the Proposed Project. The Court ordered flows are based on the best available information regarding the amount of flow required to mobilize substrate. The DEIR should clarify where these flows would be the same, higher in volume, and address the frequency of these flows under the Proposed Project as comparted to this and other alternatives.

Response to Comment ORG46-425
Section 4.4.3.2 *Alternatives – Continued Operations with Fish Passage Alternative – Aquatic Resources – Bed Elevation and Grain Size Distribution* (page 4-126) has been revised to clarify how the 2017 court-ordered flushing flows were considered in the EIR analysis. Please refer to Volume III Attachment 1 Section 4.4.3.2 *Alternatives – Continued Operations with Fish Passage Alternative – Aquatic Resources – Bed Elevation and Grain Size Distribution* for the revisions.

Please also refer to Master Response HYD-1 for discussion of how the EIR considers the 2019 BiOp Flows.

Note that this comment is in reference to the analysis of bed mobilization. The analysis of disease issues related to the flushing flows that the comment raises are addressed in Section 4.4.3.4 *Alternatives – Continued Operations with Fish Passage Alternative – Aquatic Resources – Fish Disease and Parasites*.

Comment ORG46-426
The DEIR states that a portion of the fall-run Chinook upstream migration would be limited unless they travel in a narrow band of temperature and dissolved oxygen that exist in the upper 10 meters of the reservoirs. The temperature data cited in Appendix C show that such a band exists in the reservoirs in most years. As they do in the lower Klamath River, adult Chinook would migrate at night when temperatures are cooler and take advantage of thermal refugia provided by Fall Creek and other tributaries. The DEIR' s analysis should be consistent in discussing the fishery consequences of thermal refugia for all alternatives. The DEIR should also remove the discussion of spring-run Chinook from this paragraph because spring-run Chinook are no longer found upstream of the Salmon River in the Klamath Basin.

Response to Comment ORG46-426
With regard to the comment's assertion that Volume II Appendix C indicates that a band of acceptable dissolved oxygen and water temperature exists in the reservoirs in most years, please refer to Figure C-1 (reproduced below) which indicates that water temperature is greater than approximately 23ºC in most years during the period of fall-run Chinook salmon migration (August through September).

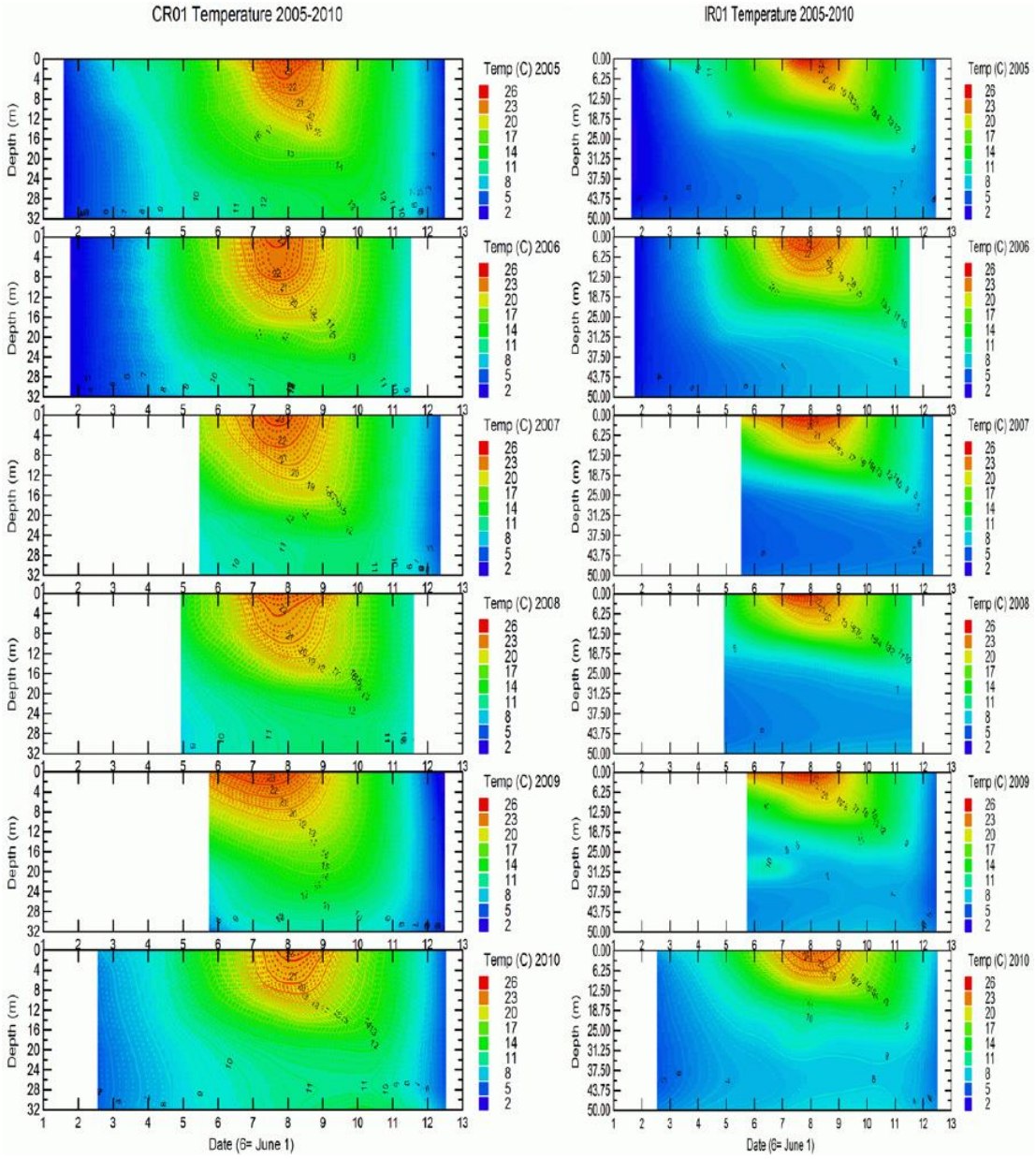


Figure C-1. Depth-time Distribution of Isopleths of Water Temperature at Station CR01 in Copco No. 1 Reservoir and IR01 in Iron Gate Reservoir from January 2005 to December 2010. Source: Asarian and Kann 2011.

With respect to the comment regarding nighttime migration, Section 4.4.3.3 *Alternatives – Continued Operations With Fish Passage Alternative – Aquatic Resources – Water Quality* (page 4-127) has been revised to clarify how migrating at night and use of thermal refugia would affect fall-run Chinook salmon under this alternative. Please refer to Volume III Attachment 1 Section 4.4.3.3 *Alternatives – Continued Operations With Fish Passage Alternative – Aquatic Resources – Water Quality* for the revisions.

With respect to the comment regarding spring-run Chinook salmon not currently found upstream of the Salmon River, as described in Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species*, Huntington (2006) reasoned that spring-run Chinook salmon likely accounted for the majority of the Upper Klamath Basin's actual salmon production under historical conditions. Spring-run Chinook salmon spawned in the tributaries of the Upper Klamath Basin (Moyle 2002, Hamilton et al. 2005, Hamilton et al. 2016) with large numbers of spring-run Chinook salmon spawning in the basin upstream of Klamath Lake in the Williamson, Sprague, and Wood rivers (Snyder 1931). The EIR predicts that all alternatives providing fish passage past Iron Gate Dam (including the Continued Operations with Fish Passage Alternative) would allow spring-run Chinook salmon to recolonize their historical habitat and distribute farther upstream than the confluence with Salmon River.

Comment ORG46-427

The DEIR should clarify that spring temperatures are cooler under the Continued Operations with Fish Passage Alternative than the Proposed Project, these cooler temperatures provide benefits to fish.

Response to Comment ORG46-427

PacifiCorp asserts that Section 4.4.3.4 *Alternatives – Continued Operations with Fish Passage Alternative – Aquatic Resources – Fish Disease and Parasites* (page 4-128) fails to mention that under continued operations water temperatures will be lower during spring than under the Proposed Project. Volume I Section 4.4.3.3 *Alternatives – Continued Operations with Fish Passage Alternative – Aquatic Resources – Water Quality* (page 4-126 and 4-127) discusses water temperature under this alternative and compares temperatures with those anticipated under the Proposed Project. Please also refer to Volume I Potential Impact 4.2.2-1 (page 4-106) for a discussion of lower spring water temperatures under continued operations compared to those anticipated under the Proposed Project.

Comment ORG46-428

The DEIR does a poor job explaining the different factors that affect C. shasta and leaves much to inference. To address this, the DEIR should include a discussion that provides the differences in factors that affect C. shasta in regard to nidus formation. For example, a table could provide the level and frequency of flushing and dilution flows, and deep flushing flows produced under the Proposed Project compared to Court ordered flows produced under the different alternatives. Such a table would allow the readers of the DEIR to see the likelihood of the effectiveness of the flows.

The Court ordered deep flushing flows (11,200 cfs) to occur at least once between February 15 to March 31. The February 15 date was set to avoid scouring redds and incubating eggs. This assumes that the majority of

emergence has occurred prior to this date; however, the emergence timing information for Chinook, Coho, and Steelhead in Sect ion 3.3 of the DEIR indicates that significant numbers of eggs and alevins will still be in the gravel through May (dependent on species). As such, the DEIR should discuss the risk to mainstem spawners from deep flushing flows where appropriate. It is also worth noting that the assumption that the deep flushing flow would continue to be required is not reflected in the USBR's proposed action (USBR 2018a) nor are these flows that can be artificially created on a desired schedule with existing water control facilities on the Klamath River let alone those that would remain after implementation of the Proposed Project.

Response to Comment ORG46-428
Deep flushing flows are not included in the 2019 BiOp Flows and thus would not occur after March 2019 under the Proposed Project or any alternative analyzed in the EIR. Section 4.4.3.4 *Alternatives – Continued Operations With Fish Passage Alternative – Aquatic Resources – Fish Disease and Parasites* has been revised to clarify how the 2019 BiOp Flows are analyzed under this alternative. Please refer to Volume III Attachment 1 Section 4.4.3.4 *Alternatives – Continued Operations With Fish Passage Alternative – Aquatic Resources – Fish Disease and Parasites* for the revisions. Please also refer to Master Response HYD-1 for additional discussion about how the EIR considers the 2019 BiOp Flows.

In regard to deep flushing flows potentially impacting mainstem spawning salmon redds, note that the referenced deep flushing flows that were required by the 2017 court order are not included in the 2019 BiOp Flow prescriptions. For additional information, the timing of the surface flushing flows under the 2019 BiOp are managed to occur after fall-run Chinook salmon fry emerge from redds and would not occur when eggs are incubating. Please note that steelhead and coho primarily spawn in tributaries and their redds would therefore be less at risk from any flushing flows.

In regard to nidus formation, please see Volume III Attachment 1 Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Disease and Parasites* as well as Master Responses AQF-5 and 6.

Comment ORG46-429
The DEIR states that the disease nidus is anticipated to continue to occur to some degree under this alternative. The DEIR should ensure that this assumption is incorporated into all of the alternatives. This is particularly warranted, because earlier in this same paragraph the DEIR states that flow and dilution requirements alone have not been successful at eliminating the nidus. When this observation is connected with that by Bartholow and Foott (2010) who noted that a low number of infected adult salmon (>3,000) are sufficient to maintain high infection prevalence in polychaetes and the fact that polychaetes

are distributed throughout the river, it is reasonable to expect that C. shasta will be found anywhere there are Chinook and Coho in the Klamath River .

Response to Comment ORG46-429
The analysis of the Proposed Project and all alternatives includes an assessment of the risk of the nidus remaining downstream of Iron Gate, and the risk of a new nidus forming upstream of Iron Gate Dam for those alternatives that incorporate dam removal or fish passage. Please also refer to Master Response AQF-5 and AQF-6.

Comment ORG46-430
The DEIR includes many references to "existing adverse conditions." The DEIR should remove the biased term "adverse" and limit discussion to changes from "existing conditions."

Response to Comment ORG46-430
In addition to meeting CEQA's requirements to identify and analyze potentially significant impacts from the Proposed Project, this EIR is intended to inform the State Water Board's decision with respect to potential issuance of a water quality certification for the Proposed Project under the federal Clean Water Act (CWA). Unlike CEQA, which is concerned primarily with new impacts as compared to baseline conditions, section 401 of the Clean Water Act authorizes issuance of a water quality certification only if the issuing authority (here, the State Water Board) finds that discharges from the project/facility will not result in violations of water quality standards. In that context, identifying and evaluating potential or confirmed exceedances of water quality standards under existing conditions is an important component of the State Water Board's consideration of the conditions that may be necessary to certify that approval of the project will not cause violations of water quality standards.

Additionally, an EIR is a public information document, and including accurate information about existing conditions enhances rather than detracts from that purpose. Use of this phrase is intended to provide appropriate and helpful context for the general reader to understand the nature of the existing condition in light of the CEQA requirement to consider the baseline condition as existing conditions (CEQA Guidelines Section 15125(a)).

Here, the phrase "existing adverse conditions" is used instead of "existing conditions" because algal toxin concentrations measured under existing conditions are high enough to result in adverse impacts on environmental receptors (e.g., fish). In addition to evaluating changes to the physical environment from baseline conditions, this EIR is also intended to inform the State Water Board's required findings in its Clean Water Act section 401 water quality certification regarding the project's effects on attainment of applicable water quality standards and other state laws. Volume I Section 4.4.3.5 *Alternatives – Continued Operations with Fish Passage – Aquatic Resources –*

Algal Toxins (pages 4-129 to 4-130) is objective and unbiased when it concludes that the Continued Operations with Fish Passage Alternative would result in no change from existing adverse conditions in the Hydroelectric Reach.

Please also refer to response to comment ORG46-376.

Comment ORG46-431
The DEIR's discussion on activities currently underway to recover salmonid and sucker populations is useful but does not appear in other alternatives (e.g., Sections 4.2, 4.3, etc.). The DEIR should treat this information equally in all alternatives.

Response to Comment ORG46-431
The concept that activities currently underway to recover salmonid and sucker populations within the Klamath Basin would likely continue at their current levels appears in substance in all of the alternatives, though phrasing and exact text varies.

Comment ORG46-432
The DEIR refers to "Implementation of the Coho Enhancement Fund under the No Project Alternative..." This should be "under the Continued Operations with Fish Passage Alternative..."

Response to Comment ORG46-432
Section 4.4.3.6 *Alternatives – Continued Operations with Fish Passage Alternative – Aquatic Resources – Aquatic Habitat and Instream Flows* has been revised to clarify Continued Operations with Fish Passage Alternative. Please refer to Volume III Attachment 1 Section 4.4.3.6 *Alternatives – Continued Operations with Fish Passage Alternative – Aquatic Resources – Aquatic Habitat and Instream Flows* for the revisions.

Comment ORG46-433
The DEIR states that assumed trap and haul survival rates for aquatic species is not different than for volitional fish passage systems. The DEIR should clarify whether this means that the trap and haul system has a 21 percent mortality rate as defined for volitional fish passage, or whether assumed trap and haul survival rates are the same as survival rates assumed for a single ladder and collection system. This clarification is needed in the DEIR because it would make little sense to implement a trap and haul system that had the same survival rate as a volitional system through four dams and reservoirs.

The assumptions reported in the DEIR for the trap and haul system should be corrected. The assumed survival rate for juveniles trapped at J.C. Boyle Dam and transported to the river downstream of Iron Gate Dam averaged 81 percent and ranged from 67 to 95 percent (Option 1C in Oosterhout 2005). Adult survival rates for fish transported from Iron Gate Dam to J.C. Boyle Reservoir was 79

percent (range 70 to 89 percent, Tables 2 and 6 in Oosterhout 2005). Note that Oosterhout (2005) incorporated delayed mortality for adults transported in trucks in the estimate and cites the literature estimate (7 to 22 percent) used in the analysis.

Oosterhout (2005) estimated that fall-run Chinook spawner abundance for the volitional passage and trap and haul scenario (Option 1C in Oosterhout 2005) were within a couple of thousand fish (29,754 and 28,539 under a no harvest assumption). Both options produced about 12,000 less adults than the four-dam removal option. Because Iron Gate Hatchery produces approximately 50,000 fall-run Chinook adults, total production under volitional and trap and haul scenarios is significantly higher than the four-dam removal. The Oosterhout (2005) and Ecosystem Diagnosis Testing (EDT) Habitat modeling results (PacifiCorp 2005) provide analyses that can be used to show the expected difference in adult fall Chinook production for alternatives in the DEIR. The EDT analysis has data for Chinook, Coho, and Steelhead. PacifiCorp's recent work on a trap-and-haul program on the Lewis River (WA) has indicated survival of adult salmon and Steelhead approaches 100 percent (PacifiCorp and Public Utilities District No. 1 of Cowlitz County 2016). This indicates that the mortality assumptions included in prior work evaluating trap and haul alternatives were high relative to those experienced in current practice.

The DEIR should clarify the findings of Lusardi and Moyle (2017). Lusardi and Moyle (2017) did not perform a literature review of prespawn mortality rates for volitional, natural, and trap and haul passage systems. They presented findings showing that trap and haul systems can have high adult prespawn mortality rate and therefore can pose a risk to reintroduction efforts. Specific ally, the 20 percent adult mortality figure came from one Coho program on the Toutle River in Washington. In contrast to this, PacifiCorp has been moving salmon and Steelhead, both adults and juveniles, past the Lewis River dams with very little mortality (PacifiCorp and Public Utilities District No. 1 of Cowlitz County 2016). The issues associated with juvenile trap and haul programs discussed are most frequently related to programs on the Columbia River that barge juvenile salmonids for hundreds of miles. As Lusardi and Moyle (2017) note, there are substantial differences in survival based on the species, run, distance fish are moved, method of movement, water quality, and so on. There is no basis, let alone substantial evidence, to assume that trap and haul survival is similar to survival from passage via ladders and screens without substantially more detailed research and evaluation. The DEIR should have addressed these complexities.

Data collected by the Wild Fish Conservancy (2008) show that prespawn mortality can be as high as 100 percent for streams in the Pacific Northwest. The environmental conditions present in the stream have a substantial effect on prespawn mortality rates. Thus, in order to determine if trap and haul has a higher prespawn mortality rate than the volitional passage system, the DEIR

needs to define the rates for both, which it does not. The DEIR should have defined these rates for all alternatives.

Response to Comment ORG46-433
Analysis of fish passage in the EIR is based on considering likely passage alternatives, potentially including volitional passage, or trap and haul. Regarding the comment that it would not make sense to implement a trap and haul system that did not improve passage survival compared to volitional passage, it is worth noting that some facilities have selected trap and haul because of cost or other feasibility concerns, rather than to improve passage survival (Lusardi and Moyle 2017).

In regard to the trap and haul mortality predictions used in the EIR, PacifiCorp's recent evaluation of a trap and haul facility on the Lewis River is not considered a reliable analogue for the Lower Klamath Project, since the Lewis River has much better water quality conditions than the Klamath River, fewer miles required to be traversed to haul fish, and other site specific considerations affecting juvenile fish collection efficiency. Section 4.4.3.7 *[Continued Operations with Fish Passage] Aquatic Resources – Fish Passage* has been revised to clarify the passage effect assumptions used in the EIR analysis, more directly incorporate the predictions of Oosterhout (2005), and to clarify how the passage methods considered in Lusardi and Moyle (2017) apply to the EIR analysis. These revisions address the comment's concern regarding comparability of mortality rates. Revisions have been similarly made to Potential Impacts 4.2.3-1, 4.2.3-7, 4.2.3-8, 4.2.3-9, 4.2.3-10, and 4.2.3-11. Please refer to Volume III Attachment 1 Section 4.4.3.7 *[Continued Operations with Fish Passage] Aquatic Resources – Fish Passage* for the revisions.

Comment ORG46-434
The DEIR's assumption that effects of passage through trap and haul facilities would be equivalent to volitional passage for other migratory species may be reasonable for Redband Trout but is unsupported for other species such as lamprey and suckers if they were also subject to trap and haul.

Response to Comment ORG46-434
Trap and haul facilities have been shown to be similarly as effective for Pacific lamprey (Corbett et al. 2014), and sucker species (Cheek 2014) as for salmonids. Effects would vary based on site specific considerations and design, as they would for salmonids.

Comment ORG46-435
The DEIR' s analysis should be more precise when defining the reach referred to as downstream of Iron Gate Dam. The DEIR should be specific as to whether this reach extends to the Shasta River, estuary, or just a few miles downstream of the dam.

The DEIR states that "there is currently no reasonable proposal to achieve water quality standards important to Coho salmon within or downstream of the Hydroelectric Reach." The DEIR should list all proposals considered in regard to this statement and the specific justification for why they are not reasonable

Response to Comment ORG46-435
Section 4.4.3.7 *Alternatives – Continued Operations with Fish Passage – Aquatic Resources – Fish Passage* Potential Impact 4.2.3-1 has been clarified with respect to the extent of the Middle Klamath River downstream of Iron Gate Dam in which coho salmon are more susceptible to disease. Please refer to Volume III Attachment 1 Section 4.4.3.7 *Alternatives – Continued Operations with Fish Passage – Aquatic Resources – Fish Passage* Potential Impact 4.2.3-1 for the revisions.

With respect to the comment's concern regarding proposals to achieve water quality standards under continued operations of the Lower Klamath Project, the quote in the comment is incomplete. The first portion of the referenced sentence was omitted in the comment; this portion informs the reader regarding where to look for the analysis of various actions that have been proposed to achieve water quality standards. The entire quote is: "Despite the modest water quality improvements achieved to date through implementation of actions contained within PacifiCorp's Reservoir Management Plan (see also Volume I Section 4.4.2 *[Continued Operations with Fish Passage] Water Quality*), there is currently no reasonable proposal to achieve water quality standards important to Coho salmon within or downstream of the Hydroelectric Reach." As such, please refer to Volume I Section 4.4.2 *[Continued Operations with Fish Passage] Aquatic Resources – Water Quality* (pages 4-102 to 4-125) for discussion of PacifiCorp's Reservoir Management Plan and its proposed solutions to addressing water quality impairments and meeting water quality standards, including water temperature, algal-derived (organic) suspended material, nutrients, dissolved oxygen, pH, chlorophyll-a, and algal toxins.

Comment ORG46-436
The DEIR states that predation on outmigrating juveniles is expected to be low but fails to provide a value for this metric. On page 4-137, the DEIR indicates that juvenile passage mortality through the hydroelectric reach is expected to be 58 percent, but the source of this mortality is not clear.

The Oosterhout (2005) analysis used a survival value for volitional fish passage for fish arriving downstream of Keno Dam to downstream of Iron Gate Dam of about 77 percent. For trap and haul, the juvenile survival value was 81 percent. If this type of information is provided for one alternative, the DEIR should provide the same type of information for all alternatives, including the Proposed Project.

Response to Comment ORG46-436
The sentence in Volume I page 4-137 referenced in the comment includes a reference to Section 4.4.3.7 *Alternatives – Continued Operations with Fish Passage Alternative – Aquatic Resources – Fish Passage* (page 4-132) for more information on the estimates of passage survival used in analysis of effects of the alternative on fall-run Chinook salmon, and cites the source of the estimates (which is FERC 2007). As noted in the cited section, the mortality estimates are cumulative assuming migration through all facilities past all dams and through all reservoirs, and specifically noting that predation is included in the mortality estimate (which is the same approach used by Oosterhout 2005).

The No Project Alternative appropriately assumes adult migration mortality similar to existing conditions, based on reported smolt-to-adult return rates, and implicitly incorporates predation and disease.

The Proposed Project includes volitional passage, and therefore appropriately does not include a mortality estimate for migration through a facility or hydroelectric reservoir. An estimate of migration mortality (from predation, harvest, disease) is included within the estimates of escapement predicted by Hendrix (2011) and reported in the EIR, through incorporation of adult migration mortality modeling based on available information for the watershed and region.

Each of the alternatives includes explicit discussion of the approach to estimating adult migration and fish passage survival, and the assumptions are applied consistently.

Comment ORG46-437
The DEIR describes effects of dissolves oxygen under the Continued Operations with Fish Passage Alternative on fall-run Chinook. The DEIR states that oxygen levels will range from less than 85 percent saturation to 90 percent saturation. The effects to Chinook from these oxygen levels are not discussed. Carter (2005) reviewed oxygen effects to salmon and showed that effects are expressed in concentrations of dissolved oxygen in mg/l. Expressing dissolved oxygen values as percent of saturation is consistent with the Basin Plan, but because the actual values can vary based on elevation and water temperature, they are difficult to interpret in terms of effects to fish. The resulting oxygen values for the months cited should be reported and compared to a published metric so that the public and decision-makers can understand likelihood and scale of effect to salmonids.

Response to Comment ORG46-437
Potential Imapct 4.2.3-7 has been revised to clarify the relevant dissolved oxygen concentrations and the associated potential effects on egg incubation. Please refer to Volume III Attachment 1 Section 4.4.3.7 *Continued Operations With Fish Passage Alternative – Aquatic Resources – Fish Passage* for the revisions.

Comment ORG46-438

The DEIR includes a summary statement for the Continued Operations with Fish Passage Alternative indicating that there would be no impact (no change relative to existing conditions) for fall-run Chinook salmon in the short term (i.e., less than 5 years) timeframe. The DEIR should ensure that each summary section of effects for all alternatives should have a conclusion statement as to whether the alternative achieves the identified objectives of the Proposed Project for natural fish populations. As previously stated on page ES-4 of the DEIR, the objective is as follows: "Advance the long-term restoration of the natural fish populations in the Klamath Basin, with particular emphasis on restoring the salmonid fisheries used for subsistence, commerce, tribal cultural purposes, and recreation." The level of advancement sought in this objective is not defined in the DEIR. Thus, while the scale of the advancement may vary between alternatives, it appears that all alternatives achieve the objective to some extent.

Response to Comment ORG46-438

Please refer to Volume I *Executive Summary –Alternatives to Proposed Project* (pages ES-17 and ES-18) for a discussion of how alternatives meet the identified objectives of the Proposed Project.

The Proposed Project and every alternative evaluate the potential short- and long-term impacts to Chinook salmon.

Comment ORG46-439

The DEIR states that "...poor water quality in reservoirs is expected to have minor effects on this species, and only at the early and late ends of migration periods, outside peak migration times." Given that there are no spring-run Chinook upstream of the Salmon River, the DEIR needs to clarify why the early portion of the spring-run Chinook adult migration would be negatively affected by the reservoirs before and during April. The DEIR should further clarify why this same statement is not made for the Keno Reservoir. The water quality parameters that the DEIR assumes would negatively affect adult spring-run Chinook migrating through reservoirs before and during April should be identified and applied equally through the river and within the DEIR.

Response to Comment ORG46-439

Volume I Section 4.4.3.7 *Alternatives – Continued Operations with Fish Passage Alternative – Aquatic Resources – Fish Passage* Potential Impact 4.2.3-8 (page 4-141) describes how fish passage facilities installed at the Lower Klamath Project dams within the Hydroelectric Reach would allow spring-run Chinook salmon to regain access to 360 miles of habitat in the upper Klamath River upstream of J.C. Boyle Reservoir. The access would expand the Chinook salmon's current habitat to include historical habitat along the mainstem Klamath River upstream to the Sprague, Williamson, and Wood rivers (Hamilton et al. 2005, Butler et al. 2010, Hamilton et al. 2016). Huntington (2006) reasoned that spring-run Chinook salmon likely accounted for the majority of the Upper Klamath

Basin's actual salmon production under historical conditions. Overall, the Continued Operations with Fish Passage Alternative would provide spring-run Chinook access to 49 significant tributaries in the Upper Klamath Basin, comprising hundreds of miles of additional potentially productive anadromous fish habitat upstream of Iron Gate Dam (DOI 2007), including access to important thermal refugia within areas influenced by groundwater exchange that are more resistant to climate change (Hamilton et al. 2011).

Volume I Section 4.4.3.7 *Alternatives – Continued Operations with Fish Passage Alternative – Aquatic Resources – Fish Passage* Potential Impact 4.2.3-8 (page 4-141) does include the same consideration for spring-run Chinook salmon timing and reservoir water quality for the Keno Reservoir, stating, "Under the current migration timing, most or all of the spring-run Chinook salmon migrants would be able to pass upstream through the Keno Impoundment/Lake Ewuana area before seasonal water quality reductions would make passage restricted."

Comment ORG46-440

Given that there is not a population of spring-run Chinook upstream of the Salmon River, the DEIR needs to explain why there is an analysis of effects to spring-run Chi nook. The DEIR note s that spring-run Chinook could recolonize habitat upstream through straying. However, Iron Gate Hatchery data indicate that spring-run Chi nook have not been collected at Iron Gate Hatchery for decades. This is likely because the nearest spring-run Chinook population is about 130 river miles downstream of Iron Gate Dam in the Salmon River. The Salmon River spring-run Chinook population is also very small, thereby reducing the number of adults likely to stray. Therefore, the DEIR should account for the actual population data and state that it is highly unlikely spring-run Chinook would recolonize existing habitat by straying from the Salmon River in any reasonable timeframe. The DEIR should not speculate about spring-run Chinook recolonization, but at a minimum should indicate that if straying from the Salmon River does occur, it likely would take decades (or longer) before substantial spring-run Chinook production occur upstream of Iron Gate Dam. This same statement should be added to all alternatives.

Response to Comment ORG46-440

As discussed in response to comment ORG46-439, increased habitat access for spring-run Chinook salmon has been predicted to increase the opportunity for migration upstream beyond the Salmon River, and upstream of Iron Gate Dam. The text this comment refers to indicates that the timeframe for spring run recolonization without active reintroduction would be long.

The issue of the timeframe for recolonization has been considered by state and federal salmonid resource managers, and Oregon Department of Fish and Wildlife (ODFW) has drafted a plan for the active reintroduction of spring-run Chinook salmon to habitat within Oregon upstream of Iron Gate Dam (T. Wise, ODFW, pers. comm., 2018). Active reintroduction of spring-run Chinook salmon

has been demonstrated to be effective at supporting relatively rapid recolonization of habitat within other Oregon watersheds, including several tributaries within the upper Willamette River.

ODFW has not specified the fish passage alternatives that would be a prerequisite for active reintroduction. The potential for this plan to be implemented also exists for all alternatives. Stray rates of spring-run Chinook salmon from the Salmon River to habitat upstream of Iron Gate Dam would be directly addressed through active reintroduction efforts from ODFW. Otherwise, as noted in the text, recolonization would likely be slow. Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-7 has been revised to note that a draft plan for active reintroduction of spring run Chinook salmon exists, although the EIR does not rely on its implementation. Please refer to Volume III Attachment 1 Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* for the revisions.

Comment ORG46-441

Previous comments related to prespawn mortality rates apply here (see comment 3.2-43 and 3.3-70). The DEIR should clarify that, although temperature effects from the dams do not extend downstream of Clear Creek (RM 95), summer temperatures downstream of Clear Creek can be naturally high enough to impair adult salmon migration and survival. This is a condition that would persist independent of the Propose d Project or any alternatives.

Response to Comment ORG46-441

Please refer to response to comment ORG46-127, which affirms that the Lower Klamath Project effects on water temperature are apparent to the confluence with the Salmon River (river mile [RM] 66.3).

With regard to pre-spawn mortality, please also refer to responses to comments ORG46-19, ORG46-128, ORG46-185, ORG46-227, and ORG46-433.

Comments ORG46-442, ORG46-443, and ORG46-444

The DEIR should state that juvenile Steelhead survival rate may be higher than the smaller juveniles produced by fall-run Chinook. Because juvenile Steelhead rear for a longer amount of time in freshwater and juvenile Steelhead are larger than juvenile Chinook which imparts a higher survival rate.

The DEIR indicates that aquatic resource measure AR-6 (Suckers) is not included in this alternative because measures under AR-6 are not possible to implement in this alternative. The elements included in AR-6 are possible, but likely unnecessary because the existing reservoirs would remain. However, if suckers were encountered in fish passage facilities developed for this alternative, then genetic testing for hybridization, followed by sucker salvage and release would be possible and perhaps reasonable to implement.

Response to Comments ORG46-442, ORG46-443, and ORG46-444
Please refer to Volume I Section 4.4.3.7 *[*Alternatives – *Continued Operations with Fish Passage] Aquatic Resources – Fish Passage* (pages 4-131 to 4-132) for information regarding juvenile steelhead and Chinook salmon downstream survival rates. For the analysis of juvenile downstream mortality rates, the best available scientific data indicate that effects of passage through volitional fishways would be equivalent for other migratory species based on available data (DWR 2013) for fishways designed and constructed to modern agency criteria as required by DOI (2007). The commenter's assertion that Chinook salmon and steelhead would have different survival rates during migration is not critical to the analysis of the EIR. Assumed survival rates during migration are estimates based on available data and used for comparing alternatives. The nuanced differences in survival that may occur between various species would not affect the analysis comparing alternatives, or the conclusions reached by the EIR; therefore, using the best available data on survival rates and assuming similar survival among species is reasonable and appropriate.

Regarding the comment's assertion that genetic testing for hybridization followed by sucker salvage and release would be possible and perhaps reasonable to implement under the Continued Operations with Fish Passage Alternative, please note that there is no reason to expect that Aquatic Resource Measure AR-6 would be feasible under this alternative. As discussed in Section 3.3 *Aquatic Resources – Potential Impacts and Mitigation* Potential Impact 3.3-13, Section 2081.11 was added to the Fish and Game Code to authorize take of Lost River and shortnose suckers, subject to certain conditions. CDFW (2018b) has reviewed Aquatic Resource Measure AR-6 and preliminarily agreed that the Proposed Project with implementation of Aquatic Resource Measure AR-6 potentially meets the standards for take authorization under Fish and Game Code, section 2081.11. Further, as stated in 4.4.3.7 *[Continued Operations with Fish Passage] Aquatic Resources – Fish Passage* Potential Impact 4.2.3-13, because the Continued Operations with Fish Passage Alternative would directly connect the reservoirs to Upper Klamath Lake, it would not be possible prevent further hybridization under this alternative and would thus not be reasonable to implement Aquatic Resource Measure AR-6, irrespective of feasibility.

Comment ORG46-445
The DEIR incorrectly concludes that there would be no impact for Lost River and Shortnose sucker populations in the long term. As the DEIR notes, volitional passage could allow hybrid suckers to move into Upper Klamath Lake but aside from citing work cautioning against allowing hybrid suckers to reach Upper Klamath Lake, the DEIR makes no effort to evaluate the potential for this affect to be a substantial effect on the sucker populations in Upper Klamath Lake. The DEIR reasonably asserts that "Overall, it is speculative to determine whether increased access to spawning habitat outweigh the increased risk of hybridization, or vice-versa." Just because something is speculative does not

mean there is no impact, and the DEIR certainly speculates about many other topics throughout the document. The DEIR correctly concludes that there are no significant impacts for Shortnose and Lost River suckers in the short term although that conclusion should probably be restricted to the population in the Klamath Hydroelectric Project reservoirs and not those in Upper Klamath Lake.

Response to Comment ORG46-445
Potential Impact 4.2.3-13 has been revised to clarify how hybridization is considered in the analysis of the Continued Operations with Fish Passage Alternative. Please refer to Volume III Attachment 1 Section 4.4.3.7 *Alternatives – Continued Operations with Fish Passage Alternative – Aquatic Resources – Fish Passage* Potential Impact 4.2.3-13 for the revisions.

Comment ORG46-446
Other species have a discussion in the DEIR of trap and haul as it differs from volitional passage. That discussion is missing for Redband Trout and the DEIR either needs to add such a discussion or explain to the reader why it was not included.

Response to Comment ORG46-446
With respect to redband trout passage, Section 4.4.3.7 *Alternatives – Continued Operations with Fish Passage – Aquatic Resources – Fish Passage* Potential Impact 4.2.3-14 has been revised to clarify trap and haul implementation under continued operations of the Lower Klamath Project. Please refer to Volume III Attachment 1 Section 4.4.3.7 *Alternatives – Continued Operations with Fish Passage – Aquatic Resources – Fish Passage* Potential Impact 4.2.3-14 for the revisions.

Comment ORG46-447
The DEIR states that "Continued Operations with Fish Passage Alternative would result in no change from existing adverse conditions in the short term and long term for these reaches." The DEIR should remove the biased term "adverse" and limit discussion to changes from "existing conditions."

Response to Comment ORG46-447
In addition to meeting CEQA's requirements to identify and analyze potentially significant impacts from the Proposed Project, this EIR is intended to inform the State Water Board's decision with respect to potential issuance of a water quality certification for the Proposed Project under the federal Clean Water Act (CWA). Unlike CEQA, which is concerned primarily with new impacts as compared to baseline conditions, section 401 of the Clean Water Act authorizes issuance of a water quality certification only if the issuing authority (here, the State Water Board) finds that discharges from the project/facility will not result in violations of water quality standards.

In that context, identifying and evaluating existing exceedances of water quality standards is an important component of the State Water Board's consideration of the conditions that may be necessary to certify that approval of the project will not cause violations of water quality standards.

Additionally, an EIR is a public information document, and including accurate information about existing conditions enhances rather than detracts from that purpose. Use of this phrase is intended to provide appropriate and helpful context for the general reader to understand the nature of the existing condition in light of the CEQA requirement to consider the baseline condition as existing conditions (CEQA Guidelines Section 15125(a)).

Here, the phrase "existing adverse conditions" is used instead of "existing conditions" because high cyanobacteria [blue-green algae] cell counts and algal toxin concentrations measured under existing conditions exceed primary (i.e., algal toxin) and secondary (i.e., cyanobacteria [blue-green algae] cell counts) threshold triggers for posting health advisories for recreational water contact and these levels can result in adverse impacts on human health or environmental receptors (e.g., fish). Please refer to Volume I Section 3.4.2.3 *Phytoplankton and Periphyton – Environmental Setting – Hydroelectric Reach - Phytoplankton* (pages 3-405 to 3-413) for a summary of the nuisance and/or noxious phytoplankton blooms occurring in the reservoir under existing conditions and the public health advisory postings that have occurred in Copco No. 1 and Iron Gate reservoirs and the Middle and Lower Klamath River from 2005 to 2017. Potential Impact 4.4.4-1 (pages 4-162 to 4-163) is objective and unbiased when it concludes that the Continued Operations with Fish Passage Alternative would result in no change from existing adverse conditions in the short term and long term for these reaches.

Comment ORG46-448

The description of work for the Continued Operations with Fish Passage Alternative indicates that "Under the Continued Operations with Fish Passage Alternative, construction activities to install fish ladders would occur at all four Lower Klamath Project dam complexes." Considering that this work may be conducted within the Klamath Hydroelectric Historic District or directly impact the four individual/contributing dams and reservoirs (J.C. Boyle Dam, Copco No. 1 Dam, Copco No. 2 Dam, Iron Gate Dam) and all associated hydroelectric facilities, an analysis of impacts resulting from the installation of fish ladders is warranted here. Table ES-1 (Summary of Impacts and Mitigation Measures) indicates that this alternative would have "No Significant Impacts" to the Historic District or the four individual/contributing darns and reservoirs but it is not clear from the DEIR how this finding was reached.

Response to Comment ORG46-448

Section 4.4.12 *Continued Operations with Fish Passage Alternative – Historical Resources and Tribal Cultural Resources*, second paragraph has been revised to

add a reference to Potential Impact 3.12-11, which should have been cited instead of Potential Impact 3.12-12. Please refer to Volume III Attachment 1 Section 4.4.12 *Continued Operations with Fish Passage Alternative – Historical Resources and Tribal Cultural Resources* for the revisions.

Table ES-1 has been corrected to indicate that Potential Impact 3.12-11 for historic-period archaeological resources under the Continued Operations with Fish Passage Alternative would be significant and unavoidable. Please refer to Volume III Attachment 1 *Executive Summary* for the revisions.

Comment ORG46-449

This section includes a significance statement, while other sections do not, and the reader is left to interpret the text, possibly leading to different conclusions than the DEIR authors intended. These sections should be organized similarly with consistent significance statements.

Response to Comment ORG46-449

For the alternatives analysis, as with other sections of the EIR, significance statements are presented for each analysis that begins with a numbered potential impact title. For the alternatives, significance statements for new potential impacts or for changed findings of significance in comparison to the Proposed Project also are presented. Here, the numbered potential impact title was inadvertently omitted. Section 4.4.22 *Alternatives – Continued Operations with Fish Passage Alternative – Transportation and Traffic* has been revised to clarify which part of the impact analysis is associated with the short-term construction-related changes to traffic and which part of the impact analysis is associated with long-term operational changes to traffic due to trap and haul. Please refer to Volume III Attachment 1 Section 4.4.22 *Alternatives – Continued Operations with Fish Passage Alternative – Transportation and Traffic* for the revisions.

Comment ORG46-450

The DEIR incorrectly states that "J.C. Boyle Reservoir would not alter water temperature in the J.C. Boyle Peaking Reach from the Oregon-California state line to Copco No. 1 Reservoir." However, under the Two Dam Removal Alternative, a steady state flow from J.C. Boyle Powerhouse would produce a different diurnal temperature signal than the Proposed Project or No Action Alternative. This condition would occur because water would be released to the bypass reach and through the J.C. Boyle Powerhouse. Travel times through these areas differ and waters would heat at different rates if they were conveyed through the power canal or the bypass reach to the J.C. Boyle Powerhouse location. The DEIR does not accurately reflect conditions that would occur as a result of this alternative.

Response to Comment ORG46-450
Volume I Section 4.5.2.1 *Two Dam Removal Alternative – Water Quality – Water Temperature* (pages 4-187 to 4-189) has been revised to clarify the potential water temperature changes in the J.C. Boyle Peaking Reach under the Two Dam Removal Alternative compared to existing conditions. Please refer to Volume III Attachment 1 Section 4.5.2.1 *Two Dam Removal Alternative – Water Quality – Water Temperature* for the revisions.

Comment ORG46-451
The DEIR states that "The long-term increases in mineral (inorganic) and algal-derived (organic) suspended material due to the lack of interception by the dams would be a less than significant impact under the Proposed Project as only a small amount of sediment and suspended material is delivered from upstream of J.C. Boyle Dam." This statement is dangerously incorrect and reflects a serious misunderstanding of water quality dynamics in the Klamath River. There are very large seasonal loads (especially organic matter) conveyed from reaches "upstream of J.C. Boyle Dam," including notably Keno Reservoir and Upper Klamath Lake. The loss of retention in Iron Gate and Copco reservoirs under the Two Dam Removal Alternative would lead to additional available nutrients to support macrophyte and periphyton growth in the free-flowing reaches of the Klamath River, which in turn will impact water quality, particularly pH and dissolved oxygen. The loss of retention in Iron Gate and Copco reservoirs would also result in reduced travel time, translating to conveyance of organic matter to downstream reaches (all the way to the estuary) over a much shorter timeframe. Travel time from J.C. Boyle Dam to the estuary would be reduced from several weeks under existing conditions to approximately 5 days. Organic material that used to settle and/or break down in reservoirs would be delivered to the lower Klamath River and estuary, which would increase organic matter oxygen demand as well as the associated nutrients bound to the organic matter. The DEIR does not address the impacts of the conditions that would result from this alternative on water quality in the lower river and estuary.

Response to Comment ORG46-451
Please note that paragraph two of Section 4.5.2.2 *Alternatives – Two Dam Removal – Water Quality – Suspended Sediments* (page 4-191) provides context for the sentence in paragraph four that is quoted in the comment, including context for the use of "small". Paragraph two states the following: "While the amount of sediment supplied to the Klamath River on an annual basis from the watershed upstream of J.C. Boyle Dam is a relatively small fraction of the total sediment (Stillwater Sciences 2010) (see also Section 3.11.2.4 *Sediment Load*), the long-term increase in mineral (inorganic) suspended material downstream of J.C. Boyle Dam under this alternative would be less than under the Proposed Project since J.C. Boyle Dam would continue to intercept upstream sediment. The majority of algal-derived (organic) suspended material from upstream sources (Upper Klamath Lake, Klamath Straights Drain, Lost River) is intercepted and retained by the Keno Impoundment/Lake Ewauna, but J.C. Boyle Dam does

retain some algal-derived (organic) suspended material (see Appendix C, Section C.2.1 Upper Klamath Basin for more detail)."

Additionally, please refer to Volume I Section 3.4.2.3 *Phytoplankton and Periphyton – Environmental Setting – Hydroelectric Reach* (pages 3-405 to 3-413), Volume II Appendix C, Section C.2 *Suspended Sediments* (pages C-14 to C-23), and Volume III Attachment 1 Section 3.2.2.3 *Water Quality – Environmental Setting – Suspended Sediments* for a summary of the suspended sediment and algal dynamics in the Klamath River within and upstream of the Hydroelectric Reach that would potentially influence water quality dynamics in California (i.e., downstream of the Oregon-California state line).

Please refer to response to comment ORG46-135 for further discussion of the Klamath Hydropower Settlement Agreement (KHSA) Interim Measure 15 (IM15) measured total suspended solids (TSS) and volatile suspended solids (VSS) from 2003 to 2017 upstream of J.C. Boyle Reservoir (river mile [RM] 233.3), at the USGS 11510700 gage downstream of the J.C. Boyle Powerhouse (RM 224.45), and upstream of Copco No. 1 Reservoir/upstream of Shovel Creek (RM 211.2) that quantifies mineral (inorganic) and algal-derived (organic) suspended material entering the Hydroelectric Reach.

While algal-derived (organic) suspended material is transported from the Upper Klamath Lake into the Klamath River, algal-derived (organic) suspended material (measured as total phytoplankton biovolume, TSS, or VSS) in the Klamath River decreases in the downstream direction such that the average total phytoplankton biovolume decreases an order of magnitude from the Upper Klamath Lake to the upstream end of J.C. Boyle Reservoir (i.e., from approximately 10 millimeters cubed per liter (mm^3/L) at Pelican Marina to 1.0 mm^3/L upstream of J.C. Boyle Reservoir; see Volume I Figure 3.4-11 [page 3-407]) and organic suspended sediments (as TSS) typically decrease approximately 50 percent from the mouth of Link River to the upstream end of J.C. Boyle Reservoir (i.e., from approximately 15 mg/L at the mouth of Link River to 7 mg/L upstream of J.C. Boyle Reservoir; see Volume II Figure C-13 [page C- 16]). The data summarized in Volume I Section 3.4.2.3 *Hydroelectric Reach* (pages 3-405 to 3-413), Volume II Appendix C, Section C.2 *Suspended Sediments* (pages C-14 to C-23), and Volume III Attachment 1 Section 3.2.2.3 *Suspended Sediments*, along with KHSA IM15 TSS and VSS data presented in response to comment ORG46-135 quantify the magnitude of inorganic and organic suspended material expected to enter the Hydroelectric Reach under the Proposed Project. These data are also applicable to the Two Dam Removal Alternative, since neither alternative would alter inorganic and organic suspended material conditions in the Klamath River upstream of J.C. Boyle Reservoir.

In addition to the additional context provided above, the sentence referenced in the comment has been clarified to replace "only a small amount" with "a relatively small amount". Please refer to Volume III Attachment 1 Section 4.5.2.2

Alternatives – Two Dam Removal – Water Quality – Suspended Sediments for the revisions.

Further, while the comment is correct that the overall travel time from J.C. Boyle Dam to the Klamath River Estuary would be reduced under the Two Dam Removal Alternative, the decrease in the travel time would only occur from J.C. Boyle Dam to downstream of Iron Gate Dam due to the conversion of Copco No. 1 and Iron Gate reservoirs to a free-flowing river. There would be no change in the travel time from downstream of Iron Gate Dam to the Klamath River Estuary since Klamath River flow downstream of Iron Gate Dam is determined by the operation of the United States Bureau of Reclamation's (USBR's) Klamath Irrigation Project and the applicable biological opinion(s) to meet the needs of listed species and maintain full irrigation deliveries in accordance with existing contracts, contingent upon available water supplies, and the Two Dam Removal Alternative does not include any changes to the amount of flow released by the Klamath Irrigation Project.

Conversion of Copco No. 1 and Iron Gate reservoirs to a free-flowing river under the Two Dam Removal Alternative would potentially decrease algal-derived (organic) suspended material in the Hydroelectric Reach due to increases in mechanical breakdown and elimination of reservoir production of algal-derived (organic) suspended material, but conversion of the reservoirs to a free-flowing river would also potentially increase algal-derived (organic) suspended material in the Hydroelectric Reach due to periphyton and potential macrophyte growth in the new free-flowing river reaches. As discussed in Volume III Attachment 1 Potential Impact 3.2-6 for the Proposed Project (which also removes Copco No. 1 and Iron Gate reservoirs), Volume III Attachment 1 Section 4.5.2.2 *Alternatives – Two Dam Removal Alternative – Water Quality – Suspended Sediments*, and response to comment ORG46-136 (which is focused on the Proposed Project, but is also relevant to the Two Dam Removal Alternative because of the removal of Copco No. 1 and Iron Gate reservoirs), the magnitude of the potential decreases in algal-derived (organic) suspended material is anticipated to be similar to the magnitude of the potential increases in algal-derived (organic) suspended material, so there generally would be no decrease in algal-derived (organic) suspended material through the Hydroelectric Reach compared to existing conditions. It is also conservatively assumed that there potentially would be a slight relative long-term increase in algal-derived (organic) suspended material downstream of Iron Gate Dam due to the reservoirs no longer providing calm, slow-moving water conditions for algal-derived (organic) suspended material to settle out of the water column and organic suspended material production from periphyton and macrophyte growth within the new free-flowing river portions of the Hydroelectric Reach, but such increases would be well below the algal-derived suspended material previously produced in Copco No. 1 and Iron Gate reservoirs and would not exceed levels that would substantially adversely affect the cold freshwater habitat (COLD) beneficial use or any other existing designated beneficial use at the levels currently supported, exacerbate

an existing exceedance of water quality standards, or result in a failure to maintain an existing beneficial use. Please refer to Volume I Section 4.5.2 *Alternatives – Two Dam Removal Alternative – Water Quality* (pages 4-186 to 4-204) for discussion of the potential impacts to other water quality parameters under the Two Dam Removal Alternative.

Section 4.5.2.2 *Two Dam Removal Alternative – Water Quality – Suspended Sediments* has been revised to clarify the conclusions of the EIR for the Two Dam Removal Alternative with respect to long-term increases in mineral (inorganic) and algal-derived (organic) suspended material. Please refer to Volume III Attachment 1 Section 4.5.2.2 *Two Dam Removal Alternative – Water Quality – Suspended Sediments* for the revisions.

Comment ORG46-452

The DEIR states that "Accordingly, existing large summertime variations in dissolved oxygen in J.C. Boyle Reservoir, especially at depth, would still occur and could continue to influence dissolved oxygen concentrations in the California portion of the Hydroelectric Reach in the same manner as under existing conditions (see also 3.2.2.5 Dissolved Oxygen)." The DEIR should recognize that the modified operation of J.C. Boyle from a peaking facility to a run-of-river system would change the sub-daily flow regime in the reservoir from one of release-then-store to a continual flow. This modification would likely impact the settling rate, intermittent thermal stratification, algal assemblage, and other water quality conditions in the reservoir. The DEIS should analyze these potential impacts (or benefits) in the reservoir and from releases downstream.

Response to Comment ORG46-452

While the change from peaking operations to run-of-river operations for J.C. Boyle Reservoir would alter mixing conditions and dissolved oxygen concentrations in the reservoir, the analysis of long-term dissolved oxygen conditions under the Two Dam Removal Alternative in Volume I Section 4.5.2.4 *Two Dam Removal Alternative – Water Quality – Dissolved Oxygen* (pages 4-196 to 4-199) accurately characterizes the dissolved oxygen trends in J.C. Boyle Reservoir and the California portion of the Hydroelectric Reach. However, additional details, including PacifiCorp's Klamath River Water Quality Model (KRWQM) results of dissolved oxygen under steady flow conditions similar to those expected under the Two Dam Removal Alternative, are available to clarify how the change from peaking operations to run-of-river operations would alter dissolved oxygen conditions from J.C. Boyle Reservoir to the upstream end of Copco No. 1 Reservoir. Therefore, Section 4.5.2.4 *Two Dam Removal Alternative – Water Quality – Dissolved Oxygen* has been revised in Volume III Attachment 1 to clarify that modeling of steady flow conditions similar to the Two Dam Removal Alternative in PacifiCorp (2004a-1) indicates that summertime variations in dissolved oxygen in J.C. Boyle Reservoir would still occur and could continue to influence dissolved oxygen concentrations in the California portion of the Hydroelectric Reach in the same manner as under existing conditions, but

the magnitude of these variations would potentially be less than occurs under existing conditions. Please refer to Volume III Attachment 1 Section 4.5.2.4 *Two Dam Removal Alternative – Water Quality – Dissolved Oxygen* for the revisions.

For related discussion of hydropower peaking flows in the J.C. Boyle Peaking Reach and the release of lower dissolved oxygen water from J.C. Boyle Reservoir that potentially affects dissolved oxygen concentrations further downstream in the California portion of the J.C. Boyle Peaking Reach, please refer to response to comment IND156-27.

For discussion of the potential impact of modified J.C. Boyle Dam operations on water temperature under the Two Dam Removal Alternative, please refer to ORG46-450. With respect to the comment's concern regarding a change in settling rate in J.C. Boyle Reservoir due to operating the reservoir as a run-of-river facility, Section 4.5.2.2 *Alternatives – Two Dam Removal Alternative – Water Quality – Suspended Sediments* has been revised to clarify that some degree of settling of suspended material would still occur in in calm areas along the channel margins and areas nearest the J.C. Boyle Dam face, but the amount of settling would be less than under the Proposed Project. Please refer to Volume III Attachment 1 Section 4.5.2.2 *Alternatives – Two Dam Removal Alternative – Water Quality – Suspended Sediments* for the revisions.

With respect to the comment's concern regarding a change in algal assemblage in J.C. Boyle Reservoir due to operating the reservoir as a run-of-river facility, Volume I Section 4.5.2.6 *Alternatives – Two Dam Removal Alternative – Water Quality – Chlorophyll-a and Algal Toxins* states on page 4-200 and 4-201 that the shallow depth (8.3 feet average depth) and short hydraulic residence time (1.1 days at average flows) of J.C. Boyle Reservoir does not promote the low mixing conditions or thermal stratification that create optimal habitat for phytoplankton growth, so the reservoir does not have large phytoplankton blooms (as measured by chlorophyll-a) under existing conditions (see Figure 3.2-5). The EIR goes on to state that the residence time of J.C. Boyle Reservoir without peaking operations would still be short (i.e., on the order of one to three days), so leaving this dam in place and ceasing peaking flows would be unlikely to create conditions that would support large seasonal phytoplankton blooms or increase chlorophyll-a concentrations relative to existing conditions. The comment does not specify why consideration of algal assemblage in J.C. Boyle Reservoir under the Two Dam Removal Alternative is needed in addition to the information provided above and in Volume I Section 4.5.2.6.

With respect to 'other water quality parameters' please refer to Volume I Section 4.5.2.3 *Alternatives – Two Dam Removal Alternative – Water Quality – Nutrients* (pages 4-193 to 4-196) and Volume I Section 4.5.2.5 *Alternatives – Two Dam Removal Alternative – Water Quality – pH* (pages 4-199 to 4-200) for a discussion of why leaving J.C. Boyle Dam in place and ceasing peaking and recreation flows would be unlikely to impact these water quality parameters.

Comment ORG46-453
The DEIR states that "...no impact (no change from existing adverse conditions)." The DEIR should remove the biased term "adverse" and limit discussion to changes from "existing conditions."

Response to Comment ORG46-453
In addition to meeting CEQA's requirements to identify and analyze potentially significant impacts from the proposed project, this EIR is intended to inform the State Water Board's decision with respect to potential issuance of a water quality certification for the proposed project under the federal Clean Water Act (CWA). Unlike CEQA, which is concerned primarily with new impacts as compared to baseline conditions, section 401 of the Clean Water Act authorizes issuance of a water quality certification only if the issuing authority (here, the State Water Board) finds that discharges from the facility will not result in violations of water quality standards. Thus, the State Water Board cannot issue a water quality certification even if approval of a project would only continue existing violations of water quality standards.

In that context, identifying and evaluating existing exceedances of water quality standards is an important component of the State Water Board's consideration of the conditions that may be necessary to certify that approval of the project will not cause violations of water quality standards.

Additionally, an EIR is a public information document, and including accurate information about existing conditions enhances rather than detracts from that purpose. Use of this phrase is intended to provide appropriate and helpful context for the general reader to understand the nature of the existing condition in light of the CEQA requirement to consider the baseline condition as existing conditions (CEQA Guidelines Section 15125(a)).

Here, the phrase "existing adverse conditions" is used instead of "existing conditions" because data from J.C. Boyle Reservoir sediments indicate that existing conditions have the potential to cause an adverse impact on an environmental receptor. Please refer to Volume II Appendix C, Section C.7 *Inorganic and Organic Contaminants* (pages C-83 to C-119) for a summary of the inorganic and organic contaminant concentrations in J.C. Boyle Reservoir sediments greater than human and ecological screening levels, toxicity test results for J.C. Boyle Reservoir sediments that indicate moderate potential for sediment toxicity, and contaminants in aquatic biota from J.C. Boyle Reservoir greater than screening levels for the protection of human health and wildlife.

Please also refer to response to comment ORG46-376.

Comment ORG46-454

The DEIR alludes to the "poor water temperature conditions that occur downstream of the larger Lower Klamath Project reservoirs (Iron Gate and Copco No. 1 reservoirs) under existing conditions." This discussion should be revised to reflect the actual conditions that could occur under the alternative and how those conditions relate to the significance criteria.

Response to Comment ORG46-454

Section 4.5.3.3 *Alternatives – Two Dam Removal Alternative – Aquatic Resources Water Quality* (page 4-205) clearly expresses that under the Two Dam Removal Alternative the remaining two reservoirs (Copco No. 2 and J.C. Boyle reservoirs) are relatively small and have short residence times, and therefore they would generally not support the same poor water temperature conditions that occur downstream of the larger Lower Klamath Project reservoirs (Iron Gate and Copco No. 1 reservoirs) under existing conditions. This is a valid comparison to existing conditions to explain the predicted effect of this alternative.

Comment ORG46-455

The DEIR alludes to "removing Iron Gate, Copco No. 1, and Copco No. 2 reservoirs and converting the reservoir areas to a free-flowing river under this alternative..." However, Copco No. 2 Reservoir would remain under this alternative. This should be corrected.

Response to Comment ORG46-455

Section 4.5.3.3 *Alternatives – Two Dam Removal Alternative – Aquatic Resources – Water Quality* has been clarified as requested. Please refer to Volume III Attachment 1 Section 4.5.3.3 *Alternatives – Two Dam Removal Alternative – Aquatic Resources – Water Quality* for the revisions.

Comment ORG46-456

The DEIR indicates that aquatic resource measure AR-6 (Suckers) is included in this alternative. Given that this impact is not considered significant, it is unclear why this measure is included, perhaps it is required for Fish and Game Code 2081.11 under CEQA although CDFW has not made a final determination as to whether this measure meets the standards for take authorization under Fish and Game Code, section 2081.11.

Response to Comment ORG46-456

Resource measures can be implemented to further reduce effects, even when impacts are not predicted to be significant. Please also refer to responses to comment ORG46-257 and Master Response CEQ-2.

Comment ORG46-457

The DEIR alludes to "...restored habitat access of anadromous salmonids that would not differ between the Proposed Project and the Two Dam Removal

Alternative. In actuality access would differ because of the small amount of mainstem habitat inundated by Copco No. 2 and a larger amount by J.C. Boyle Reservoir, and the downstream most portion of Spencer Creek that is inundated by J.C. Boyle Reservoir. The DEIR should be corrected to accurately reflect the alternative.

Response to Comment ORG46-457
Section 4.5.3.8 *Alternatives – Two Dam Removal Alternative – Aquatic Resources – Fish Passage* Potential Impact 3.3-14 (page 4-220) discusses restored habitat access for anadromous salmonids as it relates to the potential for competition, predation, and exposure to disease which is expected to be similar under the Two Dam Removal Alternative since anadromous salmonids would have access to habitat upstream of Iron Gate Dam. In addition, Section 4.5.3.8 *Alternatives – Two Dam Removal Alternative – Aquatic Resources – Fish Passage* Potential Impact 3.3-14 (page 4-220) states: "3.8 miles of mainstem and tributary habitat would continue to be inundated by Copco No. 2 and J.C. Boyle reservoirs. It is anticipated that under the Two Dam Removal Alternative this habitat would continue to support an adfluvial redband trout population."

Comment ORG46-458
The paragraph discussing the effects of sediment release on Redband Trout is confusing. Under the Two Dam Removal Alternative, J.C. Boyle and Copco No. 2 dams remain but most of this paragraph focusses on the Proposed Project. The DEIR should actually evaluate the impact on Redband Trout of removing Copco No. 1 and Iron Gate dams

Response to Comment ORG46-458
Section 4.5.3.8 *Alternatives – Two Dam Removal Alternative – Aquatic Resources – Fish Passage Potential Impact 3.3-14* has been clarified to evaluate the impact on redband trout under the Two Dam Removal Alternative. Please refer to Volume III Attachment 1 Section 4.5.3.8 *Alternatives – Two Dam Removal Alternative – Aquatic Resources – Fish Passage* Potential Impact 3.3-14 for the revisions.

Comment ORG46-459
The DEIR should clarify that the "long-term substantial increase in redband trout habitat quality and quantity" would presumably be relative to the No Project Alternative.

Response to Comment ORG46-459
Section 4.5.3.8 *Alternatives – Two Dam Removal Alternative – Aquatic Resources – Fish Passage Potential Impact 3.3-14* has been clarified as requested. Please refer to Volume III Attachment 1 Section 4.5.3.8 *Alternatives – Two Dam Removal Alternative – Aquatic Resources – Fish Passage Potential Impact 3.3-14* for the revisions.

Comment ORG46-460

The DEIR states that "The areas downstream of the Trinity River confluence do not currently support Anodonta spp. and are unlikely to in the future (Davis et al. 2013)." If this is the case, then the DEIR should clarify why the salvage and relocation plan considers these sites.

Response to Comment ORG46-460

Regarding *Anodonta spp.* salvage and relocation, please refer to response to comment ORG46-261.

Comment ORG46-461

In this paragraph, the DEIR concludes that there would be a "...significant impact to the Anodonta spp. population under the Two Dam Removal Alternative in the short term." However, this seems to conflict with the DEIR conclusion in the following paragraph that "impacts would be not significant with for Anodonta spp. in the short term." The DEIR needs to be revised to indicate if this impact is significant or not in the short term.

Response to Comment ORG46-461

Section 4.5.3.8 *[Two Dam Removal] Aquatic Resources – Fish Passage* Potential Impact 3.3-19 has been revised to clarify the analysis regarding freshwater mussels. Please refer to Volume III Attachment 1 Section 4.5.3.8 *[Two Dam Removal] Aquatic Resources – Fish Passage* for the revisions.

Comment ORG46-462

Only short-term effects are discussed in the text leading up to this conclusion, yet a conclusion is drawn for long-term impacts for which there is no discussion.

Response to Comment ORG46-462

Please refer to response to comment ORG46-461 for revisions to text to clarify long-term effects.

Comment ORG46-463

There is no specific discussion in this section for how the Two Dam Removal Alternative would impact historic-period archaeological sites. Construction activities and a new day use area at Copco No. 2 Dam may impact known and as yet unknown historic period archaeological sites. The statement "However, installation of upstream and downstream fish passage at Copco No. 2 Dam and a new day use area near Copco No. 2 Dam, including all associated construction activities, may impact known, or as yet unknown, tribal cultural resources to a similar degree as that described for the Proposed Project" could also apply to historic-period archaeological resources. The DEIR does not currently reflect the potential impacts from this alternative.

Response to Comment ORG46-463
Section 4.5.12 *Alternatives – Two Dam Removal Alternative – Historical Resources and Tribal Cultural Resources* has been revised to clarify that historic-period archaeological resources were considered as part of the impact analysis. Please refer to Volume III Attachment 1 Section 4.5.12 *Alternatives – Two Dam Removal Alternative – Historical Resources and Tribal Cultural Resources* for the revisions.

Comment ORG46-464
This section includes a significance statement, while other sections do not. The alternatives analysis sections should be organized similarly so that the public and decision-makers can make an informed and meaningful comparison of the relative effects of the various alternatives analyzed.

Response to Comment ORG46-464
For the alternatives analysis, as with other sections of the EIR, significance statements are presented for each analysis that begins with a numbered potential impact title. For the alternatives, significance statements for new potential impacts or for changed findings of significance in comparison to the Proposed Project also are presented. Here, the numbered potential impact was incorrectly numbered. Section 4.5.23 *Alternatives – Two Dam Removal Alternative – Noise* has been revised to clarify that the potential impact number should be 4.5-23-1. Please refer to Volume III Attachment 1 Section 4.5.23 *Alternatives – Two Dam Removal Alternative – Noise* for the revisions.

Comment ORG46-465
The DEIR states "...no impact (no change from existing adverse conditions)." The DEIR should remove the biased term "adverse" and limit discussion to changes from "existing conditions."

Response to Comment ORG46-465
In addition to evaluating changes to the physical environment from baseline conditions, this EIR also is intended to inform the State Water Board's required findings in its Clean Water Act (CWA) section 401 water quality certification regarding the project's effects on attainment of applicable water quality standards and other state laws. Accurately characterizing current water quality conditions in relation to applicable water quality standards is consistent both with the EIR's purpose as a public information document and with informing the findings that the Clean Water Act requires for a water quality certification.

The phrase "existing adverse conditions" is used instead of "existing conditions" because data from J.C. Boyle Reservoir sediment samples indicate that existing conditions have the potential to cause an adverse impact on an environmental receptor. Please refer to Volume III Attachment 1 Appendix C, Section C.7 *Inorganic and Organic Contaminants* for a summary of the inorganic and organic contaminant concentrations in J.C. Boyle Reservoir sediments that are greater

than human and ecological screening levels; toxicity test results for J.C. Boyle Reservoir sediments that indicate moderate potential for sediment toxicity; and contaminant concentrations in aquatic biota from J.C. Boyle Reservoir that are greater than screening levels for the protection of human health and wildlife. Please also refer to response to comment ORG46-376.

Comment ORG46-466

The DEIR appears to be missing text. Assume the DEIR should read "Potential impacts of changes in water quality on aquatic resources in California..."

Response to Comment ORG46-466

Section 4.6.3.3 *Alternatives – Three Dam Removal Alternative – Aquatic Resources – Water Quality* has been modified to clarify that the analysis is about the potential impact of water quality on aquatic resources in California. Please refer to Volume III Attachment 1 Section 4.6.3.3 *Alternatives – Three Dam Removal Alternative – Aquatic Resources – Water Quality* for the revisions.

Comment ORG46-467

The DEIR indicates that aquatic resource measure AR-6 (Suckers) is included in this alternative. Given that this impact is not considered significant, it is unclear why this measure is included, perhaps it is required for Fish and Game Code 2081.11 under CEQA although CDFW has not made a final determination as to whether this measure meets the standards for take authorization under Fish and Game Code, section 2081.11.

Response to Comment ORG46-467

Resource measures can be implemented to further reduce effects, even when impacts are not predicted to be significant. Please also refer to responses to comments ORG46-456,ORG46-257, and Master Response CEQ-2.

Comment ORG46-468

It appears the DEIR is missing a word in this sentence "...impacts of sediment release on redband trout that would occur under the Three Dam Removal Alternative would be substantially less under the Proposed Project." Given that the Proposed Project would remove J.C. Boyle Dam and presumably this is where most of the impacts to Redband Trout would originate, PacifiCorp suspects that this sentence should read "...substantially less than under the Proposed Project."

Response to Comment ORG46-468

Section 4.6.3.8 *Alternatives – Three Dam Removal Alternative – Aquatic Resources – Fish Passage* has been revised as requested. Please refer to Volume III Attachment 1 *Section 4.6.3.8 Alternatives – Three Dam Removal Alternative – Aquatic Resources – Fish Passage* for the revisions

Comment ORG46-469

The DEIR should clarify that "long-term substantial increase in redband trout habitat quality and quantity" would be relative to the No Project Alternative. Considered as a whole, there would actually be slightly less of an increase than the Proposed Project because J.C. Boyle Dam and Powerhouse would remain, but in California the effects of this alternative would be the same as the Proposed Project.

Response to Comment ORG46-469

Section 4.6.3.8 *Alternatives – Three Dam Removal Alternative – Aquatic Resources – Fish Passage* Potential Impact 3.3-14 has been clarified to compare to existing conditions. Please refer to Volume III Section 4.6.3.8 *Alternatives – Three Dam Removal Alternative – Aquatic Resources – Fish Passage* for the revisions.

Comment ORG46-470

The DEIR states that "The areas downstream of the Trinity River confluence do not currently support Anodonta spp. and are unlikely to in the future (Davis et al. 2013)." The DEIR should clarify why the salvage and relocation plan considers these sites.

Response to Comment ORG46-470

Section 4.6.3.8 *Alternatives –Three Dam Removal – Aquatic Resources – Fish Passage* Potential Impact 3.3-19 has been revised to clarify the analysis regarding freshwater mussels. Please refer to Volume III Attachment 1 Section 4.6.3.8 *Alternatives –Three Dam Removal – Aquatic Resources – Fish Passage* for the revisions. Aquatic Resource Measure AR-7, as described in the Definite Plan, is intended to benefit all species of freshwater mussels, not just *Anodonta spp*. Therefore, while the EIR is clear that relocation locations downstream of Trinity River would not benefit *Anodonta spp*., other species of mussels would benefit. The revised text clarifies this dynamic. The analysis is also clear that impacts from sediment deposition following dam removal are predicted to be short (< 1 year) in duration, and the re-formation of river channel that would occur following the removal of Iron Gate Dam is expected to have long term benefits for *Anodonta spp., M. falcata, G. angulate,* and freshwater clams by providing more suitable substrates (i.e., large gravel, cobble, and boulder) than currently exists, especially within the current reservoir reaches.

Comment ORG46-471

In this paragraph, the DEIR concludes that a "...significant impact to the Anodonta spp. population under the Three Dam Removal Alternative in the short term." However, this seems to conflict with the DEIR conclusion in the following paragraph that "impacts would be not significant with for Anodonta spp. in the short term." The DEIR needs to be revised to indicate if this impact is significant or not in the short term.

Response to Comment ORG46-471
Please refer to response to comment ORG46-470.

Comment ORG46-472
Only short-term effects are discussed in the text above (see comment 4.6-7), yet a conclusion is drawn for long-term impacts. The DEIR needs to be consistent in how the long-term effects of the different alternatives are analyzed.

Response to Comment ORG46-472
Please refer to response to comment ORG46-470 for a discussion of revisions to Section 4.6.3.8 *Alternatives –Three Dam Removal – Aquatic Resources – Fish Passage* to clarify the analysis regarding freshwater mussels. Please note that these revisions include the clarification that the re-formation of the Klamath River channel that would occur following the removal of Iron Gate Dam is expected to have long term benefits for *Anodonta spp., M. falcata, G. angulate,* and freshwater clams by providing more suitable substrates (i.e., large gravel, cobble, and boulder) than currently exists, especially within the current reservoir reaches. Please refer to Volume III Attachment 1 Section 4.6.3.8 *Alternatives –Three Dam Removal – Aquatic Resources – Fish Passage* for the revisions.

Comment ORG46-473
There are no data or analyses presented to support the DEIR statement that "The potential for flood disturbance further downstream along the Klamath River would not be different under this alternative from that described for the Proposed Project (Potential Impact 3.12-3) since Copco No. 1, Copco No. 2, and Iron Gate dams would still be removed." Known quantifiable data associated with each alternative, study area, or resource type (e.g., tribal, historic period archaeological, historic built environment) are missing from this discussion.

Response to Comment ORG46-473
Section 4.6.12 *Alternatives – Three Dam Removal Alternative – Historical Resources and Tribal Cultural Resources* has been revised to clarify that the analysis is referring to the potential for flood disturbance of known or unknown historical and/or tribal cultural resources, as described under the Proposed Project. Please refer to Volume III Attachment 1 Section 4.6.12 *Alternatives – Three Dam Removal Alternative – Historical Resources and Tribal Cultural Resources* for the revisions.

Comment ORG46-474
See other comments (see Major Issue 2.8 and comment 3.3-28) related to C. shasta and the infectious zone downstream of Iron Gate Hatchery.

Response to Comment ORG46-474
Please refer to response to comment ORG46-185, and to response to comment ORG46-16. Please also refer to Master Responses AQF-5 and AQF-6.

Comment ORG46-475

The DEIR asserts that there are adverse effects from competition of hatchery Chinook with natural origin fish yet provides no information to support this claim (see comment 3.3-92).

Response to Comment ORG46-475

Please refer to Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Fish Hatcheries* for a summary of available information, including recent scientific literature, on the effects of competition between hatchery Chinook salmon and natural origin fish. Please refer to Volume III Attachment 1 Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Fish Hatcheries* for the revisions.

Comment ORG46-476

The DEIR indicates that aquatic resource measure AR-6 (Suckers) is included in this alternative. Given that this impact is not considered significant, it is unclear why this measure is included, perhaps it is required for Fish and Game Code 2081.11 under CEQA although CDFW has not made a final determination as to whether this measure meets the standards for take authorization under Fish and Game Code, section 2081.11.

Response to Comment ORG46-476

Resource measures can be implemented to further reduce effects, even when impacts are not predicted to be significant. Please also refer to responses to comments ORG46-456, ORG46-257, ORG46-467, and Master Response CEQ-2.

Comment ORG46-477

Most recent and best available information regarding spawning Coho downstream of Iron Gate Dam does not support the DEIR's assertion that Coho have a wide distribution in the tributaries (see MKWC 2016, 2017, 2018). The data indicates that there perhaps less than 1,000 adult Coho annually in the mainstem and the tributaries from Portuguese Creek to Iron Gate Dam including the Scott and Shasta rivers (see Major Issue 2.1).

Response to Comment ORG46-477

Please refer to response to comment ORG46-164 for a discussion of the available data supporting that coho salmon are widely distributed downstream of Iron Gate Dam. As clarification, the citations have been added to the Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species – Coho salmon. Please* refer to Volume III Attachment 1 Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species – Coho salmon* for the revisions.

Comment ORG46-478

See Major Issue 2.1 as it relates to the upper Klamath Coho population, hatchery production, etc. The DEIR acknowledges that hatchery Coho have made up over 5O percent of the upper Klamath population, but does not characterize the loss of this integrated population as a significant impact.

Response to Comment ORG46-478

Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-9 evaluates of the loss of hatchery production on coho salmon adults from the Upper Klamath River Population Unit, and the broader coho salmon population the Klamath River Basin. To the extent this comment refers to comments earlier in the comment letter, please refer to the responses to those comments – ORG46-2 through ORG46-5.

Please refer to Master Response AQF-9 for a discussion of significance criteria and associated text edits to the EIR.

Comment ORG46-479

The DEIR states that hatchery Coho are somehow of less value than natural origin fish even though the hatchery is managed as an integrated part of the Coho population through the HGMP (CDFW and PacifiCorp 2012). Because this hatchery program is integrated with the upper Klamath population, the loss of the hatchery program should be given appropriate consideration. The DEIR makes the assertion that returning hatchery adults do not contribute to the sustainability of the naturally reproducing population after previously stating that adult hatchery Coho stray into Bogus Creek and the Shasta River at relatively high percentages (about 50 percent according to the data (see Chesney and Knechtle 2017 and Knechtle and Giudice 2918a)), presumably to spawn naturally and contribute to the natural-origin populations.

Response to Comment ORG46-479

Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Fish Hatcheries* and Volume I Section 4.7.3 *Alternatives – No Hatchery Alternative – Aquatic Resources* (page 4-311), includes discussion of the contribution of hatchery strays to the abundance of the natural coho salmon population under existing conditions, and the predicted outcome of removing hatchery operations. It further discusses the context of loss of hatchery production, noting that the reduction in natural population is not equivalent to the reduction in total population from loss of the hatchery, because most of the hatchery fish return to the hatchery, rather than straying (which would increase the numbers of naturally-spawning fish). The section does not, as the comment states, assert that the fish do not contribute to the natural population. The section reflects the conservation value of coho produced at Iron Gate Hatchery, per the Hatchery Genetics Management Plan (HGMP). The EIR reflects that the HGMP clearly describes the value of naturally produced coho in terms of fitness, demographic risk to the population, and life

history diversity. In addition, the HGMP describes the potential impacts of hatchery-origin fish, including those produced for conservation.

Comment ORG46-480

Diversions from Bogus and Fall creeks that would not occur under the No Hatchery Alternative should be addressed here. Text should describe how the restoration of those diversions to their respective creeks would affect resources including aquatic and agricultural resources.

Response to Comment ORG46-480

As stated in the referenced text Volume I Section 4.7.15 *No Hatchery Alternative – Agriculture and Forestry Resources* (page 4-320), there is no change to agricultural resources between the Proposed Project and the No Hatchery Alternative, because the Proposed Project's diversions on Bogus Creek and Fall Creek would not impact agricultural resources.

Effects on aquatic resources of the No Hatchery Alternative are addressed in Volume I Section 4.7.3 *[No Hatchery Alternative – Aquatic Resources* (pages 4-304 to 4-313), and has been revised in Volume III Section 4.7.3 to specifically include mention that the effects of diversions from Bogus and Fall Creeks will not occur.

Iron Gate Hatchery currently receives water from Iron Gate Reservoir, not Bogus Creek. Under the No Hatchery Alternative, Iron Gate Hatchery would close and there would be no need to initiate diversion from Bogus Creek. Therefore, there would be no change in Bogus Creek from the current condition and no impact under the No Hatchery Alternative. California Department of Fish and Wildlife (CDFW) currently maintains flow through the Fall Creek Hatchery (FCH), even though no fish have been reared there since 2003. This existing diversion is expected to continue under the No Hatchery Alternative, which would result in no anticipated changes to aquatic resources in Fall Creek.

Comment ORG46-481

The discussion of fish production as it relates to retention of recreational fisheries following removal of hatcheries in the upper basin is overly optimistic and not supported by the record. Iron Gate Hatchery currently provides on average 28,000 fall-run Chinook for the recreation and tribal fisheries (CASHRG 2012). Under the Proposed Project fall-run Chinook production would be reduced, but still contribute to these fisheries although at a reduced rate. Under the No Hatchery Alternative, it is unlikely that the habitat upstream of Iron Gate Dam would generate this same number of fish in any reasonable timeframe (see comment 3.3-42) such that there would not be a substantial reduction in adult fall-run Chinook available for harvest or even a season during which to harvest these fish. The DEIR should present an actual analysis of this alternative in relation to potential adult returns and their availability for harvest.

Response to Comment ORG46-481
As cited in the text the comment references, Volume I Section 4.7.3 *Alternatives – No Hatchery Alternative – Aquatic Resources* Potential Impact 3.3-7 (pages 4-306 to 4-308) provides an analysis of fall-run Chinook salmon abundance, including effects on salmon available for harvest under the No Hatchery Alternative. The text the comment references further discloses that fewer Chinook salmon would be available for recreational harvest and evaluates the impact of this reduction on recreation.

Comment ORG46-482
Benefits and costs should be listed separately instead of together in one list. Mixing benefits and costs is confusing. Additionally, some benefits are placed in the list while others are cited in the DEIR text.

Response to Comment ORG46-482
Comment noted. Please note that CEQA documents analyze significant effects on the physical environment. CEQA does not address potential social or economic effects from implementing a project. (CEQA Guidelines, § 15131(a).) However, to inform the public and decisionmakers regarding the potential economic consequences of the proposed project, Section 5.4.1 *Consideration of Economic Information for Resources Potentially Affected by Dam Removal* (pages 5-4 to 5-11) summarizes the results of prior economic studies conducted by the U.S. Department of the Interior (DOI) to characterize potential costs and benefits for a number of topics.

Comment ORG46-483
The DEIR presents a list of benefits for a variety of topics from a USBR (2012) study and includes "Hydroelectric energy costs" on that list when in fact, "Hydroelectric energy costs" are not on the USBR (2012) list. Instead, the USBR (2012) study includes costs associated with the loss of hydropower benefits as "Foregone Hydropower Benefits" and are discussed under costs. The DEIR needs to clarify the source for its "Hydroelectric energy costs" or clarify the terminology.

Response to Comment ORG46-483
The referenced list in Volume I Section 5.4.1 *Other Required CEQA Discussion and Consideration of Social and Economic Factors – Social and Economic Factors Under CEQA – Consideration of Economic information for Resources Potentially Affected by Dam Removal* (page 5-4), paragraph 1 includes a list of cost and benefit topics, which include energy costs. Hydroelectric energy costs were subsequently not included in a statement associated with benefits, and paragraph 2 on page 5-4 acknowledges the USBR (2012b) and DOI Real Estate Sub-Team (2012) economic studies that determined direct dam removal costs, which included forgone costs to hydropower. As further discussed, "Benefits were identified for irrigated agriculture, commercial fishing, ocean sport fishing, in-river sport fishing, tribal fisheries and cultural values, refuge recreation,

nonuse values (e.g., desire to preserve ecosystems, altruism towards plants and animals), and real estate. Benefits to tribal fisheries and cultural values, the wildlife viewing component of refuge recreation, and real estate were not quantified in economic terms in USBR (2012b)."

Comment ORG46-484

The DEIR states "USBR (2012) reported that the removal of the dams and associated facilities would likely increase the viability of the SONCC coho ESU in the Klamath Basin." The DEIR also states, "Following dam removal, harvests would be larger because of increased abundance of salmon, which would in turn, increase commercial fishing revenues." The DEIR also states "The USBR (2012) quantitative economic analysis relied heavily on the Evaluation of Dam Removal and Restoration of Anadromy (EDRRA) model." Although not explicitly cited in this section of the DEIR, it appears that the referenced EDRRA modeling is as presented by Hendrix (2011). Several issues have been raised in these comments with the Hendrix (2011) EDRRA modeling (see Major Issue 2.6, comments 3.3-66, 3.3-76, and 3.3-86 to 3.3-97). These issues call into question the abundance and productivity estimates of salmon derived from the Hendrix (2011) EDRRA modeling that are used in the USBR (2012) quantitative economic analysis cited in the DEIR.

Response to Comment ORG46-484

The EIR explicitly describes the derivation of the Evaluation of Dam Removal and Restoration of Anadromy (EDRRA) modeling (i.e., Hendrix 2011) in Potential Impact 3.3-7. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*. In regard to abundance and productivity estimates of salmon derived from the EDRRA modeling, please refer to Master Response AQF-8.

Comment ORG46-485

The statement "dam and facilities removal was estimated by USBR (2012) to provide an additional 11 to 218 commercial fishing industry jobs within the five management areas" is confusing in stating the number of jobs created as it implies that this is a range of the total number of jobs created. The sentence should be revised in a manner consistent with the USBR (2012) study, which shows the following jobs for each of the five management areas:

- *San Francisco Management Area: 218*
- *Fort Bragg Management Area: 69*
- *KMZ-CA: 19*
- *KMZ-OR: 11*
- *Central Oregon Management Area: 136*

See page 2-7 of the Benefit Cost and Regional Economic Development Technical Report (USBR 2012b).

Response to Comment ORG46-485
Section 5.4.1.1 *Social and Economic Factors Under CEQA – Commercial Fishing* has been clarified in Volume III Attachment 1 as requested. Please refer to Volume III Attachment 1 Section 5.4.1.1 *Social and Economic Factors Under CEQA – Commercial Fishing* for the revisions.

Comment ORG46-486
The annual net revenue benefit estimate of $267,131 is not shown in Table 1.1-2 of the USBR document (USBR 2012b) for the KMZ-CA portion. That document shows a value of $381,396 for this management area. This number needs to be corrected or the DEIR needs to otherwise explain how this other value was developed. See page 1-13 of the Benefit Cost and Regional Economic Development Technical Report (USBR 2012b).

Response to Comment ORG46-486
Section 5.4.1.1 *Other Required CEQA Discussion and Consideration of Social and Economic Factors – Social and Economic Factors Under CEQA – Commercial Fishing* has been revised in Volume III Attachment 1 to correct the KMZ-CA portion of the annual net revenue benefit. Please refer to Volume III Attachment 1 Section 5.4.1.1 *Other Required CEQA Discussion and Consideration of Social and Economic Factors – Social and Economic Factors Under CEQA – Commercial Fishing* for the revisions.

Comment ORG46-487
The DEIR states the following conclusions:

> *"For the reasons discussed in this EIR i n Section 3.3.5 Aquatic Resource Impacts, the KRRC' s Proposed Project would be beneficial for populations of fall-run Chinook salmon (Potential Impact 3.3-7), spring-run Chinook salmon (Potential Impact 3.3-8), and coho salmon (Potential Impact 3.3-9). Although some aspects of the KRRC's Proposed Project are different from the dam removal scenarios analyzed in the USBR/DOI economic analyses, the primary assumptions regarding the effects of dam removal on coho and Chinook salmon have remained the same, such that the prior economic indication of the benefits of dam removal to commercial fisheries also informs consideration in this EIR that dam removal would advance the long-term restoration of natural fish populations in the Klamath Basin, including having a significant beneficial effect on commercial fisheries and an associated significant beneficial economic impact on the coastal commercial fishing industry."*

These conclusions are incorrect in that the dam removal scenarios analyzed in the USBR (2012b) economic analysis included in the analysis one fundamental assumption regarding the effects of dam removal on Coho and Chinook salmon that is no longer valid. Specifically, the Proposed Action dam removal scenario in the USBR (2012b) analysis included not only dam removal but also the entirety

of the KBRA programs and actions as a fully connected action. However, the KBRA expired in 2012 due to inaction in the U.S. Congress. The Upper Klamath Basin Comprehensive Agreement (UKBCA) also was inactivated due to the absence of funding that resulted from the KBRA's expiration. The expiration of the KBRA caused uncertain ty in moving forward with the KHSA and UKBCA, which prompted the KHSA Parties to renegotiate and sign an amended KHSA in April 2016.

The fact that the KBRA is expired and unlikely to be resuscitated indicates that a key assumption of the USBR (2012b) analysis regarding the effects of dam removal on Coho and Chinook salmon is no longer applicable. Because this key assumption of the USBR (2012b) analysis is no longer valid, the findings for the USBR (2012b) economic analysis regarding the effects of dam removal on Coho and Chinook salmon lack accuracy to support of DEIR conclusions.

Response to Comment ORG46-487
As noted in the referenced paragraph, Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-7, 3.3-8, and 3.3-9 describe predicted increase in fall-run Chinook salmon, spring-run Chinook salmon, and coho salmon. Thus, the primary assumptions of increased fish populations supporting economic benefits remains under the Proposed Project without the full range of Klamath Basin Restoration Agreement (KBRA) actions contemplated in USBR 2012. Please refer to Volume III Attachment 1 for final Section 3.3 *Aquatic Resources*. Please also refer to Master Response AQF-8 for a discussion of predictions of increased fall-run Chinook salmon abundance. Please note that there is currently not a commercial harvest for spring-run Chinook salmon or coho salmon.

Comment ORG46-488
The second sentence beginning with "USBR (2012) qualitatively assessed dam removal..." is not explicit in stating that the short-term declines in real estate values were those associated with properties adjacent to J.C. Boyle, Copco, or Iron Gate reservoirs. Given the potential effects on property values around the reservoirs, this section should be revised. See page 1-42 of the Benefit Cost and Regional Economic Development Technical Report (USBR 2012b).

Response to Comment ORG46-488
Section 5.4.1.3 *Social and Economic Factors Under CEQA – Consideration of Economic Information for Resources Potentially Affected by Dam Removal – Real Estate and Property Taxes* has been revised in Volume III Attachment 1 to clarify that the potential short-term decline in real estate values would be associated with parcels surrounding the reservoirs. Please refer to Volume III Attachment 1 Section 5.4.1.3 *Social and Economic Factors Under CEQA – Consideration of Economic Information for Resources Potentially Affected by Dam Removal – Real Estate and Property Taxes* for the revisions.

Comment ORG46-489

The sentence "For other parcels downstream of Iron Gate Dam, U5BR (2012) indicated that improvements of water quality could lead to increased real estate values in the long term" needs to be explicit that it is talking about riverine parcels and that the water quality improvements are detectable and important to property owners. See page 1-42 of the Benefit Cost and Regional Economic Development Technical Report (USBR 2012b).

Response to Comment ORG46-489

Section 5.4.1.3 *Social and Economic Factors Under CEQA – Consideration of Economic Information for Resources Potentially Affected by Dam Removal – Real Estate and Property Taxes* has been clarified as requested. Please refer to Volume III Attachment 1 Section 5.4.1.3 *Social and Economic Factors Under CEQA – Consideration of Economic Information for Resources Potentially Affected by Dam Removal – Real Estate and Property Taxes* for the revisions.

Comment ORG46-490

According to the following paragraph from the DEIR, an updated records search was conducted in 2018:

"In response to the delineation of a preliminary APE, KRRC initiated an expanded records search in 2018 for an area encompassing a 0.5-mile wide zone on either side of the Klamath River from below Humbug Creek to the mouth of the river at the Pacific Ocean, in California. KRRC will incorporate results of the 2018 expanded records search for California into future reports and are not reflected in the discussion and tables provided below."

The DEIR only includes records search data from 2017 (see DEIR pg. 3-806). The 2018 data are available on known cultural resources (e.g., tribal, historic-period archaeological, historic built environment resources), and any other relevant findings from the recent KRRC studies may provide additional detail on significant impacts to cultural resources and allow for the identification and development of specific mitigation measures. This information should be included in the DEIR and the cultural resources impact analysis should be amended.

Response to Comment ORG46-490

Section 3.12.2.3 *Historical Resources and Tribal Cultural Resources – Environmental Setting – Known Tribal and Historical Resources in the Vicinity of the Proposed Project* has been revised to clarify complete versus incomplete inventory efforts. Please refer to Volume III Attachment 1 Section 3.12 *Historical Resources and Tribal Cultural Resources – Potential Impacts and Mitigation* for the revisions.

Additionally, although previously stated in various locations throughout the EIR, the introductory text of Section 3.12 *Historical Resources and Tribal Cultural*

Resources has been clarified to acknowledge that not all of the required cultural resources inventory and significance analysis would be completed prior to certification of the Final EIR.

The decision regarding whether to update record search data or conduct additional surveys would be made during pre-survey record searches and outreach with local tribes (see Mitigation Measure TCR-1). Site form updates would be completed in the context of significance evaluations for sites not previously evaluated, or when formulating site-specific mitigation measures.

Please also refer to response to comment ORG46-299.

Comment ORG46-491

The following excerpt suggests that an archaeological inventory covering 100 percent of the designated areas will be conducted: "Any archaeological inventory to be conducted for the Project will include100 percent, intensive-level survey of designated areas. The inventory will employ a standard systematic pedestrian survey following the appropriate Oregon and California survey and reporting standards, tailored if appropriate to meet any specific federal land management agency guidelines." Archaeological inventories typically represent a sample survey where archaeologists walk systematic intervals and/or excavate systematic shovel scrapes/shovel tests as part of a sample inventory effort. Given the scale of the Proposed Project, a commitment to survey and inventory 100 percent of designated area(s) would be very costly and may not be completed in compliance with state standards. Because this inventory may not be possible to conduct in compliance with state standards, the identification of potential impacts to cultural resources is not complete and the proposed investigations necessary to develop appropriate mitigation are not feasible.

Response to Comment ORG46-491

The commenter is providing its interpretations of a portion of the Klamath River Renewal Corporation's (KRRC's) Definite Plan (Appendix B of the Draft EIR), specifically Definite Plan Appendix L and the KRRC's proposed archaeological inventory survey methods. The commenter interprets the statement "…the Project will include 100 percent, intensive-level survey of designated areas" to mean that 100 percent of the ground will be surveyed within these designated areas. The commenter's interpretation is not an accurate reading of the statement. Rather, the KRRC is stating that 100 percent of all designated areas will be surveyed using an intensive-level survey approach. The commenter is referring to Section 6.2.4, paragraph 1 of Appendix L, with states that inventory of parcels will employ standard transect spacing of 15 meter or less which is consistent with Oregon and California survey and reporting standards. In paragraph 2 of the same section, it states that the KRRC will conduct surveys in accordance with Guidelines for Conducting Field Archaeology in Oregon, published by the Oregon State Historic Preservation Office, and, in California, by the guidelines provided by the California Department of Historic Preservation.

On lands managed by federal agencies, KRRC will follow methods prescribed by the United States Forest Service (USFS) and the Bureau of Land Management (BLM). Following these state and federal standards, KRRC is committed to surveying all designated areas using standard transect interval spacing. This standard survey methodology proposed is sufficient for the identification of potential impacts to cultural resources.

Comment ORG46-492

Under federal law, a Programmatic Agreement (PA) can defer nearly all aspects of identification, evaluation, assessment of effects, and mitigation; however, this is not an acceptable approach for CEQA because it defers making a determination of significance and committing to adopt mitigation measures to reduce the significance of the impact. According to the following statement in DEIR Appendix L, the PA and Historic Properties Management Plan (HPMP) are intended to support compliance with CEQA: "KRRC will produce a number of management plans and agreements to support the Project's Section 106, CEQA, and AB-52's compliance efforts. The documents currently planned include a HPMP, Programmatic Agreement, Inadvertent Discovery Plan, Plan of Action for the treatment of human remains, and a Cultural Resources Monitoring Plan."

Response to Comment ORG46-492

The commenter is providing comments on the Klamath River Renewal Corporation's (KRRC's) Definite Plan (Volume II Appendix B), specifically Definite Plan Appendix L and the KRRC's plans for developing a Historic Properties Management Plan (HPMP), Programmatic Agreement, Inadvertent Discovery Plan (IDP), Plan of Action for the treatment of human remains, and a Cultural Resources Monitoring Plan.

Please refer to Section 3.12.5 *Historical Resources and Tribal Cultural Resources – Potential Impacts and Mitigation* for a list of potential impacts, impact analysis, and mitigation measures pertaining to the historical and tribal cultural resources. Please see Volume III Attachment 1 for the final Section 3.12 *Historical Resources and Tribal Cultural Resources*.

Please also refer to Master Response CEQ-2 and response to comment LA9-78.

Comment ORG46-493

The introduction makes the same unsupported assertions as the body of the DEIR in stating that 80 percent of the reservoir sediments are expected to reach the Pacific Ocean (see Major Issue 2.4 and comment ES.3 and 2.16).

Response to Comment ORG46-493

Regarding sediment transport modeling and fine sediment erosion, transport, and deposition, please refer to Master Response GEO-1. For any more specific comments from the body of the EIR, please see responses to those comments.

Comment ORG46-494

The assertion that the 2013 BiOp flows are 'sufficiently similar' to the 2010 BiOp flows and the KBRA flows as related to modeling results from USBR (2012a) is not adequately supported (see Major Issue 2.2 and comment 3.3-46).

Response to Comment ORG46-494

Volume II Appendix E *An Analysis of Potential Suspended Sediment Effects on Anadromous Fish in the Klamath Basin* Section E.2 *Methods* and Section E.2.2.1 *Methods – Using the Model to Predict Suspended Sediment Concentrations – Range of Conditions Assessed* have been revised to clarify where the comparative analysis of the 2013 BiOp Flows and the 2010 BiOp Flows can be found in the EIR and to incorporate the 2019 BiOp Flows into the analysis. Please refer to Volume III Attachment 1 Appendix E Section E.2 *Methods* and Section E.2.2.1 *Methods – Using the Model to Predict Suspended Sediment Concentrations – Range of Conditions Assessed* for the revisions.

Additionally, Section 4.2.1.1 *Alternatives – No Project Alternative – Introduction – Alternative Description – Summary of Available Hydrology Information for the No Project Alternative* has been revised to include a brief summary of the 2010 BiOp Flows and a comparison between 2010 BiOp Flows and 2013 and 2019 BiOp Flows that focuses on flow differences that would inform the analysis of potential suspended sediment effects on fish under the existing condition/No Project Alternative (see also Appendix E), since no other analysis in this EIR uses USBR (2012a) model output for the existing condition/No Project Alternative. Please refer to Volume III Attachment 1 Section 4.2.1.1 *Alternatives – No Project Alternative – Introduction – Alternative Description – Summary of Available Hydrology Information for the No Project Alternative* for the revisions.

Comment ORG46-495

The DEIR states that "The implication for this analysis is that predictions of impacts may be slightly higher than would occur with the faster drawdown rate under the Proposed Project." The USBR (2012) modeling does not take sediment jetting into account which may raise suspended sediment concentrations. The analysis should be updated to reflect the actual Proposed Project and hydrology conditions that can be reasonably expected to exist (e.g., 2013 BiOp or perhaps even 2019 BiOp flows) (see Major Issue 2.4 and comment USBR-2012-C).

Response to Comment ORG46-495

With regard to sediment jetting, please see response to comment ORG46-132 and LA9-69.

With regard to Proposed Project hydrology, please refer to Master Response HYD-1.

Comment ORG46-496

The DEIR states that (emphasis added): "The model was used to predict the magnitude and duration of SSCs for discrete calendar-year periods corresponding to each species' life history stages. These periods could not overlap in order to ovoid erroneously accounting for on event's Impact on two separate life stages of a cohort at the same time, which is impossible (e.g., a pulse of suspended sediment in March cannot simultaneously affect rearing juveniles and outmigrating smolts of the same cohort, but can simultaneously affect different life history stages of different species such as adult migrants of one species and smolts of another. For predicting potential SSC impacts to species identified above, the model evaluated each species and its life history stages separately."

The italicized sentence is an oversimplification of fish life cycles. Not all members of a cohort behave the same, some may migrate others may not. In the example provided, the March sediment pulse could impact both migrants and resident life stages. The modeling of suspended impacts on fish needs to be updated to more accurately reflect the life stages effected and the hydrology present.

Response to Comment ORG46-496

As described in the approach to analyzing the effects of suspended sediment on aquatic resources in Volume II Appendix E Section E.2.2 *Methods – Using the Model to Predict Suspended Sediment Concentrations*, analysis of the potential impacts due to elevated suspended sediment concentrations (SSCs) during reservoir drawdown considers that not all members of a cohort behave the same way during any one period of time; some may migrate while others may not. For example, the analysis of impacts to fall-run Chinook salmon juveniles takes into account the proportion of the cohort during spring that migrates (Type I life history), and the proportion that does not migrate until the following fall (Type II life history) (Volume II Appendix E, Table E-2). In applying this approach for impacts to a cohort in a specific time period, the EIR model does not "double count" impacts and instead considers impacts to the cohort as a whole, based on the proportion of each life history occurring within the relevant time period. In the above example, impacts during spring are considered for migrating Type I life history, as well as Type II and Type III life histories that would not migrate during that time.

Comment ORG46-497

These scenarios are reasonable but should be expressed simply as 10th, 50th, and 90th exceedance scenarios only. Using terms like 'mild' and 'extreme' is a judgement and modifies the readers perception of effects. Even the median conditions discussion states that these are "conditions that most often occur for each species and life stage..." but in reality, the median simply represents an equal probability that conditions will be different in either direction, not conditions that occur most often.

Response to Comment ORG46-497
The names used for each scenario analyzed in Volume II Appendix E.2.2.1 *Methods – Using the Model to Predict Suspended Sediment Concentrations – Range of Conditions Assessed* were selected to communicate to the reader what the occurrence probabilities mean. Each scenario equates to a relative probability of occurrence – 10th, 50th and 90th exceedance scenarios – and the EIR includes these definitions for readers conversant with those statistical terms. Here, the exceedance scenarios relate directly to the severity of the effect. Therefore, "mild conditions for fish" are literally "mild" in comparison to "extreme conditions for fish," and both are rare (low probability of occurrence) in comparison with the "median conditions" for fish scenario. This characterization leads to greater accessibility for probability-based modeling.

Comment ORG46-498
The data used to describe the distribution of different life history strategies for fall-run Chinook is from 2000. At the very least this information should be verified to ensure that the timing still represents the population and if it does not the DEIR should be updated to reflect any shifts in timing.

Response to Comment ORG46-498
Volume II Appendix E.3.1.1 *Results – Existing Conditions – Fall-run Chinook Salmon* (pages E-12 to E-14) includes a summary of relevant fall-run Chinook salmon life history information based on the best available and most current scientific and factual data. In some instances, the summary is based on data collected in the early 2000's (e.g., Scheiff et al. 2001, Magneson 2006), and it has been updated with more recent data where appropriate (e.g., Jetter and Chesney 2016).

Comment ORG46-499
It is not unreasonable to expect that hatcheries have an influence on populations near the hatchery (e.g., hatchery fish straying into Bogus Creek or the Shasta River from Iron Gate Hatchery). However, Coho spawning surveys in tributaries downstream of Iron Gate Dam have found one hatchery Coho carcass in 4 years of surveys (MKWC 2016, 2017, 2018, 2019 in progress).

Response to Comment ORG46-499
Regarding the influence of adult hatchery salmon strays that return to Iron Gate Hatchery on the coho salmon impacts analysis, please refer to response to comment ORG46-189.

Comment ORG46-500
It is extremely difficult to follow the discussion of juvenile Coho rearing and outmigration life history patterns as presented in the DEIR. This is important because these are the Coho life stages especially susceptible to impacts from suspended sediments generated by the Proposed Project.

Response to Comment ORG46-500
Volume I Appendix E Section E.3.1.3 provides a summary of the best available and most current scientific and factual data on coho salmon from the Klamath River Basin. The Appendix aims to prepare this technical information in a clear, concise, and understandable manner.

Comment ORG46-501
Coho rearing in off-channel habitats of the Klamath River would be impacted by suspended sediments, it ap pears that the DEIR is referring to off-channel rearing in the tributaries.

Response to Comment ORG46-501
As described in Volume II Appendix E Section E.3.1.3 *Coho Salmon* (page E-20), juvenile coho salmon using off-channel habitats during the winter appear to be seeking refuge from high water velocities and high suspended sediment loads. As clarification, additional detail has been added. Please refer to Volume III Appendix E Section E.3.1.3 *Coho Salmon* for the revisions.

Comment ORG46-502
The DEIR states that "After the first year following dam removal, the flow will be confined with in the historical main channel and no longer be able to access the remaining fine sediment left on the floodplain, unless an extremely high flood event is to occur." This is a confusing statement. It appears to reference the stream channel within the former reservoir areas. While the assumption may be true, the analysis does not seem to allow for increased erosion from winter rains on the reservoir sediments (which would seem likely to erode at a higher rate than adjacent soils even following revegetation), high-flow scour, bank failure, or shifts in channel alignment within the former reservoirs.

The DEIR states that increases in suspended sediment concentrations as a result of higher flow events that may erode reservoir deposits would be insignificant, but does not offer any justification for this conclusion.

Response to Comment ORG46-502
The statement quoted in the comment is from Volume II Appendix E: *An Analysis of Potential Suspended Sediment Effects on Anadromous Fish in the Klamath Basin* – Section E.3.2 *Proposed Project*. A more comprehensive discussion of the potential for reservoir sediment erosion following dam removal is provided in Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 (pages 3-765 to 3-770), which is partially modified in Volume III Attachment 1. Please also refer to Volume III Attachment 1 Section 3.2.5 *Water Quality – Potential Impacts and Mitigation* Potential Impact 3.2-3 for analysis of the suspended sediment concentrations (SSCs) under dam removal conditions. Additionally, the response to comment ORG46-8 explains that after the initial reservoir drawdown, the greatest potential

for bank slumping, gullying of reservoir sediments, and associated secondary erosion would occur in the short-term period (within two years of dam removal) following sub-aerial exposure of the reservoir sediments, as a surface runoff network establishes in the reservoir sediment deposits, connecting with existing and historic channels. Consolidation of the remaining reservoir sediment deposits (USBR 2012c), along with intensive hydroseeding (see Volume II Appendix B Section 6.1.1 of the *Definite Plan – Measures to Manage Remaining Sediment*), means that elevated concentrations of suspended sediments, with potential to impact water quality and aquatic species, are not expected to occur in the longer term. Downstream of the reservoirs, Master Response GEO-1 explains that the flow of water and sediment is expected to follow existing and historic channels, which are reasonably confined and have sufficient width-depth ratios to allow for the predicted sediment deposition to occur primarily within the channel.

Appendix E: *An Analysis of Potential Suspended Sediment Effects on Anadromous Fish in the Klamath Basin* Section E.3.2 *Proposed Project* has been clarified in Volume III Attachment 1 to relate to SSCs, which are relevant to fish impacts. Please refer to Volume III Attachment 1 Appendix E: *An Analysis of Potential Suspended Sediment Effects on Anadromous Fish in the Klamath Basin* Section E.3.2 *Proposed Project* for the revisions. Additionally, please refer to response to comment ORG46-134 for further clarification of the potential for elevated SSCs following dam removal.

Comment ORG46-503

The DEIR text incorrectly refers to December 15 as the start of the drawdown.

Response to Comment ORG46-503

Volume II Appendix E Section E.3.2.3 *Proposed Project – Coho Salmon* has been revised to clarify timing of reservoir drawdown under the Proposed Project. Please refer to Volume III Attachment 1 Appendix E Section E.3.2.3 *Proposed Project – Coho Salmon* for the revisions.

Comment ORG46-504

The DEIR does not present a clear discussion of why sediment impacts on the age 1+ outmigrating Coho would be less under the Proposed Project than existing conditions. These fish would be arriving in the mainstem Klamath River from tributaries early in 2021, the year in which drawdown would be occurring and sediment loads would be at their highest levels.

The DEIR indicates that about 44 percent of Coho migrate from February–March with the remainder migrating from April–June. While the DEIR clearly states that Coho smolts were assumed to migrate during periods of lowest suspended sediment, it does not indicate if those relative percentages of the population that migrate were shifted into periods of relatively lower suspended sediments loads throughout the entire migration window or just within their relative timeframe. In

other words, did the analysis assume that all 44 percent of those early migrating smolts wait until April or May or did they migrate during periods of lower suspended sediment loads in their normal migration window? If they waited until April or May, where did they reside, what was the impact of that delayed migration on their overall survival? If they waited for periods of relatively lower sediment loads during their normal migration window, how much lower were those sediment loads and what were the impacts to those fish?

By using percentages of the population affected by the Proposed Project, the DEIR obscures the actual impact to Chinook and Coho from the Proposed Project. There is a wealth of downstream migrant trapping data for Chinook and Coho from the mainstem Klamath River that could be used to improve this analysis and connect the impacts of the Proposed Project to actual numbers of fish. These two tables and the two tables associated with Chinook would be vastly improved if they were connected to actual fish numbers like was done for the Steelhead tables (see Table E-12, for example).

Response to Comment ORG46-504

With respect to the Severity Index (SEV) results under the Proposed Project in comparison to Existing conditions (EC), the apparent contradiction was the result of a minor calculation error in the SEV in Table E-4 for age 1 juvenile coho salmon outmigrants under existing conditions, Volume II Appendix E Section E.3.1.3 *Results – Existing Conditions – Coho Salmon* Table E-4 has been revised to correct the estimates. The corrections do not change any significance determinations. Please refer to Volume III Attachment 1 Appendix E Section E.3.1.3 *Results – Existing Conditions – Coho Salmon* for the revisions.

With respect to the suspended sediment concentration (SSC) impact assessment and the assessment of juvenile coho salmon outmigration timing, as discussed in Volume II Appendix E Section E.3.2.3 *Results – Coho Salmon* (page E-38), numerous field and laboratory studies have shown that juvenile salmonids actively avoid exposure to high (greater than 150 milligrams per liter [mg/L]) SSCs, including altering migratory patterns to seek lower turbidity (Bisson and Bilby 1982, Berg and Northcote 1985, Redding et al. 1987, Servizi and Martens 1992, Bash et al. 2001, Carlson et al. 2001, Kemp et al. 2011, Kjelland et al. 2015). Therefore, the EIR analysis assumes that coho salmon outmigration during dam removal year 2 would occur within the period of typical outmigration with the lowest predicted SSC. The amount of “delay” that occurs within tributaries prior to outmigration is not possible to predict. Some juveniles may migrate downstream during period of low SSC and experience no delay at all, whereas others may rear for additional days or weeks within tributaries to avoid poor water quality, as occurs naturally. Most outmigration occurs after April (Courter et al. 2008), when SSCs are predicted to be low enough to avoid lethal impacts.

With respect to reporting numbers of juvenile coho and Chinook salmon in the analysis, as summarized in Volume II Appendix E Section E.3.2.4 *Results – Steelhead* (pages E-40 to E-42), potential mortality is predicted for a substantial portion of the juvenile steelhead rearing population under the Proposed Project, owing to their multiple life stages (age 0, age 1, age 2) that rear for prolonged periods within the mainstem Klamath River. Existing monitoring data were available to estimate the number of steelhead individuals that would potentially suffer lethal impacts under the Proposed Project. In contrast, mortality is not predicted for significant portions of rearing coho salmon or Chinook salmon juveniles, and existing data are not sufficient to estimate the potential mortality to these small (less than 1 percent) proportions. In the cases where data are sufficient (e.g., impacts to redds for both species), estimates of mortality are provided, as shown in Volume II Appendix E Table E-8 (page E-32) and Table E-10 (pages E-36 and E-37).

Comment ORG46-505

This figure (and all of the following ones) have the wrong date range on the x-axis. Drawdown and removal is scheduled for 2021 under the currently Proposed Project.

Response to Comment ORG46-505

The projected year of primary drawdown (i.e., dam removal year 2) was revised by Klamath River Renewal Corporation (KRRC) from 2020 to 2021, and subsequently to 2022. However, it is not necessary to change the figures in Appendix F in response to this change. The figures referred to in the comment show forecast reach-averaged particle size (D_{16} and D_{50}), and simulated bed composition, in potential dry, median, and wet years. Given that the expected sediment deposition between 2020 and 2022 would be an order of magnitude less than the total range of sediment volume estimates (see Volume III Attachment 1 *Executive Summary – Reservoir Sediment Deposits and Erosion During Drawdown* and Volume III Attachment 1 Section 2.7-3 *Proposed Project – Reservoir Sediment Deposits and Erosion during Drawdown*), changing the date range on the figures in Appendix F is not expected to provide meaningfully different information and is therefore unnecessary.

Comment ORG46-506

The DEIR states that "Spring-run Chinook salmon would likely extend their range in response to dam removal and benefit from this action in the same manner as fall-run Chinook salmon." This statement is completely unsupported and unlikely to occur because the population of spring-run Chinook in the Salmon River is extremely small and strays are unlikely to occur in sufficient number to colonize habitat upstream of Iron Gate Dam. The Salmon River is also about 124 river miles downstream of Iron Gate Dam, further reducing the likelihood of straying. See comments 3.3-93 and 4.4-36.

Response to Comment ORG46-506
Regarding spring-run Chinook salmon recolonization of historical habitat following dam removal, please see response to comment ORG46-440.

Comment ORG46-507
The DEIR states that summer Steelhead would recolonize the areas upstream of Iron Gate Dam and that juvenile Steelhead could benefit from improved pool habitat downstream of Iron Gate Dam. These statements are made without considering the time of year at which Steelhead may be using this habitat, the potential effects of water temperature, streamflow, or gravel and sediment deposition on habitat suitability for Steelhead. The DEIR should be revised to more accurately present the range of conditions faced by summer Steelhead in the upper Klamath River after implementation of the Proposed Project.

Response to Comment ORG46-507
With regard to the benefit of dam removal for summer steelhead, the critical influence of dam removal is the reconnection to substantial amounts of historical habitat within tributaries and the mainstem. Summer steelhead typically spawn in tributaries, and the relative effect of increased access to tributaries would have a greater effect on the population than increased access to mainstem habitat. Volume III Attachment 1 Appendix F Section F.5.1.2 *Proposed Project – Changes in Bed Substrate – Summer Steelhead* has been revised to clarify the discussion on summer steelhead to reflect increased access to historical habitat. Please refer to Volume III Attachment 1 Appendix F Section F.5.1.2 *Proposed Project – Changes in Bed Substrate – Summer Steelhead* for the revisions.

Comment ORG46-508
While stream power increases downstream of Cottonwood Creek (Figure F-10) this logic also indicates that material transported past Cottonwood Creek would remain in transit until stream power declined (perhaps between Horse Creek and the Scott River) or in smaller areas (backwaters, eddies, etc.) that are not represented in the DEIR discussion. This deposition further downstream is not discussed in this appendix nor is the impact evaluated in the DEIR.

Response to Comment ORG46-508
Please refer to Master Response GEO-1.

Comment ORG46-509
The discussion surrounding the impacts of fine sediment on Chinook underestimates the importance of the reach downstream of Iron Gate Dam for spawning Chinook. By equating this 8-mile reach to only 4 percent of the total Klamath River length, the reader is led to believe that because the Proposed Project only affects 4 percent of the spawning habitat, impacts to Chinook are small. The only way this oversimplification is accurate is if the entire Klamath River is suitable spawning habitat, which it is not. An accurate analysis would

quantify the spawning habitat in this reach and compare that to the spawning habitat in the area used by Chinook in the Klamath River.

Regardless of this scenario, 2 years of fine sand deposition on what is known to be Chinook spawning habitat would eliminate a 1-year class of mainstem spawners (those Chinook that spawn in fall 2020) and possibly those that spawn the following fall (2021). Add the fine sand deposition to the downwelling and entrainment of suspended sediment into spawning riffles (see Major Issue 2.4), and impacts to mainstem spawning Chinook habitat become even more substantial and extend for a longer period of time because it will take a period of years with suitably high flows to wash the accumulated fine material out of the spawning gravels.

As part of their proposed action for the reconsultation that they are undertaking for operations of the Klamath Irrigation Project, USBR is including a release of just over 6,000 cfs (see USBR 2018a). The DEIR should include an analysis of this event because it is likely to occur and would affect bedload transport under the Proposed Project and all alternatives.

Response to Comment ORG46-509

The analysis in Appendix F has been updated to quantify impacts of fine sediment on Chinook spawning based on the proportion of fall-run Chinook salmon potentially affected by sediment release from dam removal, rather than on the percentage of total channel length. Please refer to Volume III Attachment 1 Appendix F for the revisions. Please also refer to Volume III Attachment 1 Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-7 for further analysis of potential impacts to Chinook spawning under the Proposed Project. The analysis remains that one-year class of fall-run Chinook salmon will be impacted by this loss of mainstem redds in the short term but does not indicate that mainstem spawning fall-run Chinook salmon would be eliminated, as the comment asserts. Further, there is no indication that salmon would choose to spawn in the same reach as in prior years if the habitat is unsuitable, and therefore the commenter's assertions regarding a second year of impact are unsubstantiated. For information on fine sediment erosion, transport, and deposition, including potential for sediment downwelling and remobilization, please refer to Volume III Attachment 1 Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 and to Master Response GEO-1. Most fine sediment is expected to be transported downstream to the Pacific Ocean during and following drawdown. As explained in Potential Impact 3.11-5 and in Master Response GEO-1, within the reach from Bogus Creek to Cottonwood Creek where most sediment deposition is expected during and following drawdown, some initiation of sediment remobilization is predicted with flushing flows of approximately 6,000 cubic feet per second (cfs), which have a return period recurrence interval of approximately two years based on historic conditions (USBR 2012).

Regarding the Klamath Irrigation Project, Volume III Attachment 1 Section 3.1.6 *Introduction – Summary of Available Hydrology Information for the Proposed Project* provides background information on the approach to considering Klamath Irrigation Project flows throughout the EIR, and the flows are further discussed in Volume III Attachment 1 Section 3.3 *Aquatic Resources;* Volume III Attachment 1 Section 3.11.4.1 *Geology, Soils, and Mineral Resources – Impacts Analysis and Approach – Flows;* Volume I Section 3.24 *Cumulative Effects*, which is partially modified in Volume III Attachment 1; as well as in Master Response GEO-1. Considering the Klamath Irrigation Project, including the 2019 BiOp flows, the impacts of the Proposed Project on Chinook spawning are not significant in the short term and beneficial in the long term (see Volume III Attachment 1 Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-7).

Comment ORG46-510

All sensitive plant communities should be converted to Sawyer alliances (Sawyer et al. 2009). Use of the Holland standard does not meet current national vegetation analysis standards and does not allow the reader to understand how to identify sensitive natural communities.

Response to Comment ORG46-510

The online edition of *A Manual of California Vegetation* (MCV) is the most recent standard for California vegetation classification and supersedes the Sawyer et al. (2009) edition. Vegetation alliances documented during CDM Smith's 2018 surveys, including those that are considered rare natural communities, are noted as part of Volume I Section 3.5.2.1 *Terrestrial Resources – Environmental Setting – Vegetation Communities* of the EIR (pages 3-457 to 3-472). Appendix H provides a list of rare natural communities (sensitive natural communities) by Holland type classification because this is how the types were recorded in the California Natural Diversity Database (CNDDB). Appendix H has been revised to provide a conversion between the Holland and MCV classifications. Please refer to Volume III Attachment 1 Appendix H for the revisions.

Comment ORG46-511

Regarding the model used in USBR (2012), the complete range of fine sediment (<63 micron) is represented in the model by only a single representative particle and the properties of that representative particle are not listed. This is a coarse representation of how the complete range of fine particles behave. In reality, very small particles like clay, behave much differently than larger silt particles but they are treated the same in the model. This model simplification may affect the sediment transport results described in USBR (2012) and as relied upon in the DEIR and in prior analyses to characterize sediment transport and associated impacts to aquatic resources.

Response to Comment ORG46-511
Although there are sixteen sediment size classes included in the USBR (2012a) model parameters, the comment is correct that one size class is used to represent the cohesive silt/clay fractions (< 0.0625 millimeter [mm]) in the SRH-1D model (USBR 2012a, page 9-4). This is because the surficial forces between particles result in the silt/clay fractions < 0.0625 mm behaving as one cohesive unit. Thus, separating out the sediment size classes that are represented by the < 0.0625 mm class is not expected to improve the accuracy of sediment model results, nor would it affect the EIR analyses as they relate to sediment erosion, transport, and deposition, and potential impacts to aquatic resources. Please refer to ORG46-8 for further information regarding the incorporation of cohesive sediment properties into the models referenced in the EIR. Please refer to Master Response GEO-1 for further information relating to fine sediment erosion, transport, and deposition.

Comment ORG46-512
The cohesive erosion function in the USBR (2012) model assumes linear rates of erosion. Field measurements of cohesive erosion rates typically show nonlinear behavior. The cohesive erosion rate exponent is typically between 1.2 and 1.4.

Response to Comment ORG46-512
USBR (2012a) considers cohesive and non-cohesive sediment transport processes within the limits of industry standard numerical sediment transport modeling. The data supporting the cohesive model parameters were taken from jet tests described in Appendix D of USBR (2012a). Including a non-linear erosion rate for cohesive sediment is not expected to change the USBR (2012a) model results because the sediment in the Klamath Basin reservoirs is highly erodible (i.e., the sediment would rapidly erode as soon as velocity increases during drawdown and thus can be described using a linear erosion rate). Please refer to ORG46-8 for additional information on incorporation of cohesive sediment properties into the models referenced in the EIR.

Comment ORG46-513
The USBR (2012) model does not include slump failures of the bank sediments that could be a first-order erosion process, potentially contributing equal or greater sediment mass to suspended sediment concentrations compared to direct erosion. This is especially important because reservoir drawdown rates under the Proposed Project are twice those used in the model, likely increasing the rate of bank failure. Related to this, the use of sediment jetting to mobilize sediments in the reservoirs during drawdown is likely to increase the potential for slump failures and increase overall amount of sediment delivery to the river, and these impacts have not been assessed.

Response to Comment ORG46-513
USBR (2012a, page 9-70) recognizes that the inability to capture bank erosion processes contributes to the uncertainty associated with the output of the SRH-

1D sediment transport model. However, the upper limit of the drawdown rate (5 feet per day) proposed would only increase water discharge by 1–7 percent of the 2-year peak flow (see Volume I Section 2.7.2 *Proposed Project – Reservoir Drawdown* [pages 2-54 to 2-60]); therefore, there would not be any substantial increase of bank erosion, including slumping. Please refer to Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-6 (pages 3-775 to 3-776), which concludes that bank erosion in downstream reaches due to reservoir drawdown would be a less than significant impact because total water discharges would be similar to, or less than, the historical seasonal 10-year flood.

Regarding sediment jetting, please refer to comment response LA9-69. Sediment jetting would be conducted in a manner that does not promote bank slumping.

Comment ORG46-514

The USBR (2012) report does not describe model validation, or any form of a reasonableness check on the model predictions.

Response to Comment ORG46-514

For the SRH-1D model applied in USBR (2012a), please refer to Huang and Gerimann (2010), which includes a description of the limits of model application, as well as descriptions of the governing equations for the model. Please also refer to the model sensitivity analyses in USBR (2012a, pages 9-18 to 9-32) and in Appendix K of USBR (2012a, pages 23-39 to 23-40). The SRH-1D model has previously been validated in applications to numerous projects throughout California and globally (see USBR 2018b for general information).
For the SRH-2D v3 model applied in USBR (2012a), please refer to Section 9.2.2 of USBR (2012a) and associated references.

Please also refer to ORG46-8 in relation to model uncertainty.

Comment ORG46-515

The cohesive and noncohesive load are simulated separately in the USBR (2012) model without any consideration of the interaction between the type classes of sediment. In reality, the erosion of noncohesive sediment, which is bound in the cohesive sediment, would be controlled by the behavior of the cohesive fraction.

Response to Comment ORG46-515

USBR (2012a) considers cohesive and non-cohesive sediment transport processes within the limits of industry standard numerical sediment transport modeling.

Comment ORG46-516

The DREAM model only simulates noncohesive sediments, which comprise just 15 percent of the sediments in the reservoir. The DREAM model also assumes that the presence of fines would have no impact on noncohesive transport. In reality, the abundant presence of cohesive sediment would have a strong influence on the behavior of the noncohesive fraction, and the effect of this interaction is not modeled or evaluated in the DEIR.

Response to Comment ORG46-516

USBR (2012a) considers cohesive and non-cohesive sediment transport processes within the limits of industry standard numerical sediment transport modeling.

Patagonia Works, Thomas R. Wilmoth, Kennon Meyer

Comments ORG42-1 and ORG45-1

This firm represents Patagonia Works, a certified B-corporation incorporated in the State of California. Attached please find Patagonia Works' comment in response to the Draft Environmental Impact Report for the Lower Klamath Project License Surrender Federal Energy Regulatory Commission Project No. 14803. If you have any questions about this comment, please contact me using the contact information provided on this letterhead.

Patagonia Works ("Patagonia") appreciates the opportunity to provide comments on the Draft Environmental Impact Report ("DEIR") for the Proposed Lower Klamath Project License Surrender Federal Energy Regulatory Commission ("FERC") Project No. 14803 for water quality certification pursuant to section 401(a)(1) of the Clean Water Act ("CWA") for the removal of the J.C. Boyle, Copco No. 1, Copco No. 2 and Iron Gate dams (together, the "Dams").

Patagonia is an outdoor apparel company with a 40-year history of environmental activism. Protecting and preserving the environment is a core business tenet as reflected in the Company's mission statement: "Patagonia is in business to save our home planet." In 2012, Patagonia became a California benefit corporation, enshrining its blended goals of business and conservation into its Articles of Incorporation. Patagonia believes deeply in the urgent shared responsibility to protect the environment. The future of Patagonia's business depends on the health of the wild places that its customers explore.

Patagonia has been involved with dam removal efforts since 1993. The company has dedicated substantial time and resources to promoting the restoration of watershed ecosystems. The contribution of dams to fishery deterioration, declines in water quality, and the impoverishment of adjacent native communities have all inspired Patagonia to encourage the removal of hydropower dams and diversions. Patagonia has donated millions of dollars to over 3,000 groups fighting to protect America's rivers. Patagonia has also invested company resources to amplify its grantees' message, using its own

marketing platforms and employee time to advocate for the health of river ecosystems.

In 2014, Patagonia released a feature length film entitled "Damnation", highlighting the destructive effect of obsolete dams on healthy river ecosystems and fish populations that are cut off from native spawning habitat. On May 7, 2014, Patagonia's founder, Yvon Chouinard, wrote an op-ed in the New York Times entitled "Tear Down 'Deadbeat' Dams" arguing that "[d]ams degrade water quality, block the movement of nutrients and sediment, destroy fish and wildlife habitats, damage coastal estuaries and in some cases rob surrounding forests of nitrogen. Reservoirs can also be significant sources of greenhouse gas emissions."

Response to Comments ORG42-1 and ORG45-1
Thank you for your comment. Please refer to Master Response GEN-2.

Comments ORG42-2 and ORG45-2
Patagonia supports the DEIR decommissioning and removal of the Dams because it will improve water quality, benefit threatened native fish species, eliminate a major source of greenhouse gases ("GHG"), and help return these stretches of the river to their natural conditions. However, the DEIR fails to adequately address the negative impacts of hatcheries on wild fish populations, and more broadly the Klamath River Basin. The California State Water Resources Control Board ("State Water Board") has failed to properly consider the full removal of hatcheries from the Lower Klamath River, which would ultimately benefit the project's objective of advancing the long-term restoration of the native fish populations in the Klamath Basin. The overwhelming evidence, as is broadly summarized within this comment, demonstrates that hatcheries have negative impacts on native fish populations in addition to a number of other negative environmental impacts. In fact, the DEIR analysis itself sets forth evidence establishing that the No Hatchery Alternative provides more benefits to native fish species than an 8-year ongoing operation of hatchery facilities. For the reasons set forth below, Patagonia asks that the State Water Board reevaluate the Proposed Project's hatchery analysis within the DEIR to include sufficient consideration of all potential environmental impacts and to adopt the No Hatchery Alternative.

Response to Comments ORG42-2 and ORG45-2
Operation of the Iron Gate Hatchery is part of the existing condition in the Klamath River Basin (Volume I Section 2.3.4 *Proposed Project – Existing Lower Klamath Project Features – Iron Gate Dam and Associated Facilities* [pages 2-13 to 2-15]).

The EIR does consider the full removal of hatcheries in the EIR; one of the six alternatives to the Proposed Project is the No Hatchery Alternative. The EIR indicates that while this alternative would reduce construction-related impacts

associated with the reopening of Fall Creek Hatchery (FCH) and modifications to Iron Gate Hatchery, in the short-term the No Hatchery Alternative would represent a material impairment of the Klamath Riverscape as a resource and a substantial restriction of tribal access to the fishery relative to existing conditions (please refer to Volume I Section 4.7.12 *Alternatives – No Hatchery Alternative – Historical Resources and Tribal Cultural Resources* [pages 4-318 to 4-319]. As stated in Volume I *Executive Summary* (page ES-20) the No Hatchery Alternative would not meet Objective 2 (to timely advance the long-term restoration of the natural fish population in the Klamath Basin, with particular emphasis on restoring the salmonid fisheries used for subsistence, commerce, tribal cultural purposes, and recreation) as quickly as under the Proposed Project.

Additionally, please refer to the response to comment ORG34-8 for additional discussion regarding the EIR's analysis of the No Hatchery Alternative.

Comments ORG42-3 and ORG45-3

The State Water Board is tasked with preparing basin plans that designate the beneficial uses of waters to be protected and establish water quality objectives necessary to protect those uses. The California Environmental Quality Act ("CEQA"), Cal. Pub. Res. Code § 21000 et seq. and the CEQA Guidelines, 14 Cal. Code Regs. §15000 et seq. require that the State Water Board prepare an EIR that evaluates potential impacts of proposed modifications and continued operation of the Dams to water quality and other resources within California. In drafting the EIR, the State Water Board is responsible for considering both the short-term and long-term effects of the proposed action. Further, the CEQA guidelines mandate that the lead agency balance the social and environmental benefits of a proposed project with the unavoidable adverse environmental effects. The State Water Board is not permitted to carry out a project for which an EIR was prepared unless the project will not have significant effects on the environment or the agency has eliminated or substantially lessened all significant effects on the environment where feasible. Procedurally, with respect to the proposed dam removal, the current DEIR satisfies the CEQA requirements by sufficiently considering the long-term and short-term environmental benefits of dam removal on the Klamath. However, as explained further below, the DEIR falls short of the CEQA standard by failing to sufficiently consider and mitigate all adverse effects of continuing hatchery operations.

Removing dams is a helpful tool to combat river ecosystem deterioration. "Aging infrastructure coupled with growing interest in river restoration has driven a dramatic increase in the practice of dam removal." The average age of dams in the United States according to the National Inventory of Dams, is 57 years and eventually by the year 2030, over 80 percent of dams in the United States will be at least 50 years old. Research and actual experience demonstrates that the removal of dams is a viable option when the cost of keeping a dam in place is higher than the expense of the dam's removal, particularly when the possibility for river restoration is high. According to the organization American Rivers,

however, only 1,384 dams have been removed since 1912 out of the 90,000 estimated dams in the United States.

Additionally, the full removal of all four Dams and their associated facilities most adequately satisfies the State Water Board's Proposed Project Objectives as set forth in the DEIR. The removal of the Dams will improve the long-term water quality conditions in the Klamath River, assist in advancing the long-term restoration of the native fish populations in the Klamath Basin, begin to restore volitional fish passage to viable habitat, and combat high disease rates among Klamath River salmonids. However, as developed further below, removing hatcheries from the Klamath more completely achieves the Proposed Project Objectives.

Response to Comments ORG42-3 and ORG45-3
Operation of the Iron Gate Hatchery is part of the existing condition in the Klamath River Basin (Volume I Section 2.3.4 *Proposed Project – Existing Lower Klamath Project Features – Iron Gate Dam and Associated Facilities* [pages 2-13 to 2-15]).

The EIR considers the potential for feasible mitigation to address significant impacts due to construction and operation of the reopened hatchery under the Proposed Project. Please refer to Volume III Attachment 1 Section 3.2 *Water Quality – Potential Impacts and Mitigation* Potential Impact 3.2-17 for discussion of mitigation that was considered to reduce the impacts of Fall Creek Hatchery (FCH) on water temperature in Fall Creek and the reasons that these options were determined to be infeasible. Additionally, the EIR evaluates the potential impacts of reducing hatchery production goals under the Proposed Project through continued hatchery operations for eight years following dam removal in the following sections:

- Volume III Attachment 1 Section 3.2 *Water Quality – Potential Impacts and Mitigation* Potential Impact 3.2-17;
- Volume III Attachment 1 Section 3.3.5.6 *Aquatic Resources – Potential Impacts and Mitigation – Fish Hatcheries;*
- Volume III Attachment 1 Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-7 through Potential Impact 3.3-10, Potential Impact 3.3-23, and Potential Impact 3.3-24;
- Volume I Section 3.5.5 *Terrestrial Resources – Potential Impacts and Mitigation* Potential Impact 3.5-25 through Potential Impact 3.5-27 (pages 3-752 to 3-574);
- Volume I Section 3.8.5 *Water Supply/Water Rights – Potential Impacts and Mitigation* Potential Impact 3.8-1 (pages 3-676 to 3-678) with revisions in Volume III Attachment 1 Section 3.8.5 *Water Supply/Water Rights – Potential Impacts and Mitigation*;

- Volume III Attachment 1 Section 3.12 *Historical Resources and Tribal Cultural Resources – Potential Impacts and Mitigation* Potential Impact 3.12-9;

With respect to the comment's assertion that removing the hatcheries from the Proposed Project more completely achieves the Proposed Project objectives, please refer to responses to comments ORG42-4 through ORG42-18.

Comments ORG42-4 and ORG45-4

A No Project Alternative would result in a denial of certification of license surrender, which would then return the Klamath Hydroelectric Project Dams to the relicensing proceedings. However, PacificCorp has already withdrawn its request with FERC for certification of a new license application and, as such, this result would be problematic. The DEIR specifically identifies that the Dams currently do not have operating licenses and the proposal to decommission the Dams has already been submitted to FERC. Further, the Klamath Hydroelectric Settlement Agreement requires the deconstruction of the Dams, adding another layer of complexity with the No Project Alternative. For these reasons, the State Water Board should reject the No Project Alternative, as it is inherently insufficient.

Response to Comments ORG42-4 and ORG45-4

Please refer to Volume I Executive Summary page ES-16, which summarizes the EIR's consideration of the No Project Alternative. This summary discussion states that in the short term, the No Project Alternative would not meet the Proposed Project's underlying objectives, while in the long term, the impacts and ability of the No Project Alternative to meet project objectives and purposes are speculative, but they would be within the range of the alternatives and the Proposed Project evaluated in this EIR.

Comments ORG42-5 and ORG45-5

The Klamath River watershed once produced large runs of Chinook salmon and steelhead in addition to significant runs of other anadromous fish, including coho salmon, green sturgeon, eulachon, coastal cutthroat trout, and Pacific lamprey. Accounts of early explorers, images from turn-of-the-century photographers, historical newspapers, and information from archaeologists indicate that salmon historically migrated to the Klamath Upper Basin. "Prior to dam construction, anadromous fish runs accessed spawning, incubation, and rearing habitat in hundreds of miles of river and stream channel above the site of Iron Gate Dam." Now, this dam is the current limit of upstream passage.

Currently, the Klamath River Basin supports Chinook salmon, coho salmon, and steelhead populations. However, the anadromous fish populations have declined substantially in abundance. Significant habitat still exists upstream of the Iron Gate Dam that is not being utilized. The Dams act as an unnatural barrier to

these valuable but unreachable habitats. Today, all anadromous runs of salmon and steelhead, once abundant in the upper basin, cannot pass Iron Gate Dam. There has been a decrease in fish populations in the Klamath River Basin from the numbers of fish that were first observed in the early 1900s. Steelhead populations that were thought to exceed one million fish prior to the 1900s fell to 400,000 by 1960. Similarly, coho salmon returns declined by 70% since the 1960s according to National Resource Council research conducted in 2008. As a result of these dwindling numbers, coho salmon in the Klamath River Basin were listed as threatened under the Endangered Species Act ("ESA") in 1997 and then were listed as threatened under the California Endangered Species Act in 2004.

"Once spring-run Chinook salmon disappear, they are not likely to re-emerge," but prompt conservation action "could preserve spring-run Chinook, as well as their evolutionary potential." There are a number of factors that are currently contributing to the decline of anadromous fish populations on the Klamath River, including blockage of upstream migration by dams, rampant disease due to poor water quality, and dangerously high water temperatures.

Response to Comments ORG42-5 and ORG45-5
Comment noted. This comment pertains to the historical abundance of fish populations in the Klamath River Basin, and asserts that removal of the Lower Klamath Project dams would support those fisheries.

Comments ORG42-6 and ORG45-6
Currently, the Dams block access to hundreds of miles of migration, spawning, and rearing habitat for native steelhead, Chinook salmon, and coho salmon. The Dams attempt to mitigate these losses by offering assistance through the use of fish passage facilities such as fish ladders, which are currently located at Iron Gate and J.C. Boyle dams. However, fish ladders are often an inadequate tool to assist salmonids migration. Fish have difficulty utilizing the infrastructure, and the success rates of fish that do navigate their way through the facilities are typically low. Finally, the fish that do successfully utilize the infrastructure do so in much lower quantities than historic abundances. A free flowing river without the physical barriers of dams would allow the fish to repopulate upstream of the current dam blockage.

Second, both adults and out migrating juvenile anadromous fish in these reaches of the Klamath River are suffering as a result of increased disease and parasites that are currently plaguing the populations. "Severe infection by the myxozoan parasite Ceratomyxa shasta has, in large part, been responsible for the declining numbers of juvenile Klamath River fall Chinook and coho salmon and subsequent impacts on later adult returns." Over the past decade, as many as half of the juvenile Chinook salmon migrating annually toward the ocean through the Klamath River have suffered from severe infections by the myxozoan Ceratomyxa shasta. Additionally, as identified in the DEIR, algae produced in

the Upper Klamath reservoirs may be deleterious to the health of aquatic organisms in the Klamath River. Stagnant reservoirs are the leading cause of these high concentrations of toxic parasites. Allowing the Klamath River to run naturally free by removing the cesspool-creating Dams will assist the resurrection of native fish populations.

Rampant infection of disease was especially apparent during the Klamath River Fish Kill of 2002. In 2002 a relatively robust run of adult fall Chinook entered the Klamath at a time of low flow rates and volume. The combination of crowded river conditions and warm water temperatures created a situation in which parasites and bacterial pathogens spread rapidly. Fish became infected at alarming rates. In the end, the California Department of Fish and Game estimated that more than 65,000 fish died. Researchers have demonstrated that low flow from Iron Gate Dam was a substantial causative factor in this historic fish kill.

Finally, the Dams have increased water temperatures in the Klamath River. Alterations to natural river flows through dam construction and water diversions have altered seasonal temperature patterns in the Klamath River, which ultimately result in harmful elevated temperatures during the crucial fall spawning season. Water temperature associated with multiple mainstem hydropower facilities might be one of many factors responsible for depressing Klamath salmon stocks.

The DEIR itself identifies that the North Coast Regional Water Quality Control Board has determined that existing receiving water temperatures in the Klamath River are already too warm to support migration of aquatic organisms and cold freshwater habitats. Higher water temperatures, especially during the summer months, will likely postpone spawning migration which will then hinder egg development. In addition, elevated water can increase adult fish mortality through stress and crowding. As such, the removal of the Dams will allow the river to self-regulate temperature control rather than heat and cool at the mercy of hydropower facilities.

Response to Comments ORG42-6 and ORG45-6
Please note that Iron Gate Dam does not currently have any fish passage facilities. Comment noted.

Comments ORG42-7 and ORG45-7
Not only do dams and their reservoirs create hazards for fish and other species, there is growing evidence that dams and reservoirs are also a hazard to the earth's climate. Studies show that large amounts of GHG emissions come from reservoirs. In fact, some studies estimate that as much as 7% of anthropogenic global warming equivalents come from methane emitted from man-made reservoirs alone. These emissions are then further provoked in hotter climates.

Human alterations of the aquatic landscape, which occur directly through the construction of large hydroelectric reservoirs, contributes to carbon emissions.

These emissions come from the impoundment of water, the plant matter decay in and around the artificial bodies of water, and the high concentrations of algae accumulating in stagnant reservoirs. Methane produced by the decomposition of organic materials bubbles to the surface of the water emitting GHG into the atmosphere. Additionally, the fluctuations in water level that reservoirs experience also exacerbates the emission production. The drops in hydrostatic pressure during water level drawdowns enhance methane bubbling. Emissions can also be released via degassing at turbines and spillways.

GHG from human activities are the most significant driver of observed climate change since the mid-20th century. As such, it is critically important to analyze the GHG emissions from hydroelectric technology and the associated reservoirs.

As identified in the DEIR, the power plant operations and maintenance of the Lower Klamath hydroelectric facilities are no exception, as they also act as a source of GHG emissions. Specifically, using estimates presented by the Karuk Tribe, the DEIR establishes that the reservoirs behind the Lower Klamath Project dam facilities and developments emit 4,000 to 14,000 metric tons of methane annually. "With the removal of the Lower Klamath Project reservoirs, this source of methane emissions would be eliminated."

A recent study assessed the potential climate change impacts to recreational freshwater fishing across the coterminous US and found that the resulting higher air temperatures, and to a lesser extent changes in streamflow, will alter fish habitat. Patagonia's business depends on its customers having access to wild places to pursue outdoor activities such as fishing. Additionally, Patagonia's mission to save our home planet demands that the company dedicate itself to fighting the climate crisis, including by providing financial support to grassroots environmental groups seeking to protect these fish habitats, and using the company's own platform to amplify their issues. A decline in more desirable recreational fish species as a result of climate change will directly harm Patagonia through both its customer base and its organizational conservation mission. As such, Patagonia again encourages the removal of the dams to eliminate GHG emissions.

Response to Comments ORG42-7 and ORG45-7
Comment noted. This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (Greenhouse Gas Emissions and Energy).

Comments ORG42-8 and ORG45-8
While Patagonia supports the DEIR's full removal and decommissioning of the Dams and their facilities, the company also simultaneously contends that the

DEIR unreasonably relies on the artificial production of fish through the use of hatcheries. Patagonia strongly opposes the DEIR's proposal to maintain the Fall Creek and Iron Gate Hatcheries. A strong scientific consensus shows that hatcheries create significant risks to wild fish species, rather than help supplement dwindling populations as initially thought- a proposition supported by the DEIR itself.

Further, although the CEQA requires that the DEIR include a detailed analysis of the environmental impacts of the proposed project, the DEIR fails to consider the full extent of the environmental impacts of the hatchery operations. Instead, the DEIR fails to recognize the benefit of the No Hatchery Alternative.

Response to Comments ORG42-8 and ORG45-8

The State Water Board is not the project proponent. The Klamath River Renewal Corporation (KRRC) has applied to the Federal Energy Regulatory Commission (FERC) to decommission and remove the four Lower Klamath Project dams and associated facilities. The KRRC's Proposed Project includes continued operation of the Iron Gate Hatchery and reopening of Fall Creek Hatchery (FCH) for eight years following the decommissioning of Iron Gate Dam, as discussed in Volume I Section 2.7.6 *Proposed Project – Proposed Project – Hatchery Operations* (pages 2-77 to 2-84). It is therefore appropriate for the EIR to evaluate this proposal.

The EIR neither fails to consider the full extent of the environmental impacts of hatchery operations, nor does it fail to recognize that the No Hatchery Alternative would reduce some of the impacts of the Proposed Project. Please note that the EIR considers impacts using the CEQA baseline of existing conditions, which includes Iron Gate Hatchery operating at a greater capacity than it would under the Proposed Project. Please refer to Volume I *Executive Summary* (page ES-20) for a summary of the analysis of the No Hatchery Alternative and Section 4.7 *Alternatives – No Hatchery Alternative* (starting on page 4-301) for a detailed analysis of this alternative; for Greenhouse Gas Emissions and Energy and Air Quality, please see the portion of the Draft EIR that was recirculated on December 21, 2019.

Comments ORG42-9 and ORG45-9

As previously set forth, the Klamath River Basin was historically home to a number of wild fish species. Starting in the early 1990s many Pacific salmon populations in the United States were listed as threatened or endangered species under the ESA. In response to the rapid declines of these native fish species, hatcheries began popping up in river basins all over the Western United States. Originally, scientists thought this artificial supplementation of fish would assist to increase wild fish populations to mitigate for the loss of spawning grounds upstream of dams. However, studies show that anadromous salmonid populations in the Klamath River Basin are becoming increasingly dependent on hatchery propagation, a pattern that can threaten population persistence. This

includes the Iron Gate Hatchery in the Klamath River Basin which produce spring and fall-run Chinook salmon, coho salmon, and steelhead. With the removal of the Dams, there is a unique opportunity to regain these historical spawning grounds, lessening the need to use hatcheries to supplement Klamath fisheries.

The DEIR provides that while some of the Iron Gate Hatchery facilities would be removed along with the dam, its operational components would be retained and modified to continue operation at a reduced rate for Chinook salmon. Additionally, the Fall Creek Hatchery would be reopened and maintained.

The Iron Gate Hatchery currently releases close to 8 million hatchery salmon and steelhead annually to mitigate the habitat lost between the Iron Gate and Copco dams, which doesn't take into consideration the hundreds of miles of upstream habitat that will be available when those dams are removed. While the Proposed Project would lower the existing production goals at the hatcheries, there would still be another eight years of hatchery production dumped into the Klamath causing irreversible damage to the native populations. Further investment into this hatchery is a waste of both time and resources. Given the overwhelming scientific data that shows native fish populations fare better without hatcheries, the DEIR is falsely premised on the necessity of these structures.

Response to Comments ORG42-9 and ORG45-9
The comment states that the Iron Gate Hatchery produces fall-run Chinook salmon, spring-run Chinook salmon, coho salmon, and steelhead. Please note that as described in Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Fish Hatcheries*, under existing conditions the Iron Gate Hatchery only produces fall-run Chinook salmon and coho salmon.

In this comment, and in comments ORG42-10 to 15 the commenter includes an assessment of the potential negative impacts of fish hatcheries on salmonids, including referencing several research articles. Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Fish Hatcheries* includes an analysis of the effects of the Iron Gate Hatchery, including referencing research articles and studies specific to the Klamath River Basin. The analysis in the EIR includes consideration of research indicating potential positive and negativeeffects of hatcheries, including consideration of research consistent with the research cited by the comment, which has been included in the record. Consideration of the additional research referenced by commenter does not alter the analysis or conclusions reached by the EIR.

The Proposed Project includes a reduction of hatchery production in the short-term, and a elimination of hatchery production after eight years. The Proposed Project, specifically including eight years of hatchery production, implements a multi-party agreement to fund and implement dam removal (the Klamath

Hydroelectric Settlement Agreement [KHSA]). Both federal and state fisheries agencies deliberated over and signed the agreement, along with other entities, including a number of affected tribes, the dam owner, and commercial fishing organizations. Section 3.3.5.6 *Aquatic Resources – Potential Impacts and Mitigation – Fish Hatcheries* assesses the effects of hatchery operation and production on aquatic resources under the Proposed Project. This assessment includes disclosure and consideration of the central tenants of the concerns regarding hatcheries expressed in the comment.

In addition, all production of coho salmon is guided by a Hatchery Genetic Management Plan (HGMP) for the Iron Gate Hatchery (CDFW and PacifiCorp 2014), which redefined the operation of this hatchery from a fishery mitigation hatchery to one now operated to protect and conserve the genetic resources of the Upper Klamath population unit of the Southern Oregon/Northern California Coast (SONCC) coho salmon Evolutionarily Significant Unit (ESU). Included in the HGMP are defined monitoring and evaluation activities to evaluate effects of the hatchery activities on the abundance, productivity, spatial structure, and diversity of the SONCC coho salmon and the magnitude or relative impact of the hatchery program on other actions that influence SONCC coho salmon. This management is proposed to continue at the Fall Creek Hatchery (FCH) facility. The research and information cited by the commenter is not based on hatchery programs that are guided by an HGMP.

Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* – Potential Impact 3.3-7 finds no significant impact of the Proposed Project, including eight years of reduced hatchery production, on fall-run Chinook salmon. In addition, Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* – Potential Impact 3.3-9 finds no significant impact of the Proposed Project, including eight years of continued hatchery production of coho salmon under the existing hatchery genetics management plan, on coho salmon. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Please also refer to Master Response AQF-2 for additional discussion of the future operations of hatcheries under the Proposed Project.

Comments ORG42-10 and ORG45-10

These traditional mitigation policies of replacing wild populations with hatchery fish are not consistent with modern conservation goals, environmental values, and scientific theories. While hatcheries are capable of temporarily maintaining higher numbers of fish populations, they are incapable of replacing lost habitat and the natural populations that historically rely on it. "The optimism of early salmon hatchery practitioners to increase abundance has been tempered in recent decades by studies indicating unintended negative effects hatcheries can have on wild Pacific salmon and steelhead."

Hatcheries jeopardize threatened and sensitive populations of native fish species, including the once-abundant salmon species. It is now clear that the widespread use of traditional hatchery programs has actually contributed to the overall decline of wild populations. "The historical use of artificial propagation for harvest mitigation has frustrated the successful integration of management directives and created regional economic inefficiencies." Scientists across the globe have studied the impact of hatchery fish on native populations and continually discover the negative impacts of hatcheries. The following are a few conclusions from studies conducted involving hatchery implications:

- *Hatchery coho salmon 14 months after release into a stream did not reach the body composition of the wild salmon in time for downstream migration and had lower ocean survival.*
- *Available data suggest progressively declining fitness for natural rearing with increasing generations in the hatchery. The reduction in survival from egg to adult may be about 25% after one generation in the hatchery and 85% after six generations. Reduction in survival from yearling to adult may be about 15% after one generation in the hatchery and 67% after many generations.*
- *Hatchery production has been reduced to a small fraction of the natural-origin production. Nickelson (2003) found that reduced hatchery production led directly to higher survival of naturally produced fish, and Buhle et al. (2009) found that the reduction in hatchery releases of Oregon coast coho salmon in the mid1990s resulted in increased natural coho salmon abundance.*
- *Hatchery fish reproductive success is poor; there is a large-scale negative correlation between the* presence of hatchery fish and wild population performance; hatchery fish reproductive success is lower than for wild fish and this is true for both supplementation and production hatchery programs…

As such, according to the Hatchery Scientific Review Group, scientists and policymakers have identified a need to reform the hatchery system based on growing concerns about the potential effects of artificial propagation on the viability of salmon and steelhead in their natural habitats. "The combined effects of large-scale hatchery programs, habitat loss and degradation and high harvest rates have replaced historically abundant wild salmon with hatchery-produced salmon in many areas." This includes the Klamath River Basin. Domestication in hatchery facilities alters predator avoidance, feeding behavior, genetics, and physiology. The DEIR should be focused on avoiding these well documented negative impacts rather than voluntarily submitting the river and its inhabitants to another eight years of ecology deterioration.

Response to Comments ORG42-10 and ORG45-10
With respect to the comment's general discussion of the negative effects of hatcheries on native fish populations, please refer to response to comment ORG42-9.

With respect to the comment's cited conclusion that hatchery produced coho smolts did not reach the same size as naturually produced fish and had lower ocean survival, please refer to Volume I Section 4.7.3 *Alternatives – No Hatchery Alternative – Aquatic Resources* and specifically to Potential Impact 3.3-9 for a discussion of the smolt-to-adult survival and lower fitness of hatchery produced smolts relative to naturally produced smolts in the Klamath River. Please also note that unlike the cited study regaridng hatchery operations in the 1950s, coho salmon hatchery operations under the Proposed Project are guided by a Hatchery Genetic Management Plan (HGMP) informed by modern fisheries management (please also refer to response to comment ORG42-9).

The comment cites data that suggest declining fitness level with increasing generations in hatcheries; please refer to Section 3.3.5.6 *Aquatic Resources – Potential Impacts and Mitigation – Fish Hatcheries* for a disussion of the relativley poor fitness of hatchery-reared fish. However, the declines presented in the data stopped falling after approximately six to nine generations of hatchery production. After nearly 100 years (generations) within hatcheries for fish produced in the Klamath River, the reductions in survival cited by the comment have likely already occurred, and additional declines in survival as a result of continued hatchery rearing are unlikely. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

With regard to data cited in the comment that suggest that reducing hatchery production of coho salmon can increase survival and abundance of natural populations, please refer to Section 4.7.3 *Alternatives – No Hatchery Alternative – Aquatic Resources* and specifically Potential Impact 3.3-9 for a discussion of the benefits of reduced hatchery production on the fitness and abundance of the natural coho salmon population. Please also note that unlike the cited studies, coho salmon hatchery operations under the Proposed Project are guided by a HGMP (please also refer to response to comment ORG42-9).

The comment asserts that the Draft EIR should be focused on avoiding the potential impacts of hatcheries. Please refer to Section 4.7 *Alternatives – No Hatchery Alternative* for a complete evaluation and analysis of an alternative to the Proposed Project that does not include hatchery production.

Comments ORG42-11 and ORG45-11
"Ecological risks occur when the presence of hatchery fish affects how wild fish interact with their environment or with other species." There are a number of detrimental ecological interactions that can take place between hatchery and wild fish. These include competition for food and territory, predation by larger

hatchery fish preying on smaller wild cohorts, and negative social interactions when large numbers of hatchery fish are released on top of small numbers of wild fish.

Hatchery fish typically have short-term physical advantages over wild fish that disrupt the natural interactions of wild fish. Larger sized juveniles, more aggressive and dominant juveniles, and different spawning times by adults all contribute to the ecological risks to native populations. Larger hatchery juveniles tend to win more competitions by virtue of their size, which then places naturally proportional wild juveniles at a disadvantage. As previously pointed out by the Native Fish Society in their comments on the draft water quality certification for the Klamath River Renewal Corporation's Lower Klamath Project No. 14083, due to the food distribution and rearing strategies necessary to make artificial production cost effective, hatchery fish become surface oriented, causing them to become more susceptible to predators. Releasing young hatchery fish into a wild stream could result in their domination of wild fish, which would then leave wild fish reduced to less favorable rearing habitats.

Further, a number of studies have demonstrated that hatchery juveniles can show more aggressive behaviors than wild juveniles. This aggression then leads to decline in native fish population only to be replaced by hatchery fish that have a lower overall survival rate. "Therefore, while hatchery juveniles released into natural streams have a competitive advantage over wild fish due to increased aggression, size, or sheer number, their impaired ability to survive to adulthood and breed successfully can translate into an overall reduction in salmon population size." While some short-term advantages may initially benefit the hatchery fish, in the long-term they will eventually lead to poorer survival or lower reproductive success in the hatchery fish themselves. This creates precisely the opposite impact intended by hatcheries in the first place.

Response to Comments ORG42-11 and ORG45-11
Regarding the comment's general discussion of the negative effects of hatcheries on native fish populations, please refer to response to comment ORG42-9.

With respect to social interactions and potential agression between hatchery and naturally produced fish, the comment does not provide any Klamath River-specific data supporting these concerns. In some cases, hatchery-released fish are in poorer health upon release than their naturally-spawned counterparts, and levels of agression appear related to size at emergence, rearing density, and food availability (Berejikian et al. 1996). Any such interactions would fall under the larger umbrella of competition that was acknowledged in Draft EIR Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Fish Hatcheries*. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comments ORG42-12 and ORG45-12

Genetic risks occur when hatchery and wild fish interbreed. Studies show that hatcheries can cause genetic changes in salmon populations after just a single generation. Research and experimental studies conducted across the years have demonstrated that artificial breeding will likely reduce genetic diversity and cause higher rates of genetic drift as a result of small effective population sizes. Wild fish have diverse genetic variances while hatchery fish have very limited genetic variances, which then yields limited genetic diversity. Continued interbreeding with hatchery-origin fish of lower fitness can lower the fitness of the wild population.

Hatchery fish that do not return to the hatchery but instead spawn naturally may potentially transfer maladaptive genetic changes into the wild population. "Generally, large, long-term hatchery programs that dominate production of a population are a high-risk factor for certain viability criteria and can lead to increased risk for the population." The Iron Gate Hatchery is no exception. Genetic variation and uniqueness are key to the success of fish populations. As previously identified by the Native Fish Society and Patagonia, the ability of salmon to migrate to the ocean and return to their natal stream has profound implications on population structure and has encouraged fine scale genetic adaptations to specific habitats used throughout their lifecycle and geographic range. As such, it is essential that these fish populations are able to maintain their authentic genetic variations.

"There is about a 40% loss in reproductive fitness for each generation of fish that spend their lives in a hatchery." Hatchery fish produce fewer returning adults when they spawn with one another compared to more successful wild fish, or when a hatchery fish spawns with a wild fish. As one study succinctly summarized:

The implication is that hatchery salmonids could be gradually reducing the fitness of the wild populations with which they interbreed. Those hatchery fish provide one more hurdle to overcome in the goal of sustaining wild runs, along with problems caused by dams, loss or degradation of habitat, pollution, overfishing and other causes. Aside from weakening the wild gene pool, the release of captive-bred fish also raises the risk of introducing diseases and increasing competition for limited resources."

Wild salmon species must preserve their genetic diversity if they are going to maintain their ability to adopt to changing environmental pressures. Hatcheries undermine this goal.

Response to Comments ORG42-12 and ORG45-12

Regarding the potential effects of hatchery production on the genetics of natural populaitons, please refer to Section 3.3.5.6 *Aquatic Resources – Potential Impacts and Mitigation – Fish Hatcheries* for a discussion of this topic. After

nearly 100 years (generations) within hatcheries for fish produced in the Klamath River, the reductions in survival cited by the comment have likely already occurred; additional declines in survival as a result of continued hatchery rearing are unlikely. Please also note that specific percentages regarding fitness cited in the comment are for hatchery fish and are not data on reductions in fitness among the natural population resulting from intermixing. Further, please note that coho salmon hatchery operations under the Proposed Project are guided by a Hatchery Genetic Management Plan (HGMP) informed by modern fisheries management practices (please also refer to response to comment ORG42-9).

Comments ORG42-13 and ORG45-13

While there are undoubtedly genetic and ecological effects on native species as a result of artificial hatchery fish, the physical infrastructure of the hatchery operations harm wild fish populations. "The physical existence of the factory represents a permanent, negative impact on the surrounding environment and can also pose serious harm to fish populations both in and outside of the facility."

Currently up to 50 cfs of water is diverted from the Iron Gate reservoir to supply the fish ladder and raceways that operate at the Iron Gate Hatchery. Water that is withdrawn from the river's flow and then utilized by hatcheries in turn reduces river flow and causes water temperatures to fluctuate unnaturally. In addition to flow reductions, these withdrawals displace other stream-dwelling organisms that are crucial to the aquatic food web and dewater natural spawning and rearing areas. Further, as admitted in the DEIR itself, "Hatcheries potentially alter water temperature through increasing exposure to direct sunlight (e.g., in raceways or settling ponds) and ambient air temperatures. Hatcheries also potentially increase suspended material, turbidity, and nutrients in streams by discharging water containing organic solids from uneaten commercial pelletized feed and fish waste."

Hatcheries are also susceptible to technical difficulties that leave millions of hatchery fish at the mercy of unreliable modern technology. Power outages, machinery malfunctions, and human error are a few of the risk factors that hatcheries pose to reared fish populations. Most recently, in December 2018, more than 6.2 million Chinook salmon died when a power outage occurred at Minter Creek Hatchery in Gig Harbor, Washington. Deadly hatchery power outages as a result of storm power line damage or faulty electric problems is not uncommon. Spending eight years putting financial resources into a facility that is susceptible to extreme technical difficulties, potentially leading to mass fish casualties, is a poor investment of time and capital.

Additionally, large releases of hatchery fish have been associated with decreases in fish survival as a result of increased predation by piscivorous fish, birds, and mammals. These predators are attracted to the high concentrations of fish that are released from hatcheries. "Not only is there an increased number of prey available to attract predators, but hatchery fish also tend to out-migrate in

unnatural, concentrated groups compared to the more dispersed and variable behavior of wild fish." Further, the carrying capacities of rivers is often exceeded during outmigration of hatchery smolts, which causes a decrease in food availability.

Response to Comments ORG42-13 and ORG45-13
Please refer to response to comment ORG42-9. With respect to the comment's concern that the existing 50 cubic feet per second (cfs) diversion of water from Iron Gate Reservoir to supply Iron Gate Hatchery reduces river flows and causes unnatural fluctuations in water temperatures in the Middle and Lower Klamath River, please note that the diversion is non-consumptive and occurs directly from the reservoir itself. Please see Volume I Section 2.7.6.1 *Proposed Project – Proposed Project – Hatchery Operations – Iron Gate Hatchery* Figure 2.7-13 (page 2-79). The point of return to the river is the settling pond outfall at the base of Iron Gate Dam where water temperatures are influenced by the presence of the dam itself. For a discussion of the temperature influences of the Proposed Project, please see Volume III Attachment 1 Section 3.2.5.1 *Water Quality – Potential Impacts and Mitigation – Water Temperature*. Separate discussion of any influence from hatchery operations is not requried to adequately describe the current condition, particularly as the current diversion is proposed to change.

The commenter notes that there is potential for malfunctions at hatcheries to affect the fish being raised within the hatchery. Comment noted. Commenter has not asserted, and it would be speculative to assume, that such a malfunction would be likely to occur in the next eight years at Fall Creek or Iron Gate hatcheries. There is no evidence that the technological risk to fish is increasing under the Proposed Project relative to existing conditions. To the contrary, the Definite Plan includes upgrades to hatchery facilities designed to improve their functionality, and distributing the fish populations between two hatcheries creates redundancy in the event of a malfunction.

The comment's assertions regarding predation are noted. Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Fish Hatcheries* has been revised to cite Kostow (2009) to note that large releases of hatchery fish have been shown to increase predation on natural populations of juvenile salmonids. Please refer to Volume III Attachment 1 Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Fish Hatcheries* for the revisions.

Comments ORG42-14 and ORG45-14
Finally, the physical presence of hatchery infrastructure along the river creates an aesthetically displeasing and unnatural disturbance to the historic natural beauty of the Klamath River Basin. Hatchery buildings, tanks, and filters insert an artificial presence in what should be a peaceful wilderness environment. Patagonia's customers are deeply interested in the preservation of wild spaces,

as it is the area they utilize for their recreational, spiritual, and personal needs. The removal of the hatcheries along with the Dams will help preserve the original natural wonder of the area.

Response to Comments ORG42-14 and ORG45-14
From an aesthetics standpoint, the continued presence of Iron Gate Hatchery under the Proposed Project would result in no change from existing conditions. Construction activities at Fall Creek Hatchery (FCH) would result in improvements to existing infrastructure under the Proposed Project, but since Fall Creek Hatchery already exists and the proposed improvements are generally in line with existing infrastructure size and placement (Volume I Section 2.7.6.2 *Proposed Project – Hatchery Operations – Fall Creek Hatchery* Figure 2.7-15 [page 2-83]), there would be little if any long-term aesthetics effect. Section 3.19.5 *Aesthetics – Potential Impacts and Mitigation* Potential Impact 3.19-5 has been revised to clarify that the removal of the dam complexes and the associated Iron Gate and Fall Creek hatchery modifications would not result in a significant long-term (permanent) impact because there would be no degradation of the designated view class for the surrounding landscape (i.e., Bureau of Land Management's [BLM's] Visual Resource Management [VRM] class) at a key observation point and because no scenic vista in areas that were not assigned a VRM class would be adversely impacted. Please refer to Volume III Attachment 1 for the final Section 3.19 *Aesthetics*. Please also refer to responses to comments ORG46-321 through ORG46-331.

As stated in Section 4.7.19 *Alternatives – No Hatchery Alternative – Aesthetics*, the portion of the Limits of Work containing the Iron Gate Hatchery footprint (Volume I Section 2 *Proposed Project* Figure 2.7-13 [page 2-79]) would undergo a similar degree of construction activities and associated short-term impacts related to aesthetics as the Iron Gate Hatchery modifications (i.e., relocation of fish trapping and holding facilities, relocation of the cold-water supply) under the Proposed Project. Section 4.7.19 *Alternatives – No Hatchery Alternative – Aesthetics* has been revised to clarify that the removal of Iron Gate Hatchery and the lack of construction/upgrading activities at Fall Creek Hatchery under the No Hatchery Alternative would not, as described for the Proposed Project, cause the VRM class to be degraded at a key observation point, would not adversely impact a scenic vista for those areas that were not assigned a VRM class, and would not result in a significant long-term (permanent) impact. Please refer to Volume III Attachment 1 Section 4.7.19 *Alternatives – No Hatchery Alternative – Aesthetics* for the revisions.

Comments ORG42-15 and ORG45-15
Although the Proposed Project would remove the cold-water supply and aerator for the hatchery, the operational components of Iron Gate Hatchery would still be retained and modified to continue operations in addition to the reopening of Fall Creek Hatchery for eight years following the dam removal. If the Dams are being removed to benefit the health of the Klamath River, the continuation of hatchery

operations stands in direct contrast to that objective. Although the proposed plan will lower hatchery production over the eight-year period, the mere reduction of total hatchery production goals is not enough to mitigate the damage hatchery operations will continue to have on the Klamath.

In addition to the continued operation of the hatcheries, the Definite Plan authored by the Klamath River Renewal Corporation proposes the construction of additional hatchery facilities, including a new spawning facility, circular tanks, and a UV treatment system. Additional expenditures on hatchery infrastructure stands in bold contrast to the proposed plan's objective of advancing the long-term restoration of the native fish populations. Instead of dedicating resources to the unnatural and ultimately destructive operation of hatcheries, the DEIR should reallocate these resources to the restoration of native fish populations.

The DEIR identifies that reopening the Fall Creek Hatchery will increase hatchery-related discharges which would potentially alter water temperature downstream. In fact, the DEIR provides a list of "potential negative effects" that include genetic risks, competition and predation, hatchery facility effects on water quality, effects of weirs and other hatchery infrastructure, masking of current wild population status due to the presence of large numbers of hatchery-origin fish, incidental fishing pressure, and disease transfer from hatchery to wild fish. This direct recognition of the negative impacts of hatchery operations demonstrates that the State Water Board has not properly considered the full range of environmental impacts associated with hatchery removal.

Response to Comments ORG42-15 and ORG45-15
Allocation of resources to hatchery reconfiguration and operation is described in the Definite Plan, and are part of the Proposed Project. Comments on the Definite Plan should be submitted to the Klamath River Renewal Corporation (KRRC).

The EIR adequately considers the potential water quality impacts of the continued operation of Iron Gate Hatchery and the reopening of Fall Creek Hatchery (FCH) under the Proposed Project. Please refer to Volume III Attachment 1 Section 3.2.5.8 *Water Quality – Potential Impacts and Mitigation – General Water Quality* Potential Impact 3.2-17 for this analysis. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

With respect to the EIR analysis of the potential impacts on anadromous fisheries due to the continued operation of Iron Gate Hatchery and the reopening of Fall Creek Hatchery under the Proposed Project, please refer to Volume III Attachment 1 Section 3.3.5.6 *Aquatic Resources – Potential Impacts and Mitigation – Fish Hatcheries*. Please also refer to response to comment ORG42-9 and Master Response AQF-2.

Comments ORG42-16 and ORG45-16

The DEIR does indeed provide a No Hatchery Alternative which would result in the permanent removal of the Iron Gate Hatchery and avoid the refurbishing and reopening of the Fall Creek Hatchery. However, this alternative is falsely caveated by the assertion that these actions would fail to meet the Proposed Project's Objective 2, to "advance the long-term restoration of the natural fish population in the Klamath Basin with particular emphasis on restoring the salmonid fisheries used for subsistence, commerce, tribal cultural purposes, and recreation" as quickly as under the Proposed Project.

This conclusion stands in bold contrast to the analysis of the No Hatchery Alternative, which actually reveals that the No Hatchery Alternative will be beneficial for coho salmon and fall-run and spring-run Chinook salmon populations in the long term. The DEIR states, "The Chinook salmon released to the Klamath River annually also likely result in deleterious effects on natural-origin populations, including competitive pressure between hatchery-derived and natural-origin fish in the limited habitat areas (e.g., thermal refugia) used by rearing juveniles in the Klamath River (NMFS 2010a)." Further, "Negative hatchery effects due to competition, leading to displacement and lower growth, are well documented (Flagg et al. 2000, McMichael et al. 1997)." As a result, the DEIR itself asserts that the removal of hatcheries "could increase survival of natural-origin Chinook salmon at a faster rate than with continued hatchery operations under the Proposed Project" and "ending hatchery operations under this alternative may result in a more rapid increase in the spring-run Chinook salmon adult population as a result of dam removal than under the Proposed." Thus, it's difficult to comprehend how the No Hatchery Alternative would "fail to meet Objective 2" when the DEIR provides ample evidence that hatchery removal will advance the long-term restoration of native fish populations – the very purpose of Objective 2.

Response to Comments ORG42-16 and ORG45-16

The EIR differentiates between an increase in abundance of naturally produced fall-run Chinook salmon, and an increase in total adult returns (which could include adults produced from either hatchery or natural production). The elimination of hatchery produced fall-run Chinook salmon and coho salmon under the No Hatchery Alternative is characterized as having the potential to result in a faster increase in survival of *naturally* produced fall-run Chinook salmon, mostly because there would be no competition or other impacts from hatchery produced fish (although, as noted in Goodman 2011, the degree to which this potential is realized depends on characteristics of the hatchery stock and of the existing mixed hatchery and natural-origin population). This means that, in any given year, the naturally spawned fall-run Chinook have the potential to survive better without competition or other impacts from hatchery releases. However, under the Proposed Project, both hatchery returns *and* natural returns from newly accessible habitat would occur in the short-term. Thus, the *total* adult returns from naturally produced and hatchery released production will be greater in the

short-term than natural production alone. The combined production under the Proposed Project is anticipated to increase the rate of reintroduction of fall-run Chinook salmon and coho salmon into newly accessible habitat, with the hatchery-origin strays into the new habitat becoming part of the new natural fish population. This increase in population as well as the hatchery production itself are anticipated to provide increased resiliency to unforeseen environmental disturbance or other threats to the populations (NMFS 2017b), and more rapid realization of the other benefits of increased habitat access to these populations. Further, it is worth noting that the coho salmon hatchery is managed under an Hatchery Genetic Management Plan (HGMP) to address any potential negative genetic impacts of hatchery operations and has been deemed necessary to protect the remaining genetic resources of the Upper Klamath River Population unit (PacifiCorp and CDFW 2014). Both naturally produced and naturalized hatchery strays will increase the natural population available to recolonize newly accessible habitat following dam removal.

The EIR notes that spring-run Chinook salmon do not benefit from hatchery production in the same way as fall-run and coho salmon (Potential Impact 3.3-8). However, in light of the population and resiliency benefits to the other anadromous salmonids, and in light of the fisheries emphasis in Objective 2 – which highlights the importance of fall-run Chinook salmon – the findings regarding Objective 2 remain appropriate.

A greater total number of adult salmon available for harvest in the short term meets the emphasis of the Proposed Project Objective 2, "In a timely manner, advance the long-term restoration of the natural fish populations in the Klamath Basin, *with particular emphasis on restoring the salmonid fisheries used for subsistence, commerce, tribal cultural purposes, and recreation*" as quickly as possible.

Thus, while both the Proposed Project and the No Hatchery alternative are projected to increase natural fish populations in the long term, the Proposed Project is projected to do so more rapidly, and to better meet the fisheries emphasis of Objective 2.

Please also refer to responses to comments ORG42-9.

Comments ORG42-17 and ORG45-17

In addition to the benefits to native fish populations, the DEIR also directly identifies that the No Hatchery Alternative will result in lower GHG emissions than the Proposed Project. "[U]nder the No Hatchery Alternative, operational emissions from the hatcheries would be lower (zero) than those under existing conditions." Moreover, the DEIR states that the No Hatchery Alternative "would further the underlying purpose and most of the project objectives" and "reduce construction-related impacts of reopening Fall Creek Hatchery and making modifications at Iron Gate Hatchery." The full removal of the hatcheries in

conjunction with the dam removal, as opposed to waiting eight years, would save time and resources by eliminating the need to engage in two different deconstruction phases. Instead of expending energy relocating fish trapping and holding facilities and balancing the repurposing of the facilities, the dam and hatchery deconstruction activities can occur simultaneously so to eliminate a second wave of construction activities. This would eradicate the need for a subsequent disruption of the aquatic habitats rehabilitating in the river post-dam removal.

The No Hatchery Alternative provides more environmental benefits to native fish populations, results in overall less GHG emissions, eliminates aesthetically displeasing infrastructure, and thus undoubtedly meets the Project objectives. As such, Patagonia strongly urges the State Water Board to consider adopting the No Hatchery Alternative in the long-term interest of native fish populations.

Response to Comments ORG42-17 and ORG45-17
With respect to the potential for future hatchery operations beyond eight years following dam decommissioning, demolishing of hatchery structures, or decommissioning of the hatchery in place, the EIR is not required to speculate (CEQA Guidelines section 15145). If the hatchery were to be demolished following the eight years of continued operations analyzed in this EIR, those deconstruction activities, or any other hatchery-associated actions not analyzed in this EIR, would be subject to separate environmental review.

With respect to the comment's concern about greenhouse gases, this portion of the Draft EIR was recirculated on December 21, 2019. Please refer to the recirculated document (*Greenhouse Gas Emissions and Energy*).

With respect to aesthetics, please refer to response to comment ORG42-14.

Comments ORG42-18 and ORG45-18
While Patagonia supports the removal of the Dams from the Klamath River Basin, the company also strongly opposes the continued operation of the Iron Gate and Fall Creek Hatcheries due to their detrimental impacts on native fish populations. Patagonia urges the State Water Board to adopt the No Hatchery Alternative to better protect the ecological health of the Klamath River Basin and fully embrace the project's objective of restoring native fish populations, particularly the restoration of salmonid fisheries used for subsistence and recreation. The State Water Board should reconsider and reevaluate the impact of hatcheries on the Proposed Project in an attempt to benefit the longevity of all anadromous fish species and restoration of viable river habitat.

Response to Comments ORG42-18 and ORG45-18
This comment is noted as a summary conclusion of prior comments. Please refer to prior responses.

Save California Salmon, Save the Klamath Trinity Salmon, Regina Chichizola

Comment ORG41-1

Please accept the following comment letter from Save California Salmon on the the current application to provide a 401 certification to take down four of the Klamath River dams and transfer the license for the dams from PacifiCop to the Klamath River Renewal Corporation. We support this permit and transfer and urge the water board to process and approve a final license for the removal of four Klamath River dams.

We thank you for producing a well supported and thorough CEQA document, and for your professionalism and commitment in providing for public comment opportunities and to creating a final 401 permit that protects, and restores, the Klamath River. We support the conclusion that the removal of four of PacifiCorp's dams is the only way to restore water quality in the Klamath River. We also wish to apologize for the disinformation campaigns, and at times poor treatment, the board and staff has had to deal with throughout this process. Your commitment to civility, ahearance to state laws and water quality standards, and use of the best available science is commendable. We thank you for this commitment.

At this time we wish to incorporate by reference the comments of the Karuk Tribe, the Yurok Tribe, the Klamath Tribes of Oregon, the Pacific Coast Federation of Fishermen's Associations, The Institute for Fisheries Resources, the Klamath River Renewal Corporation, California Trout, and the California Hydropower Reform Commission.

Years of studies and peer reviewed science surrounding these dams operations have been exhaustive and have proven that the only legal alternative pursuant to state law, is dam removal of four Klamath dams. All other possible alternatives and mitigations have been explored and found unachievable or to be too expensive to be attainable. We feel that the application from the Klamath River Renewal Corporation is thorough and supported by science and their plan for removal is achievable and provides for the best possible mitigations for any short term adverse impacts to water quality. These impacts are minimized to the level of an foreseeable winter storm events and this is amazing considering that this is the largest river restoration project even planned.

We are also incorporating by reference our January 29th, 2016 comment letter, which gives a much more detailed argument for taking down, rather than permitting, the Klamath Dams.

The remainder of this comment letter will be focused on the impacts from dam removal only and will mainly consist of quotes from dam removal studies or science magazines. Links to referenced studies will be included. They will show that even the fears of short term impacts are overblown and the actual impacts of

dam removal and been very short term and less than significant even in dam removal projects with extremely high levels of PCBs and sedimentation.

Short term impacts verse. Long term benefits of dam removal

There has been much negative misinformation shared in the public hearings on the dam removal that is easily disproved. The impacts and toxicity from sediments behind the dams and flood control are the most common talking points used for misinformation campaigns be dam removal opponents. In truth the movement of sediments and a dynamic river system is absolutely necessary for healthy river and fishery, and multiple studies have been done to show that the sediments that can be mobilized are non-toxic.

Sediments from dam removal which may have a short lived negative impact, will likely provide for new, and needed in river and estuary habitat, and deposit sediments that will allow for streamside restoration. In the Klamath where much of the habitat in river is starved for gravel and much of riverbars have been heavily mined and grazed leading to lack of streamside vegetation, this sediment could actually provide much needed habitat in the long term. The positive impacts of increasing habitat, when coupled with the reduced temperatures and fish diseases that will come with dam removal can not be overstated.

Many studies speak to the short term impacts and long term benefits of dam removal and impacts of sediment. The most recent is in Volume 69 Issue 1 of BioScience Magazine at:

https://academic.oup.com/bioscience/article/69/1/26/5285462

"Although sediment deposition may initially perturb aquatic organisms and riparian vegetation, it is also a resource for ecological recovery. Sediment-starved river channels downstream from dams can become incised, armored, and disconnected from their floodplains (Ligon et al. 1995). Deposition and subsequent redistribution of reservoir sediments create new gravel bars, a more heterogeneous streambed, and more suitable spawning habitats for nest-building fishes (Kibler et al. 2011) Entrained reservoir sediments can also aggrade downstream channels and reconnect lateral floodplain habitats (East et al. 2015, Magilligan et al. 2016). Increased channel migration, creation of new gravel bars, and sediment deposition on floodplains provide new surfaces for colonization by pioneer plant species and potentially restore a shifting riparian habitat mosaic (Shafroth et al., 2002, 2016).

https://academic.oup.com/bioscience/article/69/1/26/5285462

"In the past there have been concerns about the short term impacts from sediment plumes as a result of dam removal. Dam removals on the Elwha and White Salmon River, along with dam removals in Florida, Wisconsin, Maine, and

Arizona provide a wealth of information on methods to minimize this risk. Studies and observation have shown that rivers have been extremely efficient at moving fine sediments. Related water quality studies have shown temperature and Dissolved Oxygen improvement almost immediately following dam removal, which in turn can have a positive impact on fish disease and attached algae composition.

There are several approaches to sediment mitigation during dam removal. They can range from slow drawdown and complete sediment removal to a quick removal allowing sediment to be washed down river." A discussion of these methods can be found at:"

http://repository.usfca.edu/cgi/viewcontent.cgi?article=1137&context=capstone

Until large scale dam removal was initiated in the Pacific Northwest, physical sediment removal was a preferred method of sediment management. This was true until the Condit dam removal in Washington, where a "blow and go" method was used due to monetary concerns. This proved very effective with minimal impacts at the Marmot Dam.

"The results were impressive—but very different at the two sites. At Marmot, the sediment contained an equal mixture of sand and gravel. Once exposed to river action, it eroded out relatively quickly but sedately, with about half of it gone within 8 months. Researchers were surprised to find that the fish seemed little affected—the first curious salmon poked its nose back towards the former dam site within a day. At Condit, the sediment contained a higher proportion of fine-grained material: 35% mud, 60% sand and just 5% gravel. The result was predictable in retrospect, but nobody anticipated it.

When engineers blew open a hole at the bottom of the dam, a jet of black liquid shot out as if from a giant fire hose. Instead of the expected flood of water, what came out was more like a mudflow, as waterlogged sediment from the reservoir slumped into the rapidly dropping water, then blasted downriver in a slurry that was as much as 28% sediment by volume. The reservoir lost its water and much of its sediment load in three hours. "It was almost like a volcanic event," says Jon Major, a geomorphologist at the USGS's Cascades Volcano Observatory in Vancouver, Washington. The 5-kilometre-long stretch of river between the dam and its confluence with the Columbia River temporarily became a muddy wasteland. With this kind of approach, says East, the slug of sediment wipes out everything, but the river can start recovering much sooner."

http://www.nature.com/news/dam-removals-rivers-on-the-run-1.15636

In the Elwha Dam removal, a more conservative approach was used "Unwilling to risk the blow-and-go approach on both dams, engineers opted for a compromise. They quickly removed the lower, 32-metre-high Elwha Dam, which contained

only about one-sixth of the total sediment. But the upstream Glines Canyon Dam, which is twice as big, came out in a series of steps that have so far lowered it to a 9-metre stub of its former self. East compares the method to deciding whether to uncover a wound quickly or gradually. The approach on the Elwha, she says, is like "pulling the Band-Aid off slowly, over the course of three years".

http://www.nature.com/news/dam-removals-rivers-on-the-run-1.15636

Initial findings on sediment movement during dam removal have shown that gravel has migrated slowly, while silt coming out of the Olympic Mountains tended to move quickly downstream and into the Strait of Juan de Fuca. This fine sediment has thus far been found to be beneficial to river mouths. In the removal of the dams from the Elwha River in Washington new sandy beaches were found to be prime habitat for shellfish, which could greatly benefit the commercial and subsistence fisheries in this area. Though benefits of sediment recruitment are already occurring, there are short term impacts to kelp and shellfish beds. As far as short term sediment release, the rivers have proved unexpectedly efficient at flushing the worst of the mud downstream towards the sea, rather than letting it accumulate in river-choking mudflats. It is important to note that the Klamath reservoirs and Klamath River have less sediment-related issues then the sediment-impaired rivers that were removed in Washington. Reports regarding sediment behind the Klamath dams can be found in the Klamath River dams secretarial determination record.

Impacts to Fisheries

We believe that this dam removal project will have limited to no negative impact on endangered, subsistence, commercial and threatened fisheries in the short term because the removal is well planned. This dam removal has been planned mimic a large flood event, which often actually benefit fisheries by scouring out fine sediments and attached algae, and providing new habitat. The long term positive impacts of restoring water quality and fisheries populations can not be overstated. This is a rare opportunity to restore a watershed that is climate change adaptable and delist a river for many water quality impairments.
"Data on the recent dam removals suggest that the fish are now coming back to the unfettered rivers. At Condit, fish were seen returning within weeks of the explosion. Two years later, the total exceeded 5,500, including steelhead and spring Chinook (Oncorhynchus tshawytscha), which had been effectively extirpated from the river," said Jody Lando, a quantitative ecologist with Stillwater Sciences in Portland, Oregon, who reported her results in May at an aquatic-sciences meeting in Portland."

http://www.nature.com/news/dam-removals-rivers-on-the-run-1.15636

"Furthermore, observations have shown that benefits have been almost immediate, with salmon spawning in above-dam tributaries within the first two

years that dams were removed for fish entering the river, researchers can barely contain their excitement about last fall's migration of chinook, coho and pink salmon, along with steelhead trout. At least some of every species made it past the spot where the Elwha Dam stood just two years ago."

http://www.kitsapsun.com/news/environment/dramatic-changes-following-elwha-dam-removal-ep-416589177-356243611.html/

For salmon and insect-dependent species, such as the dipper recovery was also almost immediately.

"In one study, the researchers documented that American dippers with access to salmon were in better physical condition and more likely to attempt multiple broods of offspring in a season. They also produced larger female offspring and were more likely to stay in breeding territories year-round. The research, published early online, will appear in an upcoming issue of the journal Ecography"

(https://news.osu.edu/news/2015/12/28/river-ecosystems/)

"Returning steelhead are not the only signs of success. Just above the old dam site, Coffin winds his way through patches of alder trees that were planted after the dam was removed, then crosses a rocky beach to the river. The rounded stones range from the size of potatoes to loaves of bread, and make for tricky footing. But Coffin is thrilled to see them because none of these ankle-breakers was here when the dam was first taken out. "All of this washed in," he says.

The cobbles provide nesting spots for the trout and a habitat for the insects that the fish eat. "People pay attention to the big animals," Coffin says, "but the bugs are an important part of the system." Reaching into the water, he plucks out a couple of rocks, turns them over and points out six types of insect clinging to the underside, including caddisfly larvae and a stonefly. "The year after the dam was removed, these wouldn't have been here," he says with satisfaction."

http://www.nature.com/news/dam-removals-rivers-on-the-run-1.15636

The lack of water quality impacts and immediate fisheries restoration are not specific to Northwest Rivers. "other parts of the United States have also seen dramatic fish returns. On south-central Wisconsin's Baraboo River, the removal of a string of dams has allowed sturgeon to reach their former spawning grounds. And in New England, the destruction of two dams 7–9 metres high on Maine's Kennebec River and one of its tributaries has allowed Atlantic alewives (Alosa pseudoharengus) to repopulate 100 kilometres of previously blocked-off river. In 1999, before the first dam was taken out, no alewives were recorded in the upper part of the watershed, says Serena McClain, head of river restoration for American Rivers. By 2013, the annual run had rebounded to around 3 million."

http://www.nature.com/news/dam-removals-rivers-on-the-run-1.15636

Thank you for the opportunity to comment and for coming to Siskiyou and Humboldt Counties so we could provide verbal testimony.

Response to Comment ORG41-1
Comment noted. Please refer to Master Response GEN-1. With respect to the Lower Klamath Project Draft EIR comment letters incorporated by reference, please refer to responses to comments TR-18 (Karuk Tribe), TR-19 (Yurok Tribe), ORG-29 (Pacific Coast Federation of Fisherman's Association and the Institute for Fisheries Resources), ORG-47 (Klamath River Renewal Corporation), ORG-27 (California Trout) The Klamath Tribes of Oregon and the California Hydropower Reform Commission did not submit comments on the Lower Klamath Project Draft EIR.

Thank you for the additional references regarding the beneficial effects of dam removal in other river systems. Ligon et al. (1995) and Shafroth et al. (2002) are cited in the EIR and the other references listed on page 3 of the comment have been added to the administrative record for the Lower Klamath Project EIR.

Sierra Club, John Livingston

Comment ORG43-1
The Shasta Group of the Sierra Club has approximately 1200 members who live between the Oregon Border and the City of Red Bluff in California and who reside in the Klamath River area. Our review of the DEIR indicates that very significant benefits will occur with adoption and implementation of the proposed project which includes removal of dams and appurtenant facilities to allow unrestricted flow of the Klamath River in California.

Response to Comment ORG43-1
Thank you for your comment. Please also refer to Master Responses GEN-1 and GEN-2.

Comment ORG43-2
We support the proposed project and look forward to implementation at the earliest possible time. Additionally, we hope that the State Water Resources Control Board will work with the State of Oregon to improve water quality and remove any barriers in Oregon that continue to impair water quality and fish habitat.

Response to Comment ORG43-2
Comment noted. Please refer to Master Response GEN-1.

Siskiyou County Water Users Association, Richard Marshall, Rex Cozzalio

Comment ORG30-1

Attached is part 1 of 2 submittal by Siskiyou County Water Users Assoc. in the matter of the response to 401 Water Certification EIR for the Klamath Dam project. Part 2 will be submitted forthwith. We look forward to any response that the Water Board may make.

Response to Comment ORG30-1

The State Water Board received the comments attached to this email and designated by Siskiyou County Water Users Association as "part 1" of their submittal. Please note that comments on the California Draft Water Quality Certification for the Lower Klamath Project should be submitted to the State Water Board's Water Quality Certification Program following the instructions provided at https://www.waterboards.ca.gov/waterrights/water_issues/programs/water_quality_cert/lower_klamath_ferc14803.html.

Comment ORG30-2

The Siskiyou County Water Users Board of Directors hereby submits their review, analysis, and attachments relative to our response to the proposal by the California Water Board of conditions relative to the proposed destruction of four Hydro-electric generation facilities and resultant release of contaminated sediment laden waters into the Klamath River, a federally designated "Wild and Scenic and Recreational River".

Response to Comment ORG30-2

The Proposed Project is not a proposal of the State Water Board. As stated in Volume I *Executive Summary* (page ES-1) and Section 1.1 *Introduction – Authorization, Purpose, and Use of EIR* (page 1-1), the Klamath River Renewal Corporation (KRRC) applied to the California State Water Resources Control Board (State Water Board) on September 23, 2016, for water quality certification for the Proposed Project, which involves removal of the Lower Klamath Project and associated facilities, pursuant to section 401 of the Clean Water Act. The State Water Board is the lead agency under the California Environmental Quality Act (CEQA) for water quality certifications. The State Water Board prepared this EIR to conform with CEQA, which requires a lead agency to analyze the environmental impacts of projects that may affect the environment. The EIR focuses primarily on impacts related to actions proposed for the California portion of the Proposed Project, including potential impacts related to releases of sediment-laden water in the mainstem Klamath River downstream of Iron Gate Dam designated as a wild and scenic river segment by both the State of California and the federal government. For information on potential impacts to the wild and scenic river segments of the Klamath River associated with the Proposed Project, please refer to Volume III Attachment 1 Section 3.20.5 *Recreation – Potential Impacts and Mitigation* Potential Impact 3.20-7. Further, all potential impacts associated with sediment releases under the Proposed

Project would be short term (1-2 years post dam removal) and would not compromise the wild and scenic designation. Additional information regarding sediment-related impacts is included in responses ORG30-9, ORG30-23, ORG30-60, ORG30-64, ORG30-65, ORG30-66, and ORG30-87 below.

For information on sediment erosion, transport, and deposition associated with the Proposed Project, please refer to Volume I Section 3.11.2 *Geology, Soils, and Mineral Resources – Environmental Analysis* and Section 3.11.4 *Geology, Soils, and Mineral Resources – Impacts Analysis Approach.* Additionally, please refer to Volume III Attachment 1 Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* for an updated Potential Impact 3.11-5. Please also refer to Master Response GEO-1 for an in-depth discussion regarding sediment modeling.

For information on potential sediment-related impacts to water quality please also refer to Master Responses WQ-3 and WQ-7.

Comment ORG30-3

Not only will the destruction of these facilities cause widespread contamination of the Klamath but will result in a potential long term extirpation of numerous endangered aquatic species besides the Salmon which are claimed to be benefited by the proposed destruction.

Response to Comment ORG30-3

The available science and evidence supporting predictions of the effects of the Proposed Project on aquatic resources are described for each aquatic species in Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts*. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Volume I Section 4.4 *Alternatives – Continued Operations with Fish Passage Alternative* includes an evaluation of the potential effects on aquatic resources of maintaining the Lower Klamath Project facilities using fish ladders or trap and haul as fish passage in Volume I Section 4.4.3 *Alternatives – Continued Operations with Fish Passage Alternative – Aquatic Resources* (pages 4-125 to 4-162).

Please also refer to Master Responses AQF-1, 11, and 12.

Comment ORG30-4

We have suggested previously as has the County of Siskiyou and other groups that before destruction of the clean energy producing hydro facilities that "truck and haul", a viable and inexpensive process be conducted to physically demonstrate the likelihood of the claimed production capability beyond the Hydro facilities. There has never been a scientific analysis which

supports the creation of additional viable habitat beyond Moonshine Falls area.

Response to Comment ORG30-4
The scientific analysis in the EIR that supports the production capability of fall-run Chinook salmon upstream of Iron Gate Dam is presented in Potential Impact 3.3-7. Please also refer to Master Response AQF-4 for a discussion of the historical abundance of salmon upstream of Iron Gate Dam, indicating that salmon use of this habitat would be "restored," and not "created."

Comment ORG30-5
We represent Siskiyou County citizens who indicated by voting nearly 80%, their desire to keep the Klamath Dams in place. We would hasten to add that a recent vote in Klamath County, Oregon, produced approximately the same result. Our concern which should be the concern of all citizens and agencies in California and Oregon is that once the hydro facilities are lost ***there will be no ability to replace them****.*

Response to Comment ORG30-5
Thank you for your comment. Please also refer to Master Response GEN-1.

Comment ORG30-6
Before such a step is taken and what will be a irretrievable condition resulting therefrom i.e. extirpation of numerous endangered species, loss of water storage for fires, loss of control of instream flow, loss of view, loss of recreational opportunities, loss of a valuable hatchery, loss of property values, and loss of lake fishing opportunities amongst other beneficial qualities.

Response to Comment ORG30-6
Please refer to Volume III Attachment 1 Section 3.19.5 *Aesthetics – Potential Impacts and Mitigation* Potential Impact 3.19-1 for an analysis of the potential loss of open water vistas. Please also refer to Section 5.4.2 *Other Required CEQA Discussions and Considerations of Social and Economic Factors – Social and Economic Factors Under CEQA – Real Estate and Property Taxes* (pages 5-7 to 5-11) and Master Responses TER-1, HAZ-2, FLD-1, REC-1, and AQF-1.

Comment ORG30-7
It should also be noted for example that the long nose and short nose sucker fish which are considered an endangered species and are a cultural value to the Klamath Tribe are planned to be nearly exterminated according to the ODEQ study (JC Boyle Dam). They report that the sucker fish population will be reduced by 90%. We also know that a very fragile and unique fresh water trout will be eliminated by the loss of their current habitat at the edge of Copco I, II and Iron Gate.

Response to Comment ORG30-7
As described in Section 3.3.5 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resources Impacts* Potential Impact 3.3-13, the Proposed Project would not exterminate the Lost River and shortnose sucker populations; rather it would eliminate reservoir habitat in which some individuals of the population currently reside. Please see Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*. Please also refer to Master Response AQF-1.

The commenter also expresses concern for the elimination of habitat for a, "very fragile and unique freshwater trout," from the loss of reservoir habitat. State Water Board assumes that the commenter is concerned about impacts to redband trout. As described in Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resources Impacts* Potential Impact 3.3-14, redband trout are highly adapted to riverine habitat, and is anticipated that this species would benefit from the conversion of the Lower Klamath Project reservoirs to riverine habitat. Removal of the reservoirs would not eliminate or harm the overall redband trout population, but rather it would convert habitat from lacustrine to riverine, and it would not impact the proportion of the population already residing in mainstem and tributary riverine habitat. Please see Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment ORG30-8 and ORG30-9
Our first issue with the project proposal is that this proposed project requiring an environmental study is not properly done by using CEQA. The Klamath River is a federally designated "Wild and Scenic River" and also qualifies under the navigable river federal waterway. The project as proposed impacts two states, Oregon and California. This alone demands that an environmental analysis concerning the destruction of the hydroelectric and associated storage capabilities; the destruction of environmental protected fish species not the least of which includes the Coho Salmon and the Green Sturgeon; as well as the short and long nosed suckerfish; and much of the aquatic life in the river system; together with the pollution of the riverine system by toxic sediment demands that the EIR/ EIS be done under NEPA rules and prepared by the ***US Commerce Department and the Department of Interior.***

Response to Comment ORG30-8 and ORG30-8
Please refer to Master Response CEQ-1 for a discussion of the general application of CEQA and the relationship between CEQA and National Environmental Policy Act (NEPA), and Volume I Section 1.1.1 *Introduction – Authorization, Purpose, and Use of the EIR – CEQA Guidance Regarding State Boundaries* (page 1-2) for a description of how CEQA Guidelines apply to projects that may have effects in other states. For information on potential impacts to the wild and scenic river segments of the Klamath River associated with the Proposed Project, please refer to Volume III Attachment 1 Section 3.20.5 *Recreation – Potential Impacts and Mitigation* Potential Impact 3.20-7.

The potential effects of the Proposed Project are discussed in the EIR for coho salmon in Potential Impact 3.3-9, for green sturgeon in Potential Impact 3.3-12, and for Lost River and shortnose suckers in Potential Impact 3.3-13. The potential effects of reservoir sediment released under the Proposed Project are analyzed in Section 3.2.5.2 *Water Quality – Potential Impacts and Mitigation – Suspended Sediment*. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Comment ORG30-10 and ORG30-11

Furthermore, one can't study just part of the Klamath River system in California especially when it comes to sediments and pollution. One must look to the headwater source of the Klamath in Oregon. The production of nitrogen and microcystin which is wrongly attributed to the presence of the hydroelectric facilities occurs naturally and by way of the byproduct of farming operations and particularly the bird life in the Oregon side of the River system. The studies done previously by the Bureau of Reclamation make this point very clear. Among others they concluded that the pollution problems could be substantially reduced or even eliminated by the ***installation at Keno Dam of a water quality treatment facility****.*

Response to Comment ORG30-10 and ORG30-11

Please refer to Master Responses WQ-1 and PAP-1 for a discussion of the role of the Lower Klamath Project facilities with respect to overall water quality and the influence of upstream sources of algae and associated toxins on conditions in the Hydroelectric Reach, the Middle and Lower Klamath River, the Klamath River Estuary, and the Pacific Ocean nearshore environment. As explained in those master responses, the EIR acknowledges upstream sources of pollutants, and the potential impacts of the Proposed Project were analyzed with that context.

Comment ORG30-12

Within this same study the removal of the hydro facilities and storage capability will dramatically impact the ability to modulate the river flow especially in low water times. The BOR estimates that replacing this in stream flow capability may cost upwards of ***Eight Billion*** *dollars. This would require the placement of significant water storage facilities in the upper Klamath Basin.*

Response to Comment ORG30-12

As described in Volume I Section 3.8.1 *Water Supply/Water Rights – Area of Analysis* (pages 3-667 to 3-669), there would be no water supply impact to the mainstem Klamath River from implementation of the Proposed Project. The United States Bureau of Reclamation (USBR) maintains its biological opinion obligations on operations of the Klamath Irrigation Project which require water to be released to the mainstem Klamath River regardless of the existence of the Lower Klamath Project, such that dam removal would not alter the amount of

water available for environmental purposes, or the source of that water, for the mainstem Klamath River or the tributaries. Please also refer to Master Response HYD-1 for a discussion of how the EIR considers Klamath River flows under the 2019 BiOp operations criteria for the Klamath Irrigation Project.

As described in Volume I Section 3.8.5 *Water Supply/Water Rights – Potential Impacts and Mitigation* Potential Impacts 3.8-1 and 3.8-2 (pages 3-676 to 3-680), during the extreme drought of 2014-2016, PacifiCorp coordinated late-2014 releases from Iron Gate and Copco No. 1 dams which resulted in a small degree of flexibility for managing irrigation water in the Upper Basin by allowing USBR to postpone releasing water for irrigation purposes at Keno Dam. A comparable water borrowing agreement between PacifiCorp and USBR for approximately 20,000 acre-feet also occurred in 2018. It is unclear if further water borrowing would occur in the future due to the multiple constraints detailed by USBR and discussed in Volume I Section 3.8.5 *Water Supply/Water Rights – Potential Impacts and Mitigation* Potential Impact 3.8-2 (pages 3-679 to 3-680). The EIR's assessment of the unlikelihood of future water borrowing is further bolstered by USBR's elimination of this alternative from further consideration as part of its environmental assessment of the Klamath Irrigation Project operations (USBR 2019). Removal of the Lower Klamath Project dams would not affect USBR's central role in providing flows to the Klamath River as required by the current biological opinion.

Please also refer to Master Response WSWR-3, which explains that the Lower Klamath Project reservoirs hold approximately two percent of the active water storage in the Klamath River watershed, and Master Response WSWR-1 for a discussion of potential effects on water supplies for the USBR Klamath Irrigation Project.

Comment ORG30-13

*Therefore we object strenuously to the proposed actions which absent a thorough analysis of t**he Pacific Decadal Oscillation (Exhibit A)**, as well as all **seven reaches of the Klamath** cannot determine the full impact of the effort to remove the hydroelectric facilities.*

Response to Comment ORG30-13

The analyses in the EIR do not dispute the importance of ocean conditions for anadromous salmon, nor do they contradict studies that focus on the population-level effects of large-scale variability in the ocean environment that occurs over decades or longer, such as the Pacific Decadal Oscillation (PDO) and/or the El Niño/Southern Oscillation (ENSO). Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species* provides analyses based on historical and current data for salmon run sizes (e.g., Table 3.3-2, and data analyzed in Appendix E) and juvenile production numbers. The data for juvenile production typically occurs as ranges or as average values that have a high standard deviation (or indicate high variability across years using another standard

measure of variation from the mean). Using either run sizes or juvenile production acknowledges the inherent variability in salmon populations that results from numerous factors that influence them at different points in their life cycles, including time spent in the ocean. For further consideration of ocean conditions, please refer to Master Response AQF-13.

The analysis of fall-run Chinook salmon summarized in Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-7 considered the predictions of the Hendrix (2011) population dynamics model, which explicitly addressed the Proposed Project, used stock-recruitment data from the Klamath River, explicitly incorporated variability in watershed and ocean conditions, and presented variance estimates of uncertainty.

The Lower Klamath Project EIR explicitly addresses impacts to aquatic resources in all relevant reaches of the Klamath River, as described in detail in Section 3.3.1 *Aquatic Resources – Area of Analysis*. The EIR primarily focuses on population-level effects of the Proposed Project and the alternatives on salmonid life-history stages that are associated with the mainstem Klamath River, the Klamath River Estuary, and the Pacific Ocean Nearshore Environment, as the dams and associated facilities are located on the river and are upstream of the estuary and the nearshore environment. However, the analyses also include consideration of conditions in tributaries to the mainstem Klamath River, since salmon species that use habitat in the tributaries must access that habitat via the mainstem river, and conditions in much of the Upper Klamath Basin in Oregon, to the extent to which the upper basin areas affect California aquatic resources.

Please see Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment ORG30-14

The study should further include an examination of the impact of the destruction of the facilities will have on the economic well- being of the counties which are impacted. For example there will be an immediate destruction of property values particularly at Copco Lake where owners have already experienced a loss in value.

Response to Comment ORG30-14

Please note that CEQA documents analyze significant effects on the physical environment and does not require analysis of potential effects from implementing a project that are solely social or economic in nature. However, to inform the public and decisionmakers regarding the potential economic consequences of the proposed project, Volume I includes Section 5.4.1 *Other Required CEQA Discussion and Consideration of Social and Economic Factors – Social and Economic Factors Under CEQA – Consideration of Economic Information for Resources Potentially Affected by Dam Removal* (pages 5-4 to 5-11) which summarizes the results of prior economic studies conducted by the U.S.

Department of the Interior (DOI) to characterize potential effects on property value.

Comment ORG30-15
Finally in this section we raise an objection to the State of California spending tax payer dollars to benefit a private 501 (3c) non- profit corporation, the KRRC, which although filed as a California Corporation was conceived and developed in New York City. It is bad enough that we ratepayers have been forced to pay an electric surcharge to remove the hydro facilities for many years now against our will and best interest for Siskiyou County. Either KRRC or PacifiCorp should be paying for the studies to be submitted to the State for review, analysis and potential approval.

Response to Comment ORG30-15
Thank you for your comment. Although statements expressing a project or policy preference are noted, a response is not required under CEQA in the absence of a comment on a significant environmental issue.

Comment ORG30-16
The KRRC has not been recognized by either the FERC or the CPUC to carry out the proposed activity. In fact the FERC raised an objection to the KRRC both filing simultaneously the license transfer from PacifiCorp to KRRC and filing to terminate the license and remove the hydro power facilities. Before going into detail we would like to point out that right at the beginning of the Draft report in section 1.0 your author has misstated an important point that the project has been split into two elements by FERC. Our understanding is that shortly after the request was submitted and FERC proposed the split it was countered by PacifiCorp and their subordinate KRRC. Therefore the project is still under license to PacifiCorp and has not yet been split into two pieces. The FERC has never before approved a license transfer and immediately authorized a termination of an existing productive carbon free hydro -electric facility.

Response to Comment ORG30-16
Comment noted. Please see Master Response GEN-2.

Comment ORG30-17
We have not seen any public hearings with the Siskiyou County Water and Flood Control who by statute have control over all waters in Siskiyou County including surface and subterranean waters. Prior to any actions which will impact the Klamath River and or its tributaries in Siskiyou County permits will have to be obtained from the Siskiyou County Water and Flood Control Agency.

Response to Comment ORG30-17

The Siskiyou County Flood Control and Water Conservation District is one of the several flood control and water conservation districts created by a special act of the California Legislature. The District's enabling act, set forth in Chapter 89 of the California Water Code Appendix, designates the Board of Supervisors of Siskiyou County as the board of directors for the Siskiyou County Flood Control and Water Conservation District. (Wat. Code App. § 89-9.)

Volume I Section 1.5 *Introduction – Public Involvement and Agency Consultation in Preparing Draft EIR* (pages 1-4 to 1-8) describes the State Water Board's outreach efforts, including consultation with Siskiyou County. In addition to the public scoping meeting held in Yreka in January 2017, which any local elected official could attend, State Water Board representatives met with the Siskiyou County Supervisors on July 2017, attended an in-person meeting with the County's designated contact and consultants on August 19, 2018, and gave a presentation at the August 14, 2018 meeting of the Siskiyou County Board of Supervisors. These outreach efforts exceeded CEQA's requirements and provided the Siskiyou County Board of Supervisors with ample opportunity to raise concerns or request additional meetings on behalf of the Siskiyou County Flood Control and Water Conservation District.

The comment that permits from the Siskiyou County Flood Control and Water Conservation District will be required to carry out the proposed project is noted.

Comment ORG30-18

Over the years there have been numerous studies of the science of the river yet one of the most significant items which has been completely overlooked is the historic conditions of the Klamath River prior to the construction of any of the Dams. The earliest history of the Klamath River argues against the concept that removing the dams will somehow create more water or more Salmon. Instead the recorded information from eyewitness accounts shows that the Klamath River has historically evidenced cyclical periods of high and low water and an inability to provide enough water for Salmon in the late summer months. In addition it is well established fact that the River is impacted by algae blooms along with little water. We have included in the attached documents a letter dated January 27, 2017 from Glen Briggs, a retired engineer from the US Bureau of Reclamation, whose family has lived on the Klamath for generations. This letter is attached as ***Exhibit B****. In addition we have included an early report from Commissioner of Indian Affairs Moneypenney in 1855. This report was also published as House Executive Document 1, Vol. 1 pp 321576, 34th Congress Seral Set no 840. The report indicates the earliest recorded history showed that there was a scarcity of fish in the Klamath. In addition we have included a selection from Reddick McKee's travel through the Klamath country in 1851. This report indicates the lack of water in the Klamath and lack of Salmon.*

Response to Comment ORG30-18
Section 3.3.2.1 *Aquatic Species – Environmental Setting – Aquatic Species* and Table 3.3-2 sets forth data regarding the historical abundance of salmon in the Klamath River watershed prior to construction of the Lower Klamath Project. In addition, Master Response AQF-4 notes disagreement among commenters regarding the historical abundance of salmonids in the Klamath River. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Regarding historical hydrology in the Klamath River, please refer to Section 3.6.2.1 *Flood Hydrology – Environmental Setting – Historical Hydrologic Conditions* (page 3-589).

Comment ORG30-19
On April 6, 2016 after the resounding failure of the previous KBRA and KHSA agreements, which had been pursued for many years by the Department of Interior, State of California, State of Oregon and numerous agencies and NGO'S, and ultimate rejection by Congress, the States of California and Oregon reconstructed the previously failed KHSA calling it the ***amended KHSA****. This is the underpinning of your organizations efforts to legitimatize the effort to destroy the hydro-electric facilities. It is our opinion that this document is illegal as the Governor of California had no legislative authority to bind the State in a potentially super fund project without the benefit of appropriate studies and deliberations by the State Legislature. In short Governor Brown of California had no authority to enter into an abortive attempt to create a Federal Interstate Compact without Congressional approval.*

Response to Comment ORG30-19
This comment provides the commenter's account of and opinion regarding the formation of the amended Klamath Hydropower Settlement Agreement (KHSA). Comment noted.

Comment ORG30-20
The Klamath Basin is governed by the 1957 Compact between the States of California, Oregon and the Federal Government. This governing doctrine is referred to as "the law of the River". It is a Federal Statute enacted by both legislatures of Oregon and California and codified by U.S. Congress by Statute enacted on August 30, 1957 (71 Stat. 497). This document was developed after many years of negotiation between the States and their representatives and set forth the process for prioritization of beneficial uses of the Klamath River including the hydropower element which was negotiated at the time by COPCO, the predecessor to PacifiCorp. The negotiating team included officials from both Oregon and California and the Federal government. The Compact is still in effect and is still the "law of the River". This magnificently versatile agreement arrived at through earnest and considerate negotiations over five years included, a right to 60,000 acre feet

of water for the benefit of Siskiyou's Shasta Valley to be taken from behind Iron Gate Dam and an additional 200,000 acre feet from behind Keno Dam for the Butte Valley area. Amongst those at the table were members of the Siskiyou County Board of Supervisors under the guidance of Senator Randolph Collier. It also resulted in the development of the very successful fish hatchery at Iron Gate which draws cold water to stimulate the development of SIX MILLION FINGERLINGS (6,000,000) per year to keep the Salmon population well stocked. This process if the dams were destroyed would go with them. There will be no way to make up the difference.

Response to Comment ORG30-20
Please refer to Master Response CEQ-4.

Section 3.3.5.6 *Aquatic Resources – Potential Impacts and Mitigation – Fish Hatcheries* and Section 3.3.5.6 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-7 provide a detailed analysis of the effect of ending hatchery production for fall-run Chinook salmon after eight years under the Proposed Project. As described, available information indicates that the benefits from dam removal and cessation of hatchery operations would increase adult returns by more than the loss of hatchery progeny.

Please also refer to Master Response AQF-2 for a discussion of the fate of Iron Gate Hatchery under the Proposed Project.

Comment ORG30-21
A unique piece of legislation flowed from the adoption of the Compact to the benefit of Siskiyou County. Assemblywoman Pauline Davis, authored AB 1592 through the legislative process in California,. This was further codified under the ***California Water Code as Section 89-1****. This unique piece of legislation blessed the* ***County of Siskiyou with special water rights to govern all waters of Siskiyou County including subterranean and surface water excluding the water controlled by the upper basin federal project****. This was intended to insure that Siskiyou County would be the master of its own fate to provide for development of hydropower and water usage to benefit industry, agriculture and domestic development. Again we would postulate that this unique water right conferred on the County of Siskiyou by the State of California trumps the efforts of the Water Board. These were "quid pro quo" for the County's spearheading the effort to develop the Federal Interstate Klamath Compact.*

Response to Comment ORG30-21
The comment provides the commenter's interpretation of the enabling legislation that formed the Siskiyou County Flood and Water Conservation District, which is codified in Chapter 89 of the California Water Code Appendix. The comment is noted.

Comment ORG30-22

Although the 401 Report by the Water Board contractor states the parameters of the different rules which they expect KRRC to follow, there are no sanctions for failure to comply. Who we ask will pay the bills for damages done after the fact? Biological damages from dam removal as well as ongoing water quality problems are a most likely scenario yet there really is no provision to cover these costs. The insurance provided by KRRC mostly covers only KRRC officers. An example of potential damage includes besides those mentioned above a potential diminution in land values in Siskiyou County alone of perhaps ONE BILLION dollars. This is really not acceptable stewardship by the State by leaving unprotected the County of Siskiyou as well as other Counties both in California and Oregon. There is no evidence that removing the dams is anything other than a political event that will not benefit the Salmon or any other aquatic organisms or any other dependent animals that depend on the river for their needs. The Water Board needs to take cognizance of the Federal Laws relative to the Klamath and take int o consideration as well the citizens who will be directly impacted by dam removal.

Response to Comment ORG30-22

Analyses of the potential impacts of the Proposed Project on water quality and biological resources are provided in Sections 3.2 (*Water Quality*), 3.3 (*Aquatic Resources*), 3.4 (*Phytoplankton and Periphyton*), and 3.5 (*Terrestrial Resources*), among others. Please see Volume III Attachment 1 for the final Section 3.2 *Water Quality* and Section 3.3 *Aquatic Resources*.

With respect to the concern regarding non-environmental impacts of the Proposed Project, please note that the EIR evaluates the potential environmental impacts of the Proposed Project, and it evaluates feasible measures to mitigate those impacts and alternatives to the Proposed Project. The statements regarding land value do not relate to the potential physical impacts of the Proposed Project. While CEQA does not require analysis of a project's purely social or economic effects, Volume I Section 5.4.1 *Consideration of Economic Information for Resources Potentially Affected by Dam Removal* (pages 5-4 to 5-11) summarizes the results of prior economic studies conducted by the U.S. Department of the Interior (DOI) to characterize potential effects on property value.

To the extent the comment raises concerns about the enforceability of requirements that the applicant address the environmental impacts of the Proposed Project, and of the ability of the applicant to do so, please note that pursuant to CEQA section 15126.4 subdivision (a) (2), mitigation measures must be fully enforceable through permit conditions, agreements, or other legally binding instruments. Please refer to Master Response CEQ-2 for further discussion of the enforceability requirement for CEQA mitigation measures in the

context of FERC proceedings. As noted in the comment, the State Water Board has issued a draft water quality certification and will issue a final certification that includes implementing water-quality related potential impacts. These requirements would become enforceable through incorporation into any Federal Energy Regulatory Commission (FERC) surrender license, as well as under the Clean Water Act (CWA). Please note that potential environmental impacts that are not mitigable are analyzed in the EIR as significant and unavoidable. Volume III Attachment 1 Table ES-1 summarizes the results of the EIR impact analyses, including identifying impacts that are significant and unavoidable and impacts that are avoidable with mitigation.

Please note that the applicant explains mitigation surety for the Proposed Project in updates to the Definite Plan. Klamath River Renewal Corporation (KRRC) has identified Resources Environmental Solutions LLC (RES) as the entity that would assume responsibility for long-term maintenance and adaptive management of mitigation measures, and would function as a specialty corporate indemnitor to cover risks not otherwise fully covered by the Project Agreement or insurance and bond programs (KRRC 2019b, 2020). Please also refer to: http://www.klamathrenewal.org/wp-content/uploads/2019/07/KRRC-July-29-FERC-Filing.pdf and http://www.klamathrenewal.org/wp-content/uploads/2020/02/Public-02-28-2020-Supp-Response-Letter.pdf.

Comment ORG30-23

We reiterate our concerns over the legitimacy of the Draft Report by the Water Board, firstly because the study period was exceedingly short and begs the question of the intent of the board with respect to the group most impacted by the potential destruction of the hydro facilities i.e. Siskiyou County in which three of the four facilities to be destroyed are located and which has the greatest river frontage to be impacted by the release of contaminated sediment and opening up the prospect of flooding and resultant damage.

Response to Comment ORG30-23

Please refer to Volume I Section 1.4 *Introduction – EIR Process Overview* (pages 1-3 and 1-4) and Section 1.5 *Introduction – Public Involvement and Agency Consultation in Preparing Draft EIR* (pages 1-4 to 1-8) for a discussion of activities that have occurred since the State Water Board issued the Notice of Preparation (NOP) on December 22, 2016, to the circulation of the Draft EIR for agency and public review, as well as a review of public stakeholder outreach, scoping meetings, scoping comments, and agency and Tribal consultation during this period.

Please refer to Section 3.19.5 *Aesthetics – Potential Impacts and Mitigation* Potential Impact 3.19-2, which discusses the potential aesthetic impacts from a change in river flow and sediment release during reservoir drawdown (page 3-956 to 3-958), as well as Master Response FLD-1, which address potential flood-

related impacts, and Master Responses WQ-3 and WQ-7, which address potential sediment-related impacts to water quality, respectively. Finally, please see Master Response WQ-4 for information regarding the time period of water quality data used in the EIR. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Comment ORG30-24

Secondly, we object to the use of state funding to conduct the EIR/EIS for the benefit of a private company, the KRRC, which is not a proven entity. The KRRC has no demonstrated capability to manage such a huge undertaking and they have no significant funding of their own.

Response to Comment ORG30-24

The comment states an objection to a state agency preparing an EIR for a project that will be carried out by a private entity and the commenter's opinion regarding the ability and finances of the Klamath River Renewal Corporation (KRRC). Please refer to response to comment ORG30-15.

Comment ORG30-25

Thirdly, we believe that the Governor of the State of California had no authority to enter into the Amended KHSA as it had never been reviewed or approved by the Legislature and by signing the agreement he has put the State of California and the citizens of Siskiyou County at great risk and peril.

Response to Comment ORG30-25

The comment provides the commenter's opinion regarding the legality of the Amended Klamath Hydropower Settlement Agreement (KHSA) and the effect thereof on the State of California and citizens of Siskiyou County. Please refer to response to comment ORG30-15.

Comment ORG30-26

Fourthly, the Water Board planned action violates at least three Federal laws (NEPA, Federal Interstate Compact, Article 1 Sec. 10 Clause 3 of the US Constitution, and Endangered Species Act).

Response to Comment ORG30-26

The comment asserts that the Proposed Project will violate federal laws. Please see Master Responses CEQ-1, CEQ-4, AQF-1, and AQF-9.

Comment ORG30-27

Fifth, the proposed objectives of the project under the KRRC are physically and scientifically unattainable. Sixth, and most importantly the existing Interstate Federal Compact has not been dealt with by Congress and therefore remains the law of the river.

Response to Comment ORG30-27
The comment provides the commenters opinion regarding the attainability of the Proposed Project's objectives and asserts that the Interstate Compact remains the law of the river. Please refer to Master Response CEQ-4 for information regarding the relationship between the Proposed Project and the Compact.

Comment ORG30-28
We will look forward to the next step in the process and would request by submission of this letter that our voice be heard and that the Water ***Board subject itself to a public hearing conducted by the County of Siskiyou and surrounding counties****.*

Response to Comment ORG30-28
The comment and request for the State Water Board to appear at a public hearing conducted by the County of Siskiyou and surrounding counties is noted. Please refer to Volume I Section 1.5 *Introduction – Public Involvement and Agency Consultation in Preparing Draft EIR* (page 1-4 and 1-5), which addresses public meetings of the Siskiyou County Board of Supervisors where the State Water Board presented on the status of the Draft EIR.

Comment ORG30-29
Attached is ***part 2a*** *of 2a,b,c submittal by Siskiyou County Water Users Assoc. in the matter of the response to 401 Water Certification EIR for the Klamath Dam project. We look forward to any response that the Water Board may make.*

Response to Comment ORG30-29
The State Water Board received the comments attached to this email and designated by Siskiyou County Water Users Association as "part 2a" of their submittal. Please note that comments on the California Draft Water Quality Certification for the Lower Klamath Project should be submitted to the State Water Board's Water Quality Certification Program following the instructions provided at https://www.waterboards.ca.gov/waterrights/water_issues/programs/water_quality_cert/lower_klamath_ferc14803.html.

Comment ORG30-30
That Klamath Hydroelectric Settlement Agreement (KHSA) was created to implement the destruction of Klamath water storage and hydroelectric production facilities (Project) and place the cost of that destruction on the backs of ratepayers and taxpayers. The intrinsically connected Klamath Basin Restoration Agreements' (KBRA) was intended to provide funding for 'mitigation' of those rewilding damages and authority to force reallocation of Upper Klamath Basin property rights without compensation. Both 'Agreements' were created in secret by regionally exclusionary special interests under Secretary of Interior direction. Those 'Agreements' were rejected by Congress multiple times before resulting in the termination of both the KBRA and KHSA. In continued pursuit of

facilities destruction, again funding and directing a portion of prior special interest KHSA signatories, the Secretary of Interior and the governors of Oregon and California secretly created a new contract with 'revised' decision to strip away 'restoration' funding and accountability in order to sidestep Congressional approval. Consistent with previously failed versions conceived in secret between selective benefitting special interests, those revisions seek imposition of politically derived destructive agenda and environmental damage upon the most affected and unrepresented majority in opposition. After public release, the KHSA created the Klamath River Renewal Corporation (KRRC) nonprofit to carry out the objective while effectively shielding KHSA signatories from any associated liability. The KRRC and PacifiCorp then submitted applications to FERC for 'Transfer' and 'Surrender' approval of that destruction to bypass both Congressional approval and the most affected majority in opposition. Throughout the multiple attempts to superimpose a predetermined agenda, the rationalized rhetoric justifying political imposition and uncompensated resource confiscation have been entirely based upon prior perceived hypothetical benefit to two, and only two, selected environmentally incompatible species (coho and sucker fish). Hypothetically based special interest 'agreed' biological opinions regarding those two species, imposed without accountability or consequence, and regulatory repetitive created regional crises, have engendered extensive Klamath regional loss and suffering. The following is an evolving paper with description of agenda history, followed by agenda signatory claims and the regional history, documentation, conditions, and emerging data refuting those claims of significant destruction benefit.

Response to Comment ORG30-30

Please refer to response to comment ORG30-15. These comments provide the commenter's overview of aspects of the background of the Proposed Project and underlying agreements. Comments noted.

Comment ORG30-31

recommendation for Klamath precedent rewilding. Focused rewilding organizations selected sucker fish and Upper Klamath Lake algae blooms as the Upper Klamath Basin point of environmental pressure, and coho and dams as the target for downstream attention. In Agency directed support, Biological Opinions were created to accommodate those concerns. The subsequent acknowledged 'limited data' modeled Biological Opinions resulted in the 2001 regulatory shutdown of water for Klamath Basin irrigators, which shutdown provided NO identifiable targeted species benefit. That action alone caused financial devastation for over 1,200 Klamath Basin family homes and livelihoods. Subsequently, the same agenda proponents who created policies withholding vested surface waters from agricultural use instead encouraged farms to invest in costly wells to pump from the aquifer for irrigation. 'Emergency loans' were made available for drilling to be secured against the properties, whether adequate water was later found or not. In addition to agriculture paying continued fees for 'vested' surface water they were not receiving, surviving farms struggled to pay

for far more expensive, energy consumptive, and hydrologically altering aquifer pumping. Once regulatory recommended pumping began drawing down the aquifer, the regulatory response was to assert further authority over the 'crisis' of groundwater reduction.

Response to Comment ORG30-31
The comments provide the commenter's description of events that occurred in the Upper Klamath Basin. Please refer to response to comment ORG30-15. Please also refer to Master Response GEN-2.

Comment ORG30-32
Thereby, local agriculture has often been left bearing the carrying costs for wells and surface water rights they are not even allowed to use. In the meantime, the Klamath Working Group, later renamed Klamath Basin Restoration Agreement or KBRA, was formed in sworn secrecy by 26 largely non vested personally benefitting select Agency, environmental Non-Governmental Organizations (NGOS), and Tribal seated 'members'. Many of those members were the same previously instrumental in bringing about the Biological Opinions implementing both the 2001 water shutdowns crisis and the compounding 2006 Federal Energy Regulation Commission (FERC) approved 'mitigation costs' for Klamath dams relicensing having an apparent intention of making PacifiCorp facilities' relicensing options economically untenable.

Response to Comment ORG30-32
Please refer to response to comment ORG30-15. The comment provides the commenter's description of the Klamath Working Group. Comment noted.

Comment ORG30-33
Using the threat of continuing lawsuits against Upper Basin water right holders to force struggling farmer/rancher participation, KBRA 'members' demanded agreement to, and promotion of, two predetermined scientifically unsupported objectives. 'Sitting at the table' required acceptance to supporting dams' removals and KBRA tiered hierarchal beneficial water use reallocation of represented and unrepresented private property rights. Those original and irrevocable 'member' requirements were accepted by a minority of regional land owners in exchange for KBRA promised preferential water allocations over and above their unrepresented neighbors. Given the KBRA 'agreed upon' policy premise of removals, the Secretary of Interior, in cooperation with the same exclusive KBRA compliant special interests, compelled PacifiCorp 'participation' in a separate 'stakeholder working group' to create the Agreement in Principle (later named Klamath Hydroelectric Settlement Agreement or KHSA).

Response to Comment ORG30-33
The comment provides the commenter's description of the implementation of the Klamath Basin Restoration Agreement (KBRA). Comment noted.

Comment ORG30-34
At the same time, California official 'agreement' participants orchestrated a 'revision' to California Water Resources 401 permit objectives 'coincidentally' precluding acceptance of previously permissible hydroelectric facilities water quality.

Response to Comment ORG30-34
The comment provides the commenter's description of revisions to California water quality certification objectives. Comment noted.

Comment ORG30-35
Facing the prospect of 401 permit non-compliance should PacifiCorp pursue FERC relicensing; assured threat of additional seated KHSA member lawsuits if PacifiCorp failed to comply with removal agreements; and give the Secretarial promises of liability indemnification from removal damages, the transference of costs to ratepayers, and apparent preferential consideration regarding other PacifiCorp interstate projects, the new owner Warren Buffet directed PacifiCorp to acquiesce.

Response to Comment ORG30-35
The comment provides the commenter's description of PacifiCorp's decision to enter into agreements regarding the Lower Klamath Project. Comment noted.

Comment ORG30-36
That compelled 'agreement' set the scenario for appropriating ratepayer funds to further propagation of seated Agency's 'biological opinions' consistent with preexisting agenda requirements.

Response to Comment ORG30-36
The comment provides the commenter's description of the intent of the Agreement in Principle. Comment noted.

Comment ORG30-37
The Secretary of Interior then appointed their USGS representative KHSA consultant previously advocating dams destruction, Dennis Lynch, to act as the 'Lead' for creating agenda defined KHSA Environmental Impact Statement (EIS) 'science' justifying a 'Secretarial Recommendation' in favor of the 'Agreements' and dams removals. Utilizing Agency administratively defined 'study' parameters; limited selective 'peer review'; shelving of studies incompatible with agenda premise; extensive 'computer modeled' assumptions; administrative 'final report' parsing of study cited risks and limitations; and 'negotiated' suppression of multiple exposed scientific corruption cases; the KHSA EIS 'opinions' were created advocating for the predetermined recommendations of dams removals and confiscatory resource reallocation. During the agenda defined 'scientific

reviews' and 'Environmental Impact Statement' required 'comment' period, truly regionally experienced and affected resident produced alternatives were repeatedly presented. Presented alternatives integrated non-attrition holistic actions allowing multiple optimized benefit and facilitation of species throughout their naturally conducive environment at a FRACTION of proposed removals and 'mitigation' costs. Though alternate options previously proven components were assessed practical and effective, they were routinely rejected in favor of the hypothetically based and cost ineffective agenda exclusively for the reason that 'alternatives did not advance the position of dams removals'.

Response to Comment ORG30-37
The comment provides the commenter's description of the development and contents of the Klamath Hydropower Settlement Agreement (KHSA) Environmental Impact Statement (EIS). Comment noted.

Comment ORG30-38
In creating those 'Agreements', the Secretary of Interior 'intrinsically linked' the KBRA and KHSA 74, publically declaring that one could not exist without the other, all the while anticipating the Congressional approval of facility removals and funding for special interest KBRA participating member financial benefit. Upon the first Congressional submission of 'Agreements', the KBRA member attached 'mitigation costs' of 1 Billion Dollars for 'restoration' which their own initially contracted study estimated at 1-6 BILLION Dollars. That legislation failed to gain approval. At that point, the Secretary expended efforts to conceal KBRA/KHSA costs within other 'alternative' public sources of funding, altered the 'Agreement', and 'reduced costs' on paper to ensure congressional passage on the next submitted iteration. 'Cost reductions' occurred in part through the Secretary's lead KBRA/KHSA EIR director unilaterally 'determining' a 'blow and go' dam removal along with unbridled release of fisheries toxic sediments into the Klamath as environmentally acceptable, even though against warnings from his own administered 'studies'.

Response to Comment ORG30-38
The comment provides the commenter's description of efforts to address costs of agreements related to the Lower Klamath Project. Comment noted.

Comment ORG30-39
Upon the second submission of that altered 'Agreement' to Congress, the concurrent exposure of special interest KBRA member benefits; multiple instances of exposed scientific corruption including firing the Nation's lead Science Integrity Officer Dr. Paul Houser for objecting to the flawed and biased 'science' regarding the Secretary's own Department of Interior produced Klamath Secretarial Recommendation; documented resident coercion; revealed hidden studies refuting the 'endangered' sucker numbers and coho flow mandates; Agency manipulation of public survey results; the Secretary's attorney authored

exclusionary 'Secretarial Recommendation'; and the 80% majority vote of the most affected region against facility removals; once again resulted in Congressional House rejection and admonition. With the KBRA time frame for Congressional approval having expired, that 'Agreement' also officially ended.

Response to Comment ORG30-39
The comment provides the commenter's description of context related to Lower Klamath Project agreements. Comment noted.

During the Lower Klamath Project Notice of Preparation public comment period, the State Water Board heard concerns regarding the whistleblowing accusations of Dr. Paul Houser as related to the 2012 KHSA EIS/EIR. After hearing these concerns, the State Water Board staff reviewed the independent investigative panel report regarding Dr. Houser's whistleblower complaint, which indicates that the concerns were related to disagreements on how to present uncertainty in scientific data, rather than about the data or scientific analysis itself. (RESOLVE, 2012 - *Independent Investigation of the Scientific Record Pertaining to the Allegations of Dr. Paul Houser.*) Ultimately, the panel determined that Mr. Houser's complaint did not have merit.

Volume I acknowledges in *Executive Summary* Table ES-2 on page ES-23 and in Section 2.6.1 *Proposed Project – Project Background – Water Conflicts in the Klamath River Basin* (page 2-21) that during the Siskiyou County Advisory Election Vote on November 2, 2010 (Measure G), approximately 79 percent of voters expressed their opinion and voted "No" to dam removal, while 22 percent voted "Yes".

Comment ORG30-40
However, originating KBRA/KHSA interests and the Secretary still continued working behind closed doors, further obfuscating, partitioning, and integrating a new secured secret 'Agreement' to obtain the exact same original objectives for benefitting participants but stripped of identifiable 'mitigation' funding which required Congressional approval. Since the KBRA had legally expired, any KHSA constructed 'biological opinions' based upon those KBRA undeliverable resource allocations, implementations, and 'mitigations', also became scientifically invalid. However, all KBRA policies mysteriously appeared to remain in full force by Department of Interior Agencies pursuing a new dams-removal-only 'Agreement'; Secretarial marshalling of participating State and Federal Agencies to 'recommend' for FERC determination of facilities' removals; and 'alternative' paper trail funding appropriations for seated members. Following that final Congressional rejection of KHSA Klamath reservoir and hydroelectric removals, benefitting 'Agreement' participants sought to evade representation of the most affected regional majority through a convoluted and contradictory 'division' of 'intrinsically connected' agenda parts. Using now defective expired EIS, the same special interest policies were again inextricably mandated within the newly (2016) 'revised' KHSA and two interdependent

secretly created 'agreements', the Upper Klamath Comprehensive Agreement (UKCA), and the Klamath Power and Facilities Agreement (KPFA), all three orchestrated and funded by the Secretary of Interior with support from KHSA signatories. However, as of 2019 the UKCA was terminated and the KPFA had still failed its 'promises in exchange for compliance' provisions to date both eliminating even the reduced vestige of essential elements formerly considered necessary for environmental benefit.

Response to Comment ORG30-40
The comments provide a description of the formation and status of additional agreements related to the Lower Klamath Project. Comments noted. Please refer to response to comment ORG30-15.

Comment ORG30-41
By placing one of the most environmentally destructive components, facilities removals, under a FERC determination inundated with conjunctive Secretary of Interior and Governors directed KHSA seated Agency endorsement; given the FERC exemption from public NEPA process; given the lack of FERC resources to adequately evaluate the current science contradicting agenda premise; and considering the relative lack of FERC decision consequence for damages; an inherent conflict of interest was created fomenting significant potential for FERC to abrogate its public trust in favor of 'sister agency' agenda policy compliance. Many of the recently revealed 'opinion' inconsistencies and empirically evidenced failures can only be effectively addressed in an environment of inclusion, accountability, and transparency. That environment to date has not occurred, and upon submission to FERC for approval of an executive policy endorsed Dam Removal Entity request for transfer of Klamath hydroelectric facilities, that representation will likely never occur.

Response to Comment ORG30-41
The comments present a description of circumstances affecting Federal Energy Regulatory Commission's (FERC's) role regarding the Lower Klamath Project dams and assert a lack of local representation in the decision-making process. FERC's role in the dam removal process is addressed in Volume I Section 1.1 *Introduction – Authorization, Purpose, and Use of EIR* (page 1-1) and Section 2.6.2 *Proposed Project – Project Background – Relationship with Klamath Hydroelectric Project* (page 2-22) through Section 2.6.4 *Proposed Project – Project Background – Prior/Related Environmental Reviews* (page 2-25).

Comment ORG30-42
The facilities' water storage, flood damage reduction power generation increased downstream water quality, fire protection, recreation, fisheries improvements, and habitat enhancements have demonstrated the dams' benefits to a unique regional ecosystem for over a hundred years. In essence, those facilities currently constitute environmentally optimized natural edifices within a historically inconsistent transitional zone.

Response to Comment ORG30-42
The comment provides the commenter's summary of the benefits associated with the Lower Klamath Project dams and the risks of dam removal. Comments noted. For information regarding the asserted benefits of the Lower Klamath Project dams raised in the comment, please see Master Responses GRW-1, FLD-1, ENR-1, WQ-1, WQ-2, HAZ-2, REC-1, AQF-10 and TER-1.

Comment ORG30-43
According to one of the world's leading experts on earthen dams construction, removal of Iron Gate in the 'cost effective' manner described by proponents in reality presents one of the greatest disaster risks in modern times through the uncontrollable and nearly instantaneous potential for collapse of an otherwise well-constructed virtually indestructible asset.

Response to Comment ORG30-43
Information regarding the risks of dam failure during removal of the Lower Klamath Project is provided in Volume I Section 3.6.5.3 *Flood Hydrology – Potential Impacts and Mitigation – Risks of Dam Failure* Potential Impact 3.6-6 (page 3-635). Dam embankment excavation would not take place until the associated reservoir is completely drawn down, and so the suggestion that removal will result in a catastrophic and uncontrolled failure of Iron Gate Dam is speculative.

Comment ORG30-44
As predicted by local residents citing historical documentation and current empirical science, hypothetically conceived 'experiments' targeting two species to the detriment of nearly all others have consistently resulted in little except repeated environmental, social, and economic damages. Despite comprehensive regional losses, the 'Agreements' continue to utilize the same rewilding 'theoretical science' now evidenced in the years since as biased, erroneously 'modeled', and failed in every significant assertion. Those same 'agreement' based biological opinions are compounding regional and environmental disaster through unaccountable 'requirement for dam removals'. Even though the theories have been seen to be defective in both premise and projected outcome those continuing imposed 'opinions' will conveniently NOT be subject to 'review' until AFTER the dams are scheduled for removal.

Implementation of the biological opinions used to authorize Agency created regional crisis seeking Hydroelectric Facilities removals are based entirely on two determined 'endangered species', Klamath sucker fish in the Upper Klamath Basin and coho salmon in the Klamath River. Listed below are:

KHSA special interest 'Biological Opinion' arguments used to 'support' Hydroelectric Facilities removals, followed by the actual current known

science, results from prior regulatory 'experimental' implementations, and the related implications regarding the two 'Agreement' considered species.

A. Upper Klamath Basin Sucker fish:

Originating biological premise: *'Klamath suckers are near extinction obviously due to anthropogenic causes affecting water quality, likely primarily associated to Project development, agriculture, municipalities, and reduced marshlands. Even though data and biological information are largely unavailable, dire circumstances require immediate drastic theoretically based environmental enhancements including water quantity and quality improvement primarily through massively decreased Project agricultural water use and agricultural production, increased land retirement, increased marshland development, raising of Upper Klamath Lake levels far above historically known levels, and reduced Municipality, Forestry, and Industrial use impacts'.*

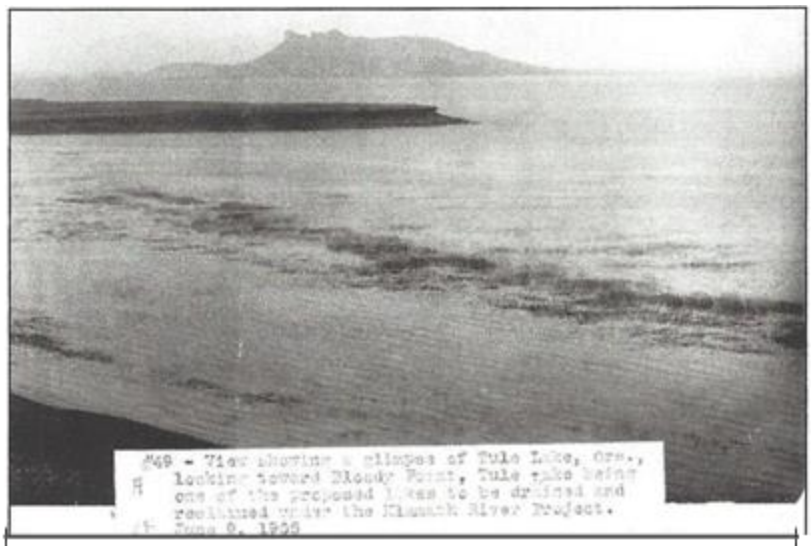
Current known standing*: Historically, due to Agency considered excessive numbers of suckers and low economic value compared to imported species, multiple government attempts were made to eradicate Klamath sucker fish up to the 1960s in different locations to no significant protest or success. Suckers had coexisted and reproduced for over 70 years subsequent to the Klamath Project. Since that time, reduced juvenile survival was the reason for recent Agency experimental 'biological opinion' confiscatory impositions which appear to have negatively impacted sucker populations more than any 'anthropogenic cause' which preceded them. Millennia of sucker fish adaptation to the historically naturally high nutrient, shallow, warm water, and drought prone region allowed it to continue surviving even when faced with newly imported predatory and competitive species adapted to less extreme conditions. New agenda-determined effective 'confiscation without compensation' policies creating unsustainably 'enhanced' environmental conditions have instead proven detrimental to 'protected' suckers advantage in competitive survival. Even though the failed results have now been definitively seen, the 'policies' still fail to change, confirming a political agenda of regulatory rewilding rather than the professed objective of environmental benefit. The following are a few of the major points addressing the present results of originating biological premise:*
Extinction: *The current 'endangered' status is based largely upon USFWS computer modeled predictions. That flawed model cited relatively few and regionally limited sucker expected numbers. A more effective survey later found that those numbers were grossly underestimated. Even though the actual numbers and range would have never supported the original listing, the listing continues. Another primary USFWS 'modeled' impetus for listing was the determination that Lake Ewauna at Klamath Falls was a 'dead zone', not only barren of suckers, but acting as an impenetrable toxic barrier to spawning passage. This was presumed by USFWS due to the 'toxic' proximity of Klamath Falls, agricultural inputs, and logging mills. In 2012, BOR Klamath Area Office resident scientists performed a study in Lake Ewauna identifying not only*

presence of suckers, but a thriving multi-generational population. Those studies surfaced due to complaints by both USFWS and NMFS against BOR for challenging their agenda 'basis', resulting in the BOR firing of those scientists and the scientists' public release of information and subsequent retaliatory lawsuit.

Facing public awareness and solid studies (including another study the scientists performed and described below under coho), BOR rehired the scientists, prohibited them from performing any additional studies, shelved their prior peer reviewed studies from public access, promoted their supervisor who had defended the agenda stance by firing the scientists, sealed the court documents, and placed a nondisclosure clause as a condition of the agreement. At present, sucker populations in Lake Ewauna are known to be some of the strongest in the region, and are actively being 'transported' in large numbers to other locations. Once again, the 'endangered' status, the resultant biological opinions, and their attendant impacts did not change.

In order to 'restore' sucker fish, over 15 years of regulatory imposed suffering and loss reigned within the Klamath Basin from water restrictions based upon the hypothetically based 'Biological Opinion' (BO) that Upper Klamath Lake levels should be higher than had ever naturally occurred, even though the original Project had already raised historically shallow UKL levels substantially with Link Dam nearly 100 years earlier. That hypothesis was and remains unsupported by historical documentation, local experience, or empirical science.

After approximately 10 years of increased lake levels, ***a 2012 DOI study cited the DECREASE of lake sucker populations ranging from 38-86%68 and overall UKL sucker decrease of 75% from 2001 to 2016****. Despite those losses and extensive unbiased expert conclusions challenging lake level benefits notwithstanding, the 2013 'programmatically' revised Biological Opinions continue to escalate water confiscations to support UKL elevated lake levels and already failed theoretically based 'restoration'.*



Note what appears to be macrophytes and periphyton (algae) in the large, shallow, solar exposed, evaporating, nutrient laden, lake, historically known for the poor quality of water. Those conditions are now being forcibly recreated by dam removal benefitting proponents as ' marshlands' touted as theoretically 'treating' water quality. Those same benefitting proponents seek to forcibly REMOVE downstream smaller surface area, deep water, large volume reservoirs actually PROVEN currently REMOVING nutrient loads and DIRECTLY enhancing salmonid conducive water quality on the Klamath River at the point of greatest benefit.

Required reductions in irrigation withdrawals from reservoirs are promoted as part of the 'opinions', based upon the supposition that fluctuating lake levels are certainly detrimental to sucker habitat and spawning. Actual studies at the shallow John Boyle Reservoir have revealed that supposedly 'detrimental' DECREASED water quality and INCREASED fluctuation of reservoir water levels directly correlated to one of the HIGHEST most robust sustainable populations of suckers. Targeted for removal, John Boyle Reservoir was presumed by removal proponents' biological opinions to be incompatible to suckers by virtue of its 'worst' water quality and greatest fluctuations. Instead, that empirical study demonstrated that ***John Boyle sustains one of the strongest and most life stage diverse populations of suckers found in the region****. Downstream Copco, with its increased water quality and lesser fluctuations sustain larger adult suckers but less generational diversity and population. Significant listed sucker numbers are cited as non-supported in current Iron Gate and downstream Klamath River conditions, likely due to facilities' progressive water quality enhancements more conducive towards both natural and invasive predatory species. Prior to Iron Gate, typical area river conditions were tangentially conducive to both warm and cold water species, presenting mixed marginal fisheries dominated by massive populations of undersized warm water species (i.e. perch, suckers, and bullhead catfish).*

Response to Comment ORG30-44
The comments provide the commenter's summary of and objections to aspects of the development of and basis for removal of the Lower Klamath Project dams, particularly with respect to the biological opinions regarding the Upper Klamath Basin sucker fish. Comments noted.

Please refer to Volume III Section 3.1.6 *Introduction – Flood Hydrology – Summary of Available Hydrology Information for the Proposed Project* for a general summary of biological opinion flows considered in this EIR. However, please also note that comments on the biological opinions for the Klamath Irrigation Project should be directed to the United States Fish and Wildlife Service (USFWS) the National Marine Fisheries Service (NMFS), and the United States Bureau of Reclamation (USBR).

Please also refer to response to comment ORG30-15.

Please also refer to Master Responses AQF-1, WQ-1, and WQ-2.

Comment ORG30-45
With Iron Gate construction, nutrients and warm water fish were sequestered; area 'unnatural' lake cold water was made available for Hatchery and Klamath River use; and increased downstream water quality improvements occurred respective to salmonids. In the case of John Boyle and Copco reservoirs, targeted removals will in fact impair and kill listed suckers by removing an empirically proven sucker conducive habitat, subjecting such removals to potential liability for endangered sucker take.

Response to Comment ORG30-45
Please refer to Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Water Quality* for a summary of the effects of the Lower Klamath Project on water quality conditions downstream of Iron Gate Dam in regard to salmonids. Please also refer to Master Responses WQ-1 and WQ-2. Please see Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources* and Section 3.2 *Water Quality*.

The commenter also expressed concern for the take of suckers from elimination of Lower Klamath Project reservoirs. Please refer to Master Response AQF-1.

Comment ORG30-46
Consistently inconsistent, in frantic pursuit of facilities removals, the 2018 KRRC 'Definite Plan' submitted to FERC called for the effective eradication of those viable populations in John Boyle and Copco, citing an unproven 'disconnect' of suckers from Upper Klamath Lake and an also unproven 'possibility' of 'hybridization' to justify destruction of the endangered species and supporting habitat.

Response to Comment ORG30-46
Please refer to Section 3.3.5 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-13 for a discussion of potential impacts to sucker populations. As noted in comment response ORG30-EMAIL-7, the Proposed Project would not exterminate the Lost River and shortnose sucker populations; rather it would eliminate reservoir habitat in which some individuals of the population currently reside. Please see Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*. Please also refer to Master Response AQF-1.

Comment ORG30-47
To eliminate KRRC liability, KHSA signatories sponsored California legislation to specifically allow them to kill an endangered species based upon the 'unbiased' sole signature of Department of Fish and Game Chuck Bonham, former attorney for Trout Unlimited paid to compel Klamath Dams removals as an author and signatory of the KBRA/KHSA. Ironically, as discussed below, with the removal of the facilities, associated removal of the lakes' progressive water quality improvements will also significantly degrade downstream coho conditions.

Response to Comment ORG30-47
Comment noted. Please refer to Master Responses AQF-1, AQF-9, and AQF-10. Please also refer to response to comment ORG30-44.

Comment ORG30-48
All recent data supports the conclusion that sucker fish endangered status and concurrent failed 'adaptively managed' policies were based upon fabricated and defective premise from the start, challenging the very validity of the endangered listing determination. Subsequent policy directed failed experiments and 'discovered' sucker numbers have only served to confirm that conclusion.

Response to Comment ORG30-48
Please refer to response to comment ORG30-44.

Comment ORG30-49
Marshes, Nutrients, and Agriculture: *Historically Tule Lake Lost River closed loop marshlands were reduced in order to diminish prevailing disease potentials; increase water quality; enhance Klamath River fisheries late summer low flows which often receded subsurface in upper Klamath locations; synergistically create more reliable downstream flows for fisheries and provide dependable renewable electricity for the region while sustaining BOR integral Upper Basin Project pumping electrical needs; better optimize utilization of precious water; increase fertile agricultural production using less water than previously lost within the formerly inundated marshland; and continue to provide wildlife benefit through both retained habitat and increased agricultural provisional feed sources. All improvements were made possible and essentially paid for by the agricultural*

production provided through the optimized exposed lands of the Project. The symbiotic benefits were recognized as a major success throughout the region for over 70 years. Locals had long cited the naturally occurring geology and climate as the primary factor for historically eutrophic conditions and experienced the consequent holistically enhanced environment as a result of the Project's optimization. Despite that local knowledge, recent rewilding promoted 'theories' demanded re-creating marshes. 'Reassigned' agricultural lands were removed from production and inundated. Just regarding lands above Upper Klamath Lake, out of 150,000 formerly irrigated acres,97,160 acres were converted into marsh between 1960 and 2006. Research has confirmed that not only is the water exiting those marshes often higher in nutrients (particularly phosphorous) than those entering, overall water loss per acre is also far greater through absorption and evaporation than when used for irrigation further exacerbating eutrophic resident conditions. The 'restored' Wood River Wetland has easily absorbed and evaporated 100% of the water entering. Interestingly, marshland 'restoration' proximal to Upper Klamath Lake for the purpose of REDUCING biomass occurring from the 1960's and greatly accelerating after the 1980's instead appears to correspond to a perceived INCREASE of Upper Klamath Lake algae blooms. Regardless, the agenda of sacrificing agricultural lands to ever increasing marshes continues.

Response to Comment ORG30-49

The comments provide background and historical information regarding the Upper Basin Project, marshland restoration projects in the Upper Klamath Lake area, and their effects. Please also see Master Response GEN-2.

Comment ORG30-50

Agricultural lands, including those created by the Project, have repeatedly been accused responsible for the predominant nutrient contributions to eutrophic waters. The National Research Council has determined that the naturally occurring phosphorous in Upper Klamath Lake (UKL), and specifically within the top 1" of sediment alone, is sufficient, even with a presumed physically impossible cessation of nutrient addition, to drive the algae/biological mass/dissolved oxygen cycles for a minimum of decades to come. Only a minority of the 40% of phosphorous estimated entering UKL annually to existing lake resident amounts is claimed identifiable to agricultural use, and a majority portion of that has been cited likely from the transitory decomposition of resident phosphorous laden peat. Paleolimnological evidence within UKL indicates a major shift to Aphanizomenon flos aquae dominance over the last century. That study reveals Pediastrum, a non-nitrogen fixing green algae, was dominate prior to Aphanizomenon flos aquae (AFA). Pediastrum is an extremely heavy nutrient dependent feeder found commonly in sewage ponds. Gas fixation by AFA is currently the primary provider of nitrogen to UKL, apparently replacing the nitrogen naturally available to Pediastrum prior to 150 years ago. However, total overall late summer cyanobacteria, biomass, and nutrients have remained nearly the same, with only the significant concurrent DECREASE in N:P ratios over

time, potentially from the transitional organic decomposition of drained former marshes. Microcystis aeruginosa (MA) has historically been a present, active, and productive participant in UKL bloom cycles throughout the entire study, both before and after area development and the subsequent Project. With decreasing springtime N:P ratios, MA development in UKL depends on the nitrogen provided by AFA through its initial bloom senescence release, typically occurring in mid to late summer. AFA is phosphorus driven and UKL contains high levels of regionally natural resident phosphorous with greatest turbulence induced water column resuspension in UKL occurring in spring/early summer. Agricultural lands actually offer the ONLY currently known cost effective long term Upper Basin method of reducing eutrophication-driving phosphorous from the ecosystem. That reduction occurs through phosphorous uptake by plant crops and livestock with their subsequent productive physical removal from the region. Studies have also indicated waters contributed to the Klamath from Lost River Project lands are actually 'cleaner' of nutrients than would 'naturally' exist without agriculture.

Response to Comment ORG30-50
The comments relate to the relationship between agricultural activity and nutrient loads in the Upper Klamath Basin area. Comments noted. Please also see Master Response GEN-2.

Comment ORG30-51
Tens of thousands of acres of agricultural lands in the region have already been forced into permanent fallow based upon the 'theory' that land retirement and reduced irrigation would increase surface water flows. The National Research Council model shows that an INCREASE of Basin agricultural irrigation use actually INCREASES contributed flows to the Klamath River at Keno, but the agenda push for increased land and water 'retirements' continue.

Response to Comment ORG30-51
Comment noted. A summary of historical effects of irrigation, power generation, and environmental requirements on hydrology in the Area of Analysis is provided in Volume I Section 3.6.2.2 *Flood Hydrology – Environmental Setting – Basin Hydrology* (pages 3-590 through 3-621).

Comment ORG30-52
Originating Biological premise: *Agricultural usage of the upper basin water reduces flows previously available downstream for chinook and endangered coho salmon during migration, thereby reducing spawning habitat, increasing water temperatures, increasing disease, and killing downstream salmon.*

Response to Comment ORG30-52
The comments provide a summary of biological premises that have been relied upon with respect to coho salmon. Comments noted.

The EIR provides a summary of existing conditions in the Klamath Basin with regard to salmonids in Section 3.3.2.2 *Aquatic Resources – Environmental Setting – Physical Habitat Descriptions*, and provides a summary of the effects of the Lower Klamath Project on conditions downstream of Iron Gate Dam as relevant to salmonids in Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project*. Please see Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment ORG30-53

Klamath water storage and hydroelectric facilities degrade water quality; contribute organic toxins; increase water temperatures to the coast; create the most salmon disease conducive reach in the river; provide no flood prevention or useable storage benefits; retard the flushing of sediment; fail to provide 'natural' gravel recruitment for spawning salmon; reduce salmon populations by blocking the historical access to millions of salmon from hundreds of miles of pristine spawning habitat; and destroys the health and wellbeing of Upper Basin Klamath Tribes who depended on the salmon since time immemorial.

Current known standing: *Local experience and historic documentation have consistently asserted regional water quality and environmental improvements as a result of the dams compared to pre- dam conditions. Throughout the special interest agenda of Klamath hydroelectric and water storage facilities removals, that information has been completely disregarded by personally benefiting KBRA/KHSA seated largely nonresident removal proponents. As a part of the agenda 'process', a KHSA Klamath Interim Monitoring Agreement demanded there be PacifiCorp ratepayer funded payments made prior to dams' removals for various removal proponent 'stakeholder' benefiting administered 'projects and data acquisition'. Ironically, that site collected data, discussed in further detail below, now confirms the continuing resident stated beneficial importance of the reservoirs and Klamath flow control in enhancing natural background environmental conditions, along with the minimal negative environmental impacts produced in exchange for those major benefits received. However, removal proponent 'analysis' of that data does not appear to be forthcoming and the current 'Biological Opinions' of removal assumptions are not 'scheduled for review' until AFTER dams are slated for removals.*

Response to Comment ORG30-53

Comments noted. Please refer to Master Responses WQ-1 and WQ-4.

Please also note that State Water Board is not a signatory to the Klamath Hydroelectric Settlement Agreement (KHSA) or the Amended Klamath Hydroelectric Settlement Agreement.

Comment ORG30-54

An originating biological premise of removal proponents has been:

'Agricultural usage of water in the upper basin reduced the Klamath River flows previously available downstream for chinook and endangered coho salmon during migration, thereby reducing spawning habitat, increasing water temperatures, increasing disease, and killing downstream salmon.'

Prior to the Klamath Project, the Upper Basin closed loop Lost River system rarely delivered waters to the Klamath River, and never during the period of lowest Klamath River flows. Evaporation from the massively exposed and shallow Lost River and Upper Klamath Lake marshlands was and is far greater than any equivalent area agricultural use. With the preponderance of existing Project agricultural lands located within previous marshlands, the net effect struck a balance between marshland habitat; reduction of detrimental Upper Basin disease conducive conditions; agriculturally produced supplemental migratory avian feed sources; and hydrologic gain for Klamath River system use. The Project stored excess waters in deepened reservoirs allowing controlled and optimized productive water usage, reduced evaporation, and increased water quality through limiting exposure to naturally endemic nutrient sources. National Research Council models show that increasing agricultural irrigation within the Upper Klamath Basin actually results in INCREASED flows entering the Klamath River at Keno. History and research support that net gains to critical late summer/fall flows were made to the Klamath River from the Project's Upper Klamath Lake storage and the Lost River additions, gains which would disappear with Upper Basin 'rewilding'.

Response to Comment ORG30-54
Comment noted. The Proposed Project does not propose reductions of agricultural water use in or “rewilding” of the Upper Klamath Basin, though it would restore the area inundated by J.C. Boyle Reservoir to free-flowing river conditions.

Please also refer to Master Responses, WQ-1 and WSWR-1.

Comment ORG30-55
Water quality has long been demonstrated 'cleaner' coming out of the Upper Klamath Basin agricultural areas compared to that entering. Marshlands being re-created in the Basin have been shown to degrade intended water quality conditions and reduce water quantities available downstream. Naturally occurring, and according to the National Research Council un-ameliorable resident phosphorous in Upper Klamath Lake has been shown to compound and feed 'current salmon objective' biodegraded conditions downstream. It is now apparent that naturally occurring upstream UKL nutrients, biomass, and dissolved oxygen impacts are sequestered, ameliorated, and detained by the downstream facilities. The downstream deep water reservoirs have been shown to provide the only effective evidenced improvement towards current downstream objectives, consistently providing 'cleaner' water below the dams and delaying

release of the worst seasonal water quality which, prior to the dams, historically occurred concurrent with the most vulnerable initial salmon runs.

Response to Comment ORG30-55
Comment noted. Please refer to Master Responses GEN-2, WQ-1, WSWR-1 WSWR-3.

Comment ORG30-56
Present data indicates that existing potential microcystin development and impacts may actually be reduced both quantitatively and temporally as a result of the dams. Considering recent better understanding of cyanobacteria life cycles, particularly Aphanizomenon flos-aquae (AFA) and Microcystis aeruginosa (MA), potential toxins originating in Upper Klamath Lake or added through nutrient uptake biological process within immediately downstream reservoirs are diluted, sequestered, and delayed past the period of greatest potential harm. MA's recently identified characteristics include in-river competitive advantages of adaptive flotation and tolerance to shade and cooler temperatures; toxicity production potential appearing greater in cooler and shadier surface (River) conditions than in stratified warmer high light surface (Lake) conditions; and much greater potential harm from any toxicity occurring through direct cellular food chain ingestion as opposed to ingestion of or exposure to instream dissolved microcystins. Microcystin has an approximate half-life of 1 day in precipitated sediment and 6 days in suspended water column, which combined with the much greater potential toxicity impacts from direct cellular instream ingestion, indicate the undisturbed sediment deep water lakes provide far less toxic potential than instream combined cellular and water column suspended microcystin. HIGHER microcystin concentrations have been shown to occur in downstream Klamath River locations than from water exiting Iron Gate reservoir even under Iron Gate's existing reduced downstream nutrient conditions, evidencing MA's instream opportunistic competitive advantage. However, 'modeled' KHSA 'expert opinion' using over 80 subjective qualifiers in one section alone (eg. could, may, possible) to proclaim removal related 'instream improvements' state that NO marcrophyte/periphyton instream empirical study was or would be performed. Considering MA's described and newly identified biological characteristics, containment, growth, and cellular senescence within the reservoirs, Project lake conditions likely produce far less potential for toxicity development, and reservoir released nutrient reduced instream waters likely result in far less potential for instream direct toxicity harm to all species, including coho and human, than will result from higher nutrient loads carried directly instream without Project deep water lakes. This 'new' regional data evidenced biological assessment is further supported by the historical fact that not a SINGLE cyanobacteria toxicity related health case was EVER reported on the dams affected Klamath region in over a hundred years of hydroelectric storage facilities' operations. The facilities sequester and delay water transport downstream approximately 2 months during late summer flows. The estimated 2 day transport time delivered from concurrent UKL MA senescence nutrient

release without facilities in place would produce significantly higher nutrient loads directly downstream during the lowest flows, highest temperatures, and initiated salmon runs. Those high instream nutrients would support extensive downstream macrophyte and perphyton densities, salmon disease potential, and drastically increased risk of directly ingested cellular MA toxicity development throughout the Klamath River to the estuary during the time of year having the greatest impact to all species, including spawning salmon. Further supporting this, pre and post Iron Gate area residents have repeatedly asserted the directly experienced improvements that Iron Gate made towards downstream salmonid conducive conditions. With virtually all other 'dam impacts' having been discredited, the primary water quality 'impairment' still claimed by hydroelectric storage reservoir removal proponents still focuses on 'toxicity', despite the current compelling evidence demonstrating a high likelihood that the Project actually REDUCES the potential for downstream microcystin toxicity.

Response to Comment ORG30-56
Comment noted. Please refer to Master Response WQ-7 and Master Response PAP-1.

Comment ORG30-57
Initially without site specific study, Agency and NGO Klamath dam removal proponent contracted 'computer generated water temperature models' described dam influenced temperature increases all the way to the coast. Those 'studies' were used to 'justify' Department of Water Resources (DWR) expanded authority for amending the 401 permit, supporting KHSA agenda objective to compel 'negotiation' and preclude feasible continuation of the facilities. Using the word 'impairment' based solely upon hypothesis acknowledging little to no regional empirical data at the time, DWR codified 'administrative' language solidifying Agency power, 'procedural' agenda of removals, and regional 're-wilding'. With several subsequent expanding empirical studies attempting to prove temperature influence, each instead increasingly exposed the opposite. Going from a hypothesized opinion of dams' temperature influence to the ocean, even removal proponent's own modeled study 'opinions' begrudgingly now admit minimal dam impacts for 7 - 15 miles; a margin of error nearly equaling any projected affects; 'benefits' which can only occur with 'fully implemented restoration' as promised by a KBRA that no longer exists; and the continued failing to acknowledge that 'impacts' may actually provide potential overall temperature fisheries benefits for that short distance affected.

Response to Comment ORG30-57
Comment noted. Please refer to Master Response WQ-2 and response to comments ORG46-127, ORG46-128, and ORG-129 for a discussion of the potential for releases from the Lower Klamath Project dams/reservoirs cool the Klamath River and the extent of water temperature impacts from the Lower Klamath Project dams under existing conditions.

Please note that the Department of Water Resources (DWR) does not issue or amend Clean Water Act (CWA) section 401 certifications.

Comment ORG30-58

From the removal agenda's beginning, facilities benefits have been cited by residents experiencing the before and after of Iron Gate, but even now those realities are still ignored by removal proponents. The consequential conclusion of current data supports residents' long held experience that the river very quickly assumes an average of day and night temperatures, with any minor temperature effects seen immediately downstream often found by locals as positive for fisheries. Even with the reversal of the underlying agency 'hypothesis' claiming significant reservoir 'temperature impairment' as justification for authority, the authority granted itself by Department of Water Resources (DWR) still remains. To further assure regulatory determined dam removal, removal proponents concurrently approached EPA to reverse EPA's prior position by adding 'microcystin' to DWR Klamath 'impairment' mandate. To achieve that reversal, EPA 'determined' to NOT consider UKL delivered contributions and based their decision to list Copco to Iron Gate NOT on actual 'impairment', but rather on the site POTENTIAL for impairment. Based on their created authority, DWR began 'amending' policy 'interpretations' to allow subjective DWR Board unelected ability to assure the impossibility of achieving facilities 401 (or potentially any other) 'permit' compliance. One of those 'permit' changes involved creating a computer modeled naturally unattainable Klamath dissolved oxygen requirement. Perhaps unintentionally revealing the true Agency objectives, in typical response to public comment, DWR sub agency North Coast Regional Water Quality Control Board (NCRWQCB) staff wrote the following: "The Regional Water Board cannot establish life cycle-based water quality objectives for the mainstem Klamath River because the DO (dissolved oxygen) concentrations associated with salmonid life cycle requirements cannot be met even under natural conditions- conditions in which there are no anthropogenic influences. As such, the Regional Water Board staff has proposed water quality objectives that protect natural [modeled pre-anthropogenic estimated background] DO conditions from further degradation (underlines and bracket explanation added). In other words, NCRWQCB acknowledges the upstream Klamath is a naturally non-conducive salmon environment, but that even though actual salmon returns have shown no overall declines directly resulting from current vested 'anthropogenic' riparian use; and even though any pronounced isolated detriment to salmon has generally been a confluence of natural and/or transient uncontrollable environmental events; and even though by their own admission salmon should not even exist in the upper middle Klamath under their utilized NCRWQCB computer modeled tolerance assumptions; and even though the computer modeled 'natural background conditions' bear no resemblance to regional Klamath history or experience; DWR still imposed naturally unattainable administrative ever expanding regulatory policy mandates inescapably continuing even AFTER elimination of ALL anthropogenic impacts.

Response to Comment ORG30-58
Comment noted. Please see Master Responses AQF-4 and AQF-8 for discussions of historical abundance of salmonids in the Klamath River and uncertainty in fall-run Chinook salmon production and recolonization. Please see Master Response WQ-5 for discussion of the inclusion of Klamath River Total Maximum Daily Load (TMDL) models in the EIR analysis.

Please note that the North Coast Regional Water Quality Control Board is not a sub-agency of the Department of Water Resources, but a semi-autonomous agency supported and subject to oversight by the State Water Board.

Comment ORG30-59
The dam removal proponents' adamant claim of 'no flood protection' provided by the facilities, without any admitted prior studies, have again been proven wrong following their original disparaging of local experience. Locals, who historically sought the dams in large part for that very reason, subsequently experienced the dramatic reduction in local flood damage that resulted. It took regional residents providing their own mathematical proof before removal-promoting lead Agencies were finally forced to officially acknowledge flood protection, but then marginalized those immediate downstream dramatically experienced benefits within their own buried documents.

Response to Comment ORG30-59
Comment noted. Volume I Section 3.6.2.2 *Flood Hydrology – Environmental Setting – Basin Hydrology* (pages 3-590 to 3-593) describes the history of flooding and alterations to the natural hydrograph in the Area of Analysis, including discussion of the effects of Copco No. 1, Copco No. 2, and Iron Gate dams on Klamath River flows. Please also refer to Master Response FLD-1.

Comment ORG30-60
The attenuation of ramping and delay of flood maximums in excess of 9 hours have resulted in a fraction of the damages to the immediate downstream reaches from high flow events relative to regular extensive riparian, fisheries habitat, and asset losses experienced prior to the dams. Citing KHSA generated one dimensional computer flood modeling 'proving' minimal Project flood damage benefit, KRRC staff admitted those models do not include provisions for historically known experienced factors affecting regional flooding. Those 'models' do not include real world realities of pre dams unchecked upstream annual Upper Klamath Canyon flash flooding avulsing unstable saturated clay based soils and riparian vegetation, forming functional 'battering rams' moving downstream in progressive destruction. With debris lodging into and backing up against any narrowing river channel area, bedrock dikes, or infrastructure, upstream water levels raise, additionally eroding higher elevated banks and vegetation until either the 'dam' itself, the bank supporting the debris dam, or the infrastructure bracing the dam collapses and carries on downstream to repeat at the next impediment. Since Project completion, the downstream affected area

has experienced a fraction of riparian erosion, avulsion, vegetation, and public/private infrastructure loss. Immediate downstream attenuated areas have also benefitted salmon conducive fisheries habitat by minimizing consequent sedimentation of spawning beds and polychaete salmon disease vector habitat, evidenced by LESS disease infection rate and HIGHER salmon survival rate immediately below Iron Gate than at downstream tributary reaches.

Response to Comment ORG30-60

The analysis of the Proposed Project relies on flood frequency analyses and hydraulic and sediment transport modeling conducted by the Klamath River Renewal Corporation (KRRC) (Volume II Appendix B: *Definite Plan*) and USBR (2012a). These analyses evaluated hydraulics and sediment transport during various reservoir drawdown and dam removal scenarios, as well as the potential future condition following removal of the Lower Klamath Project dams. See Master Response FLD-1 for further discussion of flood hydrology downstream of Iron Gate Dam. See Volume I Section 3.6.5.2 *Flood Hydrology – Potential Impacts and Mitigation – River Floodplain* Potential Impact 3.6-1 (page 3-626 to 3-630) for further discussion of reservoir drawdown and dam removal details and Potential Impact 3.6-6 (page 3-635) for further discussion of risks of dam failure.

Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project* includes an assessment of the effects of Lower Klamath Project on salmonid habitat under existing conditions and concludes that the Lower Klamath Project dams have degraded conditions for salmonids - notably by reducing access to suitable habitat upstream of Iron Gate Dam. Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Disease and Parasites* discusses the effects of Lower Klamath Project on disease dynamics and concludes that disease risk is increased as a result of the Lower Klamath Project under existing conditions. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Please refer Volume I Section 3.11.5 *Geology Soils and Mineral Resources – Potential Impacts and Mitigation* Potential Impacts 3.11-4 (page 3-765) for discussion of dam embankment instability, 3.11-5 (pages 3-765 to 3-775) for discussion of sediment deposition, and 3.11-6 (pages 3-775 to 3-776) for discussion of bank erosion; as well as Master Response GEO-1 for discussion of sediment modeling and deposition. Additionally, bedload and suspended load are the dominant sediment transport processes on the mainstem Klamath River, not debris flows. Please also refer to Volume I Section 3.5.5.1 *Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities* Potential Impact 3.5-4 (pages 3-522 to 3-523) for discussion of the potential effects of sediment deposition on riparian vegetation.

Comment ORG30-61

To this day, 'Agreement' Agencies never significantly include facilities' flood damage prevention findings in their 'conclusions' or public media, and NO WHERE do they ever consider mitigations for those damages to the affected downstream resident majority resulting from their decisions. Indirectly applicable to the 'no flood protection' argument, Removal Proponent claims of 'no useable reservoir storage' benefits have been repeatedly contradicted by KHSA members' own multiple demands for Project stored water releases used exclusively for experimental supplemental environmental fisheries coastal benefit, utilizing stored water that will not exist if Dams destruction occurs. Ironically, although Removal Proponents claim already paid for EXISTING provided water storage is of no beneficial consequence, a Bureau of Reclamation study describing the vital need for ANY storage, evaluated additional Upper Basin storage opportunities as having total cost estimates exceeding 10 billion dollars and delivered water costs as high as $44,000 per acre foot.

Response to Comment ORG30-61

Please refer to the response to comment ORG30-84 and Master Response WSWR-1.

Please also note that the State Water Board is not a signatory to the Klamath Hydroelectric Settlement Agreement (KHSA) or the Amended Klamath Hydroelectric Settlement Agreement.

Comment ORG30-62

A contradiction of claims often emerges with removal proponent assertions, depending upon the momentary rewilding purpose and audience served. Cited on the one hand is a 'need for undammed flood flows' to 'flush' sediment and periphyton for salmon disease control and expansion of spawning habitat. On the other hand they simultaneously proclaim the 'benefits' from undammed accretion of sediment for mollusks, macrophyte/periphyton food sources, and salmon parasite (lamprey) habitat. In reality, while those simultaneous claims are logically incompatible and reveal agenda intent rather than consistent environmental objective, the removal of facilities within the areas affected will certainly cause damages to both.

Response to Comment ORG30-62

Comment noted. Please see Volume I Section 3.4.5.2 *Phytoplankton and Periphyton – Potential Impacts and Mitigation – Periphyton* (pages 3-433 through 3-440) for a discussion of potential impacts of the Proposed Project on periphyton in the Area of Analysis. Section 3.3.5.9 *Aquatic Resource – Potential Impacts and Mitigation – Aquatic Resources Impacts* provides a discussion of potential impacts of the Proposed Project on aquatic resources in the Area of Analysis. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment ORG30-63

Since Copco and Iron Gate have been in place, reservoirs warmer water resident species benefitted, and formerly degraded proximal downstream river reach conditions shifted dramatically towards salmon conducive objectives.

Response to Comment ORG30-63

Comment noted. Please see Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Water Quality* for a summary of the effects of the Lower Klamath Project on water quality conditions downstream of Iron Gate Dam in regard to salmonids. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment ORG30-64

Attenuated flood events have allowed existing immediate downstream aggregate appropriate salmonid spawning beds to remain friable and clean without uncontrolled riparian erosion that loaded those beds with basalt clay sediment prior to the dams.

Response to Comment ORG30-64

For information on future flood flows and hydrological data input for sediment modeling, please refer to Volume III Attachment 1 Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*, Volume III Attachment 1 Section 3.11.4.1 *Geology, Soils, and Mineral Resource – Impacts Analysis Approach – Flows*, Volume III Attachment 1 *Aquatic Resources*, and to ORG46-203. Post dam removal, flows would continue to be controlled by Keno Dam and the United States Bureau of Reclamation (USBR) Klamath Irrigation Project 2019 BiOp, or future BiOps, such that flood flows would be expected to be within the range of historical flood conditions.

As described in Section 3.3.2.3 *Aquatic Resources –Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project*, sediment disruption by Lower Klamath Project dams has resulted in a reduction of spawning gravels downstream of Iron Gate Dam, and this has been identified as one of the causes of the decline in salmonid fry production in this reach of the Klamath River (Buer 1981). Removal of the J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate dams as part of the Proposed Project would enable more natural sediment transfer downstream as part of the natural river dynamics, which would have beneficial effects for salmon in the long term. Most fine sediment eroded during drawdown would be transported in suspension to the Pacific Ocean, and any spatially discrete fine sediment deposition would be transitory, mobilizing in future flood events (see Master Response GEO-1). Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment ORG30-65

Recent 'experiments' of water wasting releases intended to discredit that experience and 'prove' proponent contentions have in fact proven the opposite. Original computer modeled predictions of 5,000 cubic feet per second flows from Iron Gate for the exclusive purpose of 'flushing' sediments and periphyton immediately downstream instead produced the reverse effect, eroding fragile banks, depositing large amounts of sediment in gravel beds, and compounding the periphyton and salmon disease potential conditions for the following year as predicted by local residents. Rather than acknowledge 'modeled' inconsistency which would reverse removal proponent assertions and relieve regional regulatory imposed 'water crisis', the choice was instead made to 'double down' on required flows.

Response to Comment ORG30-65

Flow releases, including flushing flows, are determined by the United States Bureau of Reclamation (USBR) Klamath Irrigation Project, which is currently required to operate flows in accordance with the 2019 BiOp (USBR 2018; NMFS 2019; USFWS 2019a), and is independent of the Proposed Project. Implementation of the Proposed Project, including removal of the J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate dams, does not impact flows required for the USBR Klamath Irrigation Project, including flows for management of *C. shasta*. For information on the flow releases under the 2019 BiOp, please refer to Volume III Attachment 1 Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project* and Volume III Attachment 1 Section 3.11.4.1 *Geology, Soils, and Mineral Resource – Impacts Analysis Approach – Flows.* Note that the 2019 BiOp does not require flows equivalent to the 2017 court-ordered flushing and emergency dilution flows, which included flow releases averaging 11,250 cubic feet per second (cfs) for 24-hours downstream of Iron Gate Dam, that were in effect in the interim prior to the 2019 BiOp. For informational purposes, we also note that Hillemeier et al. (2017) demonstrates that flushing flows of specific magnitudes reduce *C. shasta* and salmon disease.

For information on sediment erosion, transport, and deposition associated with the Proposed Project, please refer to Volume I Section 3.11.2 *Geology, Soils, and Mineral Resources – Environmental Analysis*, Section 3.11.4 *Geology, Soils, and Mineral Resources – Impacts Analysis Approach, and* Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5, which are partially modified in Volume III Attachment 1, as well as to Master Response GEO-1.

Comment ORG30-66

A 2016 contrived flood event released over 11,000 cfs from Iron Gate Dam illegally increased more quickly and greater in volume than any actual known natural flood event occurring through recorded history for that date. Long accumulated Upper Klamath Basin water was, with premeditation suddenly and without public warning 'triggered' for 'flood protection' during dry weather and no

forecasted weather events. That event compared to the prior 5,000 cfs 'flush' predictably produced tremendously greater riparian erosion, loss of trees, killing of nested wildlife, and deposition of even greater amounts of sediment within affected river refugias than the previous flush. Exclusively considering only the water quantity exceeding already high flows at the time, the water wasted to the ocean within a 7 day period alone would have provided enough water for over a half million people for a year.

Response to Comment ORG30-66
The comment refers to downstream flow effects of a flood control release associated with Upper Klamath Lake, as stipulated by the 2013 National Marine Fisheries Service and United States Fish and Wildlife Service's joint Biological Opinion (2013 BiOp). The 2013 BiOp has been superseded by the 2019 BiOp. BiOp flow requirements are determined regardless of the existence of the Lower Klamath Project dams. If the Lower Klamath Project dams were removed, the BiOp flow requirement compliance point would move from Iron Gate Dam to Keno Dam.

As discussed in Volume I Section 3.5.5.3 *Terrestrial Resources – Potential Impacts and Mitigation – Special-Status Species and Rare Natural Communities* Potential Impact 3.5-4 (pages 3-522 to 3-523), under the Proposed Project sediment deposition associated with peak flow events would result in no significant impact on riparian habitat in the Middle and Lower Klamath River in the short-term and a beneficial effect in the long-term. Anticipated peak flow hydrology under the Proposed Project would be similar to existing conditions, and therefore no significant impacts on riparian habitat would be anticipated. Similarly, due to similar peak flow hydrology between the Proposed Project and existing conditions, impacts on nesting habitat are not likely to occur. For other nesting wildlife, please refer to Volume I Section 3.5.5.3 *Terrestrial Resources – Potential Impacts and Mitigation – Special-Status Species and Rare Natural Communities* Potential Impact 3.5-18 (pages 3-560 to 3-561) which discusses potential impacts on amphibian and reptile breeding in riverine habitats due to sedimentation under the Proposed Project.

Please refer to Master Response FLD-1 for a summary of potential flooding impacts associated with the Proposed Project. Please refer to Master Response GEO-1 for discussion of sediment mobilization and deposition associated with reservoir drawdown as part of the Proposed Project.

Comment ORG30-67
*Attached is **part 2b** of 2a,b,c submittal by Siskiyou County Water Users Assoc. in the matter of the response to 401 Water Certification EIR for the Klamath Dam project. We look forward to any response that the Water Board may make.*

Response to Comment ORG30-67
The State Water Board received the comments attached to this email and designated by Siskiyou County Water Users Association as "part 2a" of their submittal. Please note that comments on the California Draft Water Quality Certification for the Lower Klamath Project should be submitted to the State Water Board's Water Quality Certification Program following the instructions provided at https://www.waterboards.ca.gov/waterrights/water_issues/programs/water_quality_cert/lower_klamath_ferc14803.html.

Comment ORG30-68
Though the results completely discredit proponent 'undammed' assertions, as typical throughout this 'process' those results, riparian damages, and even the event itself, have received NO public release of information or acknowledgement. Instead of intended proponent objectives, the results actually demonstrate the balanced sediment control benefits that the dams and reservoirs provide. That demonstration, despite being within the most climatically salmon non-conducive region of the historically accessible river, explains how the immediate downstream dam influenced 'most impaired' river reach actually provides one of the highest salmon survival rates of any reach to the coastal influence.

Response to Comment ORG30-68
Please refer to Volume I Section 3.11.2.4 *Geology, Soils, and Mineral Resources – Environmental Setting – Sediment Load* (pages 3-748 to 3-753), which indicates that Upper Klamath Lake traps most sediment entering the lake, and therefore little sediment is supplied to the Klamath River from the watershed upstream of Keno Dam. Additionally, please refer to Section 3.3.2.3 *Aquatic Resources –Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Disease and Parasites* for a summary of the effects of water quality and fish disease on survival of salmonids downstream of Iron Gate Dam under current conditions. Please also refer to Beeman et al. (2007), who reported "lower survival in the most upstream reach than in those farther downstream." Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment ORG30-69
As to 'gravel recruitment' for potential salmon spawning beds, the agenda proponents' own 'expert panels' have acknowledged that regional geomorphology provides little appropriate materials or structure to significantly provide increased spawning habitat within the VERY limited area above dams that salmon were previously known to reach, leaving the amount of spawning beds that exist downstream threatened with sediment loading from facilities removals. Ironically, paid Klamath River Renewal Corporation proponents citing removal benefits of Project area habitat restoration, in their own 'Definite Plan' for facilities destruction, detail the later ongoing unfunded need for annual placement

of gravel and 'large woody debris' typically flushed out every winter in the affected area in order to increase any chance of significant anadromous benefit.

Response to Comment ORG30-69
The commenter is incorrect in asserting that there is very limited spawning habitat upstream of Iron Gate Dam. As described in Volume III Attachment 1 Section 3.3.5.8 *Aquatic Habitat*, there is ample evidence that under the Proposed Project salmon would have access to substantial amounts of historical spawning and rearing habitat. The EIR discusses the potential for impacts to spawning habitat downstream of Iron Gate Dam following dam removal. As described in Volume II Appendix F.5.2.3 *Changes in Bed Substrate*, the Proposed Project could have short-term effects on spawning habitat downstream of Iron Gate Dam. The proportion of sand in the channel bed would likely be higher during the first four months following dam removal than under existing conditions. More interstitial sand in the Klamath River channel upstream of the Cottonwood Creek confluence could reduce embryo survival-to-emergence in these reaches (Chapman 1988). The approximately eight miles of potentially affected channel length encompasses only four percent of the current total Klamath River channel length. These effects would be most apparent in successive median or dry years following dam removal, and less apparent in successive wet years. Within a year these effects are predicted to be ameliorated, and in the long term no impacts to spawning habitat downstream of Iron Gate Dam are predicted. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

With regard to the Proposed Project plan to augment gravel and large woody debris, the Aquatic Resource Measure AR-1 is an appropriate measure to ensure that the potential for short-term impacts to spawning habitat discussed above are addressed and mitigated for. No impacts are predicted in the long-term, and the aquatic resource measure is not proposed to be implemented indefinitely.

Comment ORG30-70
Considering the mounting evidence against prior removal claims, with typical 'adaptive management' agility, the prior rationale advocating water confiscation for 'flushes' has now shifted more towards polychaete reduction in the river reach below Iron Gate.

The revised claim is that the dams create elevated salmon disease conditions (polychaete habitat infected with ceratomyxa shasta delivering actinospores downstream in turn infecting salmon). Emerging evidence and inconsistencies now highly challenge that hypothesis and infer a much GREATER potential for salmon infection with removal of the facilities.

Polychaete has now been found to withstand and mobilize against high flow events. Active and large populations of Polychaete have been observed in the sediments at the mouth of the Williamson River entering Upper Klamath Lake. As the life cycle vector for ceratomyxa shasta, the polychate worm (Manayunkia

speciose) is in turn infected from the myxospores released from decaying C. shasta infected salmon carcasses. Those majority infected carcasses contribute an estimated 89% of myxospores to the Klamath River estimated in the billions, which settle in downstream sediments. High flow events have been found to distribute myxospores great distances. The higher Klamath concentrations of spores are typically found at or below Beaver Creek, substantially downstream of Iron Gate and the Shasta River confluence. Instances of highest spore densities have been tested in Orleans and Tully far downstream of Iron Gate. There is greater connectivity of salmon mortality to temperature and spore density than to low water flows. Spores LOSE viability at HIGHER temperatures, with far greatest salmon infection potential in the winter/spring. 'Interim Klamath Monitoring Agreement' data regarding 'sentinel fish testing' expose susceptible juvenile fish to various locations throughout the Klamath watershed and assess for disease infection. Recent data has revealed that infection rates are generally LESS within the Iron Gate river reach than BELOW the Shasta River confluence, with the highest zones of infection below Iron Gate varying from Beaver Creek downstream, at times occurring nearly to the ocean within the coastal influence. However, comparatively by far the most LETHAL zone of infection potential has consistently been in the Williamson River ABOVE Upper Klamath Lake and UPSTREAM of the Klamath Dams. Current DNA testing for instream monitored spore concentrations detect ALL arbitrary forms and portions of spores, whether viable, degraded, decomposed, or non-infective. Misleading or not, those figures are used to trigger prescribed 'flushing' experiments utilizing narrowly considered 'negative theory' (if nothing bad happens, it must be effective) assessment of benefit, selectively chosen data points, and unsubstantiated regional assumptions concluding potential disease 'reduction' from historically unnatural flows, which even study authors acknowledge will likely become even more necessary AFTER dams destruction, but which will realistically become impossible to achieve with reduced storage. The above has numerous implications. Polychaete vectors already exist upstream in abundance and are well adapted to ALL encountered environments. Any disease susceptible salmon surviving introduction to the Upper Basin would bring infection of polychaete with more lethal ceratomyxa genotypes into increasingly unconducive anadromous conditions, resulting in a consequent compounding of infection for all downstream fish. It is also clear from those referenced 'flushing' experiment results and much higher spore concentration rates downstream than exist below Iron Gate, that the dams are NOT indicated as a primary factor in downstream infection. It has been shown that sedimentation of the river downstream of Iron Gate by resident clay soils will destroy existing salmon redds, fill in deep water instream refugias, and increase potential disease conditions. Facilities destruction will therefore provide for degraded downstream anadromous conditions, upstream actinospore and myxospore migration, and increased risk within upstream conditions compromising multiple species as far as the acknowledged infected majority of salmon are pushed beyond limits they were naturally and historically known to ascend.

Response to Comment ORG30-70
Please refer to Master Response AQF-5 for a discussion of disease risk upstream of Iron Gate Dam.

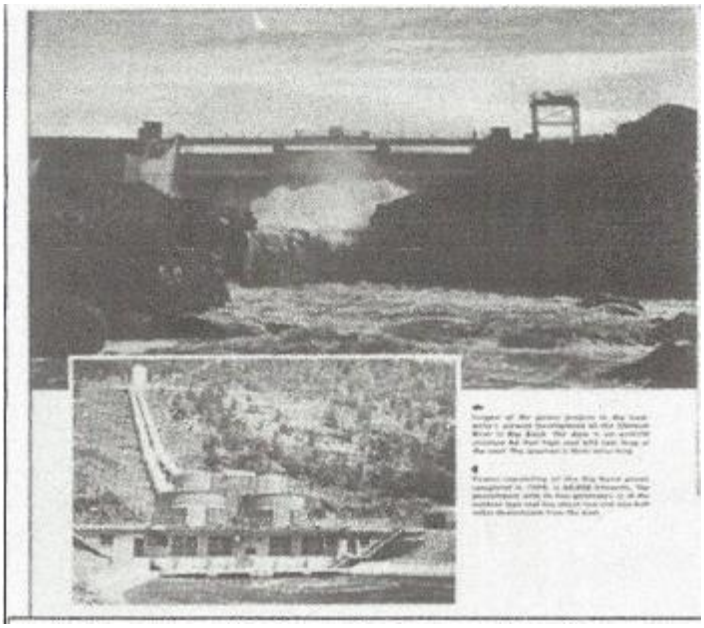
Please refer to Master Response AQF-7 for a summary of the analysis on impacts to habitat downstream of Iron Gate Dam, and Master Response AQF-6 for summary of the analysis on conditions for polychaetes downstream of Iron Gate Dam.

With respect to the commenter's assertion that anadromous salmonids did not historically access habitat upstream of Iron Gate Dam, please see Master Response AQF-4.

Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment ORG30-71
'Salmon access for 'millions of salmon' to 'hundreds of miles of historical habitat' providing food for the upper basin Klamath Tribe from time immemorial':

This is perhaps the most egregious, erroneous, and continually cited proponent argument for Klamath hydroelectric and reservoir facilities' removals. Like many of the other claims made by financially benefitting removal proponents, this 'rewilding' assertion is purposefully constructed to sound reasonable to the uninformed. In fact, those assertions are completely contradicted by Regional experience, documentation, and historical current studies.



History reef at present location of John Boyle Reservoir

Not a single certain reference from the 1820's to original Klamath dam construction ever asserted anadromous salmon in any known identified numbers within the upper Klamath basin. In a region frequently subject to pre-european settlement Tribal food shortages, Sucker fish were revered as a 'sustenance' food for the Klamath and Modoc Tribes specifically due to adapted ability to survive in the Upper Basin's predominately naturally high nutrient shallow warm waters. Dried salmon were commonly known traded by coastal tribes to the Klamath and Modoc in exchange for obsidian and other goods. Klamath Tribal guides informed early travelers that salmon were never known farther upriver than Spencer Creek, near the location of present day John Boyle Dam. In 1896 biologist Barton Evermann, and in 1897 Dr. Gilbert separately caught, identified, categorized, and documented Upper Basin fisheries. In both cases, NO inclusion of anadromous salmon was ever made.



Around 1900, Link River, between Upper Klamath Lake and Lake Ewauna, occasionally went dry before the Klamath Project was built. There was no hydropower, no hatcheries, occasionally no fish (fish need water), no artificially-raised river flows or lake levels.

Response to Comment ORG30-71
Please refer to Master Response AQF-4 for information regarding the historical abundance of salmonids in the Klamath River.

Comment ORG30-72
Water quality in the entire Klamath was frequently reported as 'feted', undrinkable, and highly organic long before ***the influence of settlers. The Klamath is unique in being an 'upside down' river and watershed, with naturally high nutrients and little precipitation at the upper end, with increasing quantity and salmon conducive quality nearer the coastal influence****.*

Response to Comment ORG30-72
Comment noted. Please refer to Master Response WQ-1.

Comment ORG30-73
With all the 'critical' emphasis on removing facilities and elimination of agriculture in the upper Basin, the actual historical amount of water exiting Iron Gate comprises an average of approximately ***12%*** *of the quantity occurring at the estuary. At least 3 natural upriver impediments in the present location of dams, reefs presently inundated by reservoirs or formerly physically removed, were considered virtually impassable to salmon by all regional accounts. Prior to reservoir's added storage; Lost River water addition; and regulated flows; it was common late summer for the river in the Klamath Canyon (area of current dams) and directly below to go entirely subsurface in cobble riverbed.* ***Even IF those historically known pre-facilities conditions of water quality, quantity, and access had NOT been present, by the time spawning salmon reach the present location of dams near the upper limits they were historically known to travel, they are largely depleted, injured, and dying.*** *Prior to dams, Shasta tribal members were known to avoid eating any salmon taken above the Shasta River confluence due to their 'unpalatable' condition. The Shasta Indian Tribe occupied a massive region of the Klamath Basin which encompassed current dams location and extended far downstream near present day Happy Camp. Shasta verbal history describes an 'agreement' with lower river Tribes even ensconced in lore. Any Shasta member could take as many salmon as they could carry from downstream weirs put in yearly by lower river Tribes, blocking upstream salmon migration to trap salmon for their own use, preservation, and trade. The Shasta being a very powerful Tribe encompassing a massive area, the only reasonable answer they would have tolerated such an arraignment is their belief that the downstream salmon were in a more palatable condition.*

Response to Comment ORG30-73
Hydrologic and hydraulic modeling results described in Volume I Section 3.6.2.3 *Flood Hydrology – Environmental Setting – Flood Hydrology* indicate that because of the influence of the tributaries entering the Klamath River downstream from Iron Gate Dam, the flow changes for the Proposed Project would not substantially affect the flows entering the estuary. Specifically, Volume I Section 3.6.5.1 *Flood Hydrology – Potential Impacts and Mitigation – Flood Hydrology* Potential Impact 3.6-1 (pages 3-626 through 3-630) and Volume I Section 3.6.5.2 *Flood Hydrology – Potential Impacts and Mitigation – River Floodplain* Potential Impact 3.6-3 (pages 3-630 through 3-633) provide further discussion and information on this effect.

The Klamath River and tributaries: (1) are contiguous with documented historical salmon rivers and streams both north and south of the Klamath River; (2) contain no natural barriers that would prevent salmon migration into the upper reaches and tributaries such as the Scott and Shasta rivers; (3) have physical attributes that would have produced suitable salmon habitat in the past (e.g., gradient,

morphology, and, in some cases like the Shasta River, spring sources that provide perennial flow); and (4) still contain suitable salmon habitat, providing evidence that native salmon inhabited the Klamath River and its tributaries prior to any stocking. Please also refer to Master Response AQF-4 for a discussion of historical salmon abundance.

In addition, and as described in Section 3.3.5.8 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Habitat*, it appears that there was no "reef" forming a barrier to fish migration at the time Copco No. 1 was built. With regard to salmon becoming depleted upon reaching upper watershed habitat, it is the documented life history of anadromous salmonids to become depleted during migration, spawn, and die (Moyle 2002). Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment ORG30-74

The longtime manager and fisheries historian, Kurt Hiser, of the Iron Gate Fish Hatchery estimated the maximum unimpeded potential range for the majority of salmon if allowed to travel above the current hatchery would be approximately 30 miles. *That assessment of potential endurance supports the same approximate range in which salmon were historically known to be found.*

Response to Comment ORG30-74

Comment noted. As described in Section 3.3.5.8 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Habitat*, under the Proposed Project anadromous fish (Chinook salmon, steelhead, coho salmon, and Pacific lamprey) access would be restored to an estimated 80 miles of habitat within the mainstem Klamath River and tributaries upstream of Iron Gate Dam and downstream of Keno Dam (DOI 2007, Cunanan 2009). Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*. Additionally, please refer to Master Response AQF-4.

Comment ORG30-75

Pre-dams local knowledge was a significant factor in the choosing of site locations for the original Klamath Project and Dams being built in the effort to improve regional environmental conditions. No small part of that investigation was based upon research by an already active and influential California Fish and Game Commission. Known limits of Klamath salmon was the reason that mitigating hatcheries were only deemed necessary to compensate for the few known marginal spawning streams affected. It was only upon Iron Gate dam's created 'unnaturally' cold water, water profoundly more conducive for salmon incubation and rearing, that the ability was achieved to contribute FAR more towards salmon numbers and fisheries sustainability than was EVER regionally known to occur naturally in the upstream region prior to dams. So successful were the improvements, that media, agencies, and sportsmen continually printed their praises for decades afterwards. In fact, the indisputable statistics of salmon returns to the dams' region from records beginning with the first dam (Copco)

before the dams full effect on salmon returns are proof alone of salmon benefits of the facilities. No reduction of upper Klamath salmon returns were evident except for one period during the 1930's, which upon investigation at the time was found caused by Yurok tribal gill netting near the estuary and which resulting sanctions saw an immediate salmon population recovery. Compared to Copco consistent returns, the construction of Iron Gate demonstrated even GREATER salmon benefit, with an increase of over 20% returns above pre-Iron Gate numbers. When compared to the period since the late 1980s to the present, constantly cited as the period of 'precipitous collapse threatening salmon extinction' and somehow attributed to historic dams 'requiring their immediate removals', the returns of salmon to Iron Gate Hatchery during that period averaged over 200% greater than pre-Iron Gate. If DNA identical so-called 'wild' salmon occurring in downstream tributaries are made the exclusive indicator for removals, then the constant century long presence of the hydroelectric facilities upstream CANNOT be the causative factor of claimed declines. However, ***it IS significant, if seldom cited, that physically unregulated Yurok Tribal gill net harvests, after approximately 40 years of restriction, resumed on the lower river during the exact same period 'coincidentally' corresponding to so-called 'salmon collapse'.***

Response to Comment ORG30-75
Please refer to Master Responses AQF-4 and WQ-1.

Comment ORG30-76
Regarding the 'threatened' designation of coho used as the justification to grant 'authority' for demanded facilities removals, coho were never historically locally known native to the upper Klamath River region. Coho are predominately a coastal fish found spawning 'within 20 miles ofthe ocean' according to CA Dept. of Fish and Game documentation. Initial plantings of coho made in the upper Klamath beginning in 1897 and repeated numerous times over the next 60 years failed every time, apparently due to continued unsuitable upstream natural conditions present both prior to and after the initial Klamath Project. Only after the third attempt in the 1960's using the imported Cascadia strain of coho, and AFTER Iron Gate Dam's further improved downstream anadromous conditions, was a 'marginal return' declared and regular rearing commenced. Over 58% of untagged coho entering and rereleased from Iron Gate Hatchery spawning runs have been shown to repatriate and spawn in alternate tributaries. ***However, since the 1990's ALL coho entering the hatchery have by 'policy' been and as of this date continue to be euthanized; coho that under normal circumstances would be considered 'endangered' wild stocks****. Being DNA identical to 'wild' coho and with current studies proving the high percentage of spawning straying in the Klamath, it becomes difficult to deny the high probability that upper Klamath 'wild' returns of coho are a derivative of those prior plantings. That fact alone raises the specter of likely future upper mid stem Klamath coho decline or 'extinction' following the loss of Iron Gate Hatchery and Dams removal degraded water conditions. Despite acknowledged awareness, NO KHSA*

alternative to replace the loss of Iron Gate artificially generated cold lake water conducive for salmon rearing has been found. As such, the only options left for cited 'adaptive management' would be frantic costly reconstruction of abandoned local hatchery sites using known inadequate and inconsistent confiscated water sources, or construction of a non-resident replacement hatchery at an as yet undiscovered equivalent alternative site, and the immediate imposition of even greater regional regulatory oppression. With hatcheries cited by facilities removal proponents as 'necessary' for coho survival, even their own paid 'expert panel' questioned any significant known benefits to coho from facility removals. However, that same panel repeatedly admonished the extreme risks to existing coho populations if ALL of the promised but unknown, undefined, and unfunded Upper Klamath Basin KBRA concurrent 'habitat improvements' failed fruition. Those panels frequently expressed their doubts that such functionally and/or cost effective unknown 'mitigations' could or would occur.

Response to Comment ORG30-76
Please refer to Master Responses AQF-11 and WQ-2.

Comment ORG30-77
Despite all of the prior information, the removal proponents' assertion of previous 'millions of salmon in the upper basin' extrapolates primarily from a mere handful of unsupported, regionally contradicted, and logically ambiguous references in a 'synthesis 'presented by a paid seated Agency employee. Massively refuted by historical documentation, in the later attempt to seemingly solidify that singular opinion with proponent agencies' paid for 'scientific verification', an archeological study was contracted to examine historic fish bones in Upper Klamath Basin Klamath Tribal middens. Out of over 15,000 bones spanning over 8,000 years being analyzed, 8 specimens were confidently determined to be anadromous. Even though authors acknowledged those numbers may actually be skewed in favor of salmon, as typically salmon bones are much larger and thereby more durable than the other species they examined, they none the less definitively concluded that anadromous salmon MUST have been resident to the upper basin. Their rationale was that the otolith (Jaw) bones tested could NOT have been from traded salmon as Alaska Tribes were never known to preserve salmon with the heads on. Since they determined 'no records exist' of Klamath estuary Tribal salmon preservation methods, there was 'no reason to believe they [Klamath coastal tribes] would be different in salmon preservation'. Therefore, those 8 bones could NOT exist unless from volitional arrival. ***In fact, in the 1851 report by George Gibbs of the Reddick McKee expedition on one of the earliest documented forays in the lower Klamath River, Mr. Gibbs reported in extensive detail the cultural fishing habits of the lower river Tribes, INCLUDING details of salmon preservation 'in their entirety' (heads on). The net effect of that information renders their conclusions unsubstantiated and instead actually supports the opposite historically consistent regional experience and Tribal references citing salmon trading and NO known significant numbers of salmon reaching the Upper Klamath***

Basin. *If salmon had been the primary food for Klamath Tribes, it is unlikely that the less palatable suckers would have been such a revered food source, and it is virtually certain that Upper Basin middens would have represented FAR more than 8 longer lasting anadromous bones in relation to 15,000 others found spanning a period of 8,000 years. However, considering the present control of water resources, payments, and land grants being obtained by Klamath Tribes and agenda proponents as a result of facilities removal 'agreements', it may not be entirely unreasonable that a historically unsupported claim of pre-dams dependence on 'salmon' is now 'remembered to time immemorial'.*



Link (Klamath) River flowing out of Upper Klamath Lake over the reef at what is now Putnum's Point before the Link River Dam was built.

Response to Comment ORG30-77
Comments noted. Please refer to Master Response AQF-4.

Comment ORG30-78
With the Project combined facilities providing increased late summer Klamath River augmented flows, river segments going subsurface rarely occurred again.

Response to Comment ORG30-78
As described in Volume I Section 3.8.1 *Water Supply/Water Rights – Area of Analysis* (pages 3-667 to 3-669), there would be no water supply impact to the mainstem Klamath River from implementation of the Proposed Project. The United States Bureau of Reclamation (USBR) maintains its biological opinion obligations on operations of the Klamath Irrigation Project which require water to

be released to the mainstem Klamath River regardless of the existence of the Lower Klamath Project, such that dam removal would not alter the amount of water available for environmental purposes, or the source of that water, for the mainstem Klamath River or the tributaries. Please also refer to Master Response WQ-2.

Comment ORG30-79

Flow continuity allowed fish consistent migratory mainstem access to any available habitat-compliant tributary. However, beyond providing post dams unbroken water connection below the facilities, the 'amounts' of water released from Iron Gate have shown little correlation to returning salmon populations. Many instances of drought induced low flows to 395 cfs revealed NO apparent deviation in subsequent life cycles for returning salmon numbers. In fact, in one of the studies performed by the BOR Klamath Area Office scientists, for which studies they were fired, was the conclusion that increased Klamath River flows provided NO equivalent benefit for coho. Scientifically solid, that conclusion conflicted with 'Agreement' seated NMFS demands for confiscated appropriations to increase downstream flows as 'necessary' for coho. Although NMFS retaliation was swift and angry, causing the relevant BOR study to be shelved, over 15 years of mandated increased flows resulting in ZERO statistically attributable benefit for coho further substantiates the scientist's study.

Response to Comment ORG30-79

Please refer to Master Response HYD-1 for a discussion of how the EIR considers Klamath River flows under the 2019 BiOp operations criteria for the Klamath Irrigation Project. Please also see response to ORG30-EMAIL-39, above. Dam removal would not alter the amount or source of water available for environmental purposes for the mainstem Klamath River.

Comment ORG30-80

As repeated by regional residents and contradictory to the 1 dimensional 'predictive models' utilized by removal proponent agencies, the river is multidimensional and complex in its 'non conducive' allowance of salmon transport to the reaches historically known. The river responds primarily to average day/night temperatures and macrophyte/periphyton aided recurrent deep water refugias, allowing salmon migration movement during biologically induced dissolved oxygen supersaturated periods, holdover resting in deep water during less salmon conducive conditions. Regionally seasonal short term late summer warm day /night temperatures creating endemic disease conditions randomly occur coincident with heavy migrating salmon populations. Those conditions appear the FAR more consistent predictor of any salmon infection and mortality than flow variations from Iron Gate.

Response to Comment ORG30-80

Comment noted. Please refer to Master Response AQF-5 and AQF-6 for a discussion of disease dynamics upstream and downstream of Iron Gate Dam.

Comment ORG30-81

The lower Klamath below the Trinity confluence has historically been the predominant location of rare significant fish mortalities. Compared to coastal influence flows to the estuary, and considering the 150+ miles of largely bedrock canyon channelized solar absorbing riverbed, the greatest potential increase from Iron Gate, to the sacrifice of all else above, represents an extremely small thermal impact upon any 'habitat' within the coastal influenced reach. It is that rationale by which the National Research Council declared the 2002 fish mortality was NOT caused by low flows from Iron Gate Dam. However, in 2002 ALL of the prior listed conditions exacerbating endemic disease occurred, plus the simultaneous chemical dump cited above. Though removal proponents are 'certain' in their assumptions, neither fish nor water were tested for transient causes until long AFTER the reported kill and existing water conditions dissipated. Also conflicting with continuing proponent claims of Iron Gate release association, the kill was relatively brief and NO identified kills occurred within the 150 miles of upstream diminishing flows to Iron Gate during or after that incident. Despite the 'fish kill' which ended as abruptly as it started, with the simultaneous decrease in night temperatures and passage of possible chemical laden water, the salmon run was still one of the largest realized returns upriver, a fact to date seldom heard included in dam removal proponent media.

Response to Comment ORG30-81

Comment noted. Please refer to Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites.* Please see Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*. In addition, please see response to comment ORG46-174 for a description of minor modifications made to the EIR that further clarify the generally understood causes of the 2002 fish kill.

Comment ORG30-82

Site specific Klamath science, historic documentation, and regional experience confirm the hydroelectric facilities with their water reservoirs enhance known affected beneficial uses. Their impacts are in optimizing, segregating, and improving both warm and cool water conditions for fisheries in a region previously marginal for each, and providing consistent water resources for sustaining both. Those consistent resources were not known to exist prior to the dams.

Response to Comment ORG30-82

Comment noted. Please refer to Master Response AQF-4 for a discussion of the historical abundance of salmonids, Master Response WQ-2 for a discussion of the Lower Klamath Project facilities' effects on water temperature, and Master Response WQ-1 for a more general discussion of the effect of Lower Klamath Project facilities with respect to overall water quality.

Comment ORG30-83

At the onset of removal proponent Klamath targeted 'rewilding' agenda, Pacific Power and Electric (PP&L) had long owned and operated the Klamath hydroelectric and water storage facilities. Up until that time, PP&L agreed with the regional experienced holistic environmental benefits the facilities have provided to a unique multifaceted watershed. At that time the removal proponent benefitting Agencies, Tribes, and NGO's insisted that PP&L was a 'public entity' and, using their own convoluted special-interest concept of 'public trust' negating private ownership, concluded PP&L MUST succumb to removal 'determinations'. After PacifiCorp fell under Warren Buffet ownership and was compelled to take a KHSA 'seat at the table', his representatives encountered the removal proponent members extorting 'agreement' threats and benefits directed at his company and shareholders. Those rewards, threats of litigation, and lack of allowed options forced PP&L position towards removals. Those same KHSA proponent groups now proclaim the 'constitutional right of a private company to make a business decision'. That 'decision' was to sign an 'agreement' between PacifiCorp and the removal proponent entities in an illegally executed exclusionary 'process' which placed the burden of removal costs, losses, 'mitigation', and risk upon the unrepresented ratepayers, taxpayers, regional residents, and particularly the vested riparian owners. In doing so, the benefitting 'agreement' signatories conveniently authored themselves confiscatory authority; self-benefitting 'agreed' rewards of land and money; funneled 'administration' of billions of future dollars; and protection from any accountability for damages caused.

Response to Comment ORG30-83

The comment provides an account of factors that contributed to decisions to pursue options for the removal of Project facilities and is noted.

Please note that the State Water Board is not a signatory to the Klamath Hydroelectric Settlement Agreement (KHSA) or the Amended Klamath Hydroelectric Settlement Agreement.

Comment ORG30-84

In reality, PacifiCorp is a quasi-public entity, subject to certain limitations and obligations to regulators, ratepayers, and the affected public in exchange for enjoying a regional monopoly. It is the regionally affected residents and ratepayers vested with the area's history and environmental needs that were instrumental in the initial development, support, construction, and funding of the regional facilities. It was the regionally affected residents who in their participation and sacrifice were willing to suffer either the benefits or the hardships of Klamath facilities construction upon their property and lives. By virtue of those presently integrated property value impacts the affected residents continue to hold a significant vested interest in the proposed unaccountable imposed physical losses to their functional survival and operational environment. Theirs is a vested interest and voice which benefitting and largely non-vested

'agreement' removal proponents have unilaterally dismissed or ignored within KBRA/KHSA exclusionary 'process'.

Response to Comment ORG30-84
Please note that under CEQA, potential effects from implementing a project that are solely social or economic in nature, such as reductions in property values, loss of property tax revenues, and increases in energy costs, do not constitute an effect (i.e., an impact) to the physical environment. Please also refer to Volume I Section 5.4.1 *Other Required CEQA Discussion and Consideration of Social and Economic Factors – Social and Economic Factors Under CEQA – Consideration of Economic Information for Resources Potentially Affected by Dam Removal* (pages 5-4 to 5-11) which summarizes the results of prior economic studies conducted by the U.S. Department of the Interior (DOI) to characterize potential effects on property value.

Please also refer to response to comment ORG30-17.

Comment ORG30-85
Renowned United Nations Earth Dam trained engineer and former Deputy Director of Earth Dams for India, Stephen Koshy, has independently evaluated and expressed extreme concern for the high odds of collapse of Iron Gate Dams upon attempted removal. His assessment of internal core pore pressures for an otherwise virtually indestructible configuration indicates likely catastrophic core collapse and loss of life upon attempted withdrawal and excavation, a conclusion offhandedly dismissed by policy directed removal advocate Agencies.

Response to Comment ORG30-85
Potential for flooding due to dam failure is addressed in Volume I Section 3.6.5.3 *Flood Hydrology – Potential Impacts and Mitigation – Risks of Dam Failure* Potential Impact 3.6-6 (page 3-635). The analyses in the EIR refute the contents of the dam collapse component of Stephen Koshy's November 18, 2011 comment letter.

Please also refer to response to comment IND272-18 in relation to the potential for dam collapse.

Comment ORG30-86
If the theoretical benefits promised by removal proponents were so certain, then proponents would not hesitate to simply indemnify all affected public against consequential losses to their lives and property relative to facilities' benefits and conditions currently enjoyed, as was required with Iron Gate construction. They do not. In the original KHSA Environmental Impact Statement (EIS) 'evaluation', only a few affected entities having financial or political power were able to gain 'report' inclusion of recognized potential damages. All other inescapable downstream and Project resident losses, including many known and stated in public comments, were just simply ignored.

Response to Comment ORG30-86
Comment noted. Please refer to response to comment ORG30-85.

Comment ORG30-87
Conservatively, over 20,000,000 cubic yards of sediment will be released to the Klamath with removals, enough bumper to bumper dump trucks to extend half way around the world, altering channels, killing wildlife, filling refugias, damaging fisheries, and destroying diversions and irrigation assets. Routinely experienced present sediment blockages to salmon passage at the Klamath estuary will be drastically compounded.

Response to Comment ORG30-87
SRH-1D model simulations (USBR 2012a) estimated that between 5.4 and 8.6 million yd^3 [1.2 to 2.3 million tons], or 36 to 57 percent of the total reservoir sediment volume, is expected to be eroded and transported downstream during the drawdown period (see Table 3.11-7 in Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 (page 3-765 to 3-775)).

The potential impacts of sediment erosion, transport, and deposition are discussed in Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 (pages 3-765 to 3-775), which is partially modified in Volume III Attachment 1, as well as in Master Response GEO-1. For related assessments of potential water quality, aquatic, and infrastructure impacts, please refer to Section 3.2 *Water Quality* and Master Response WQ-3, Section 3.3 *Aquatic Resources* and Section 3.6.5.2 *Flood Hydrology – Potential Impacts and Mitigation – River Floodplain* Potential Impact 3.6-5 (pages 3-634 to 3-635). The Proposed Project would not cause salmon passage to be blocked within the mainstem Klamath River or in the Klamath River Estuary (see Volume II Appendix F, Section 3.11.5.4 *Channel Morphology and Substrate*). Please see Volume III Attachment 1 for the final Section 3.2 *Water Quality* and final Section 3.3 *Aquatic Resources.*

Comment ORG30-88
Reduced flood control will see a return to still remembered pre-dam repetitive devastation to environment, property, assets, and infrastructure.

Response to Comment ORG30-88
Comment noted. Please refer to Master Response FLD-1.

Comment ORG30-89
Given the fact that the original KHSA EIS recognized potential liability for associated damages to a relative handful of influential interests for the removals' resultant sediment, flood, infrastructure, and value losses, then it is inescapable that those same potential losses MUST exist for EVERY riparian or river related

vested interest in the over 200 river miles affected. In spite of that massive impact, NONE of the 'agreements' signatories either accept such accountability or even recognize the most affected majority non-proponent existence. Ironically, under the 'new' (amended) KHSA, few interests formerly recognized as affected by removals receive any assurance of being kept whole.

Response to Comment ORG30-89
Comment noted. Please refer to Master Responses FLD-1 and WQ-3, and response to comment ORG30-115.

Comment ORG30-90
It is obviously apparent to anyone reading the proponent crafted, parsed, and exclusionary 'agreements' with constructed 'supporting' documentation, that the intrinsic intent is the inevitable created condition of regional 'rewilding'. Proponents' orchestrating effective 'condemnation without compensation' utilize imposed 'biological opinions' to empower the regulatory taking of property use and resources, thereby driving the economic attrition of vested residents. To those who have been living it, the proposed amended 'agreement' legislation will, if ratified, permanently codify unaccountable proponent agenda tactics. Those same tactics have already devastated thousands of vested family homes and futures for over 17 years of premised 'biological opinions'.

Response to Comment ORG30-90
The comment presents the commenter's description of the reasons for and effects of studies and planning efforts related to the Proposed Project and is noted.

Please note that under CEQA, potential effects from implementing a project that are solely social or economic in nature, such as reductions in property values, loss of property tax revenues, and increases in energy costs, do not constitute an effect (i.e., an impact) to the physical environment. However, to inform the public and decisionmakers, Volume I Section 5.4.1 *Other Required CEQA Discussion and Consideration of Social and Economic Factors – Social and Economic Factors Under CEQA – Consideration of Economic Information for Resources Potentially Affected by Dam Removal* (pages 5-4 to 5-11) summarizes the results of prior economic studies conducted by the U.S. Department of the Interior (DOI) to characterize potential effects on property value.

Comment ORG30-91
During the time of the KBRA/KHSA agencies' Memorandums of Understanding imposed agenda-defined rewilding, there has been ZERO statistically attributable 'restoration' increase to coho populations, and sucker fish have experienced up to an 86% DECREASE in the most 'restoration enhanced' region. Those environmentally unbalanced hypothetically based 'adaptively managed' demands, intentional or not, have forced the least efficient, most expensive, and

environmentally irresponsible possible management of water for the Klamath Basin.

Response to Comment ORG30-91
The comment presents the commenter's opinion regarding the cost, efficacy, and utility of the Proposed Project and is noted. Please refer to Master Response GEN-1.

Comment ORG30-92
Given the policy driven uncompensated economic push for additional agricultural decommissioning regardless of statistical benefit, the inescapable logical conclusion is that the 'rewilding' objective was the original intended agenda. Were 'rewilding' not the intent, proponents would extensively assess salmon ocean based life cycle and decadal oscillation impacts; salmon escapement/return relationships; the approximately %'s of identified salmon unutilized 'ideal' coastal influence spawning tributaries; present agenda statement inconsistencies compared to historical documentation of pre-existing conditions; the lack of facilities' attributable connection to cyclic salmon numbers; the present physically impossible ability to produce 'agreement' required 'beneficially contingent' upstream enhancements; the impacts of facilities removal upon all affected species; the impossibility of achieving 'agreement' defined 'programmatic' objectives without massive regional attrition; the complete dismissal of locally presented PROVEN far more cost effective nondestructive alternatives; or the legal basis for imposing the unaccountable 'taking' of property, assets, and value from affected, unrepresented, and uncompensated interests. They have not. Instead, proponents actually set predefined agenda objectives of compelled facilities removals and water resource confiscated tiered hierarchy reallocation, and then proceeded to force, bend, and/or buy the result.

Just a few of the tactics utilized to date in the compulsory 'process' towards 'removal determination', with each item alone sufficient to prove biased agenda intent, include; the evidenced oppression of multiple whistleblowers; the suppression of science that contradicts removal premise; the illogical frenetic 'urgency' for irreversible removals prior to empirically proven benefit; the refusal to address 'agreement' statistical and environmental objective conflicts; the strategically self-designed parameters administratively allowed for 'consideration'; utilization of deficient data and intentionally misleading assumptions; the concealment of publicly exposed removal proponent corruption; administratively manipulated paid peer review outcomes by limiting allowed 'science' sources; review 'determination' restricted to two predefined options; locally unsupported proponent constructed 'problems' and 'solutions' specifically generated to compel rewilding agenda objectives; the unaccountable tolerance of, or feigned obliviousness to, the 'risks' of imposed consequential major loss to others; and that only proponent selectively-chosen allowed 'impacts' can be considered in any 'evaluation' for removals. As such, much of the historical information and recent empirically pertinent science is banned; alternatives

banned; 'expert opinion' being portrayed as proven science encouraged; risks of loss imposed upon others easily dismissed as 'unavoidably unmitigated'; unsupported 'causes' directing regulatory imposed involuntary 'mitigation' without compensation; and the irresponsible ignoring of impacts to all other holistic beneficial uses, human attrition, and ecosystem species in favor of single species based agenda- engineered rewilding. Given past KHSA/KBRA agenda; failed beneficial performance; non- representative 'process'; lack of accountability; and current known standing, any FERC determination based upon 'Agreement' participating 'recommendations' will unquestionably end in irreversible devastation both to the environment and to the most affected and knowledgeable regional majority opposed to removals.

Response to Comment ORG30-92
The comments present reasons for the commenter's beliefs regarding the intent and effects of the Proposed Project and are noted. Please refer to Master Response GEN-1.

Comment ORG30-93
Currently known sucker numbers existing at the time of listing would not have qualified for listing of sucker fish as endangered, and repeatedly planted coho were never known native to the upper Klamath River reaches. Nonetheless, all prior KBRA/KHSA premise exclusively centers on those two species.

Response to Comment ORG30-93
Comments on the species listing should be submitted to the United States Fish and Wildlife Service (USFWS) and the California Department of Fish and Wildlife (CDFW). Additionally, the State Water Board is not a signatory to the Klamath Hydroelectric Settlement Agreement (KHSA) or the Amended Klamath Hydroelectric Settlement Agreement. Please also refer to Master Response AQF-11.

Comment ORG30-94
Many documented Upper Klamath Basin fish deaths occurred prior to the Klamath Project.

Response to Comment ORG30-94
Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites* states that, "For adult salmon, Ich and columnaris have occasionally resulted in substantial mortality, particularly when habitat conditions include exceptionally low flows, high water temperatures, and high densities of fish (such as adult Chinook salmon migrating upstream in the fall and holding at high densities in pools)." The EIR does not infer that the most severe documented disease outbreaks were caused by the Klamath Hydroelectric Project (KHP) or imply that the Proposed Project would eliminate fish mortality in the Klamath River. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*. In addition, please see Master Response AQF-4.

Comment ORG30-95

Over 15 years and hundreds of millions of dollars implementing the KHSA entrained hypothetically based policy 'experiments' have more than sufficiently PROVEN the failure of 'rewilding' promised benefit. Increased Upper Klamath Lake levels, fluctuating lake levels, agriculture, and municipal use have NOT shown any regional definitive direct causative significant link to sucker numbers. During the time of the KBRA/KHSA agencies' Memorandums of Understanding imposed agenda-defined rewilding, there has been ZERO statistically attributable 'restoration' increase to coho populations, and sucker fish have experienced up to an 86% DECREASE in the most 'restoration enhanced' region.

Response to Comment ORG30-95

Contrary to the assertion in the comment, the Klamath Hydropower Settlement Agreement (KHSA) has not been implemented over the past 15 years. Please see Volume I Section 2.6.3 *Proposed Project – Project Background – Klamath Settlement Agreements* (pages 2-23 and 2-24), which presents a summary of the KHSA along with other settlement agreements for the Klamath Basin. Pursuant to the KHSA (as amended April 6, 2016), the Klamath River Renewal Corporation (KRRC) has been formed as a non-profit organization that would, upon approval by Federal Energy Regulatory Commission (FERC), receive ownership of the Lower Klamath Project facilities and undertake the necessary steps to remove the facilities. The KRRC's Proposed Project involves dam removal and includes the objective of advancing the long-term restoration of the natural fish populations in the Klamath Basin, with particular emphasis on restoring the salmonid fisheries used for subsistence, commerce, tribal cultural purposes, and recreation, along with improvements to water quality, restoring volitional anadromous fish passage, and reducing fish disease for Klamath River salmonids (please refer to Volume I Section 2.1 *Proposed Project – Project Objectives* [page 2-1]). No comprehensive effort similar to the Proposed Project has been implemented on the Klamath River since the Lower Klamath Project facilities were constructed.

Comment ORG30-96

Historically unprecedented currently increased UKL water levels favoring native and introduced predatory competition presently appear to have exerted far greater present contributory factors detrimental to immature sucker fish.

Upper Klamath Lake (UKL) elevated lake water levels appear to have NO positive influence on sucker fish survival or prevalence, and in fact are indicative of an inverse relationship to declines.

Response to Comment ORG30-96

The comments present speculation regarding the influence of water elevations in Upper Klamath Lake on juvenile suckers. Please note that water elevations in Upper Klamath Lake are managed under the biological opinion for the United

States Bureau of Reclamation's (USBR's) Klamaath Project, rather than in relation to the Lower Klamath Project. This management would not be affected by the Proposed Project. Please refer to Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species – Lost River and Shortnose Suckers* for a discussion on existing threats to sucker populations in the Upper Klamath Basin.

Please also see Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Critical Habitat* for additional information regarding predominant threats to Lost River and shortnose suckers as cited by USFWS (2012b). Please see Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment ORG30-97

According to the National Research Council, UKL resident phosphorous levels, as the primary biological driver, present NO currently known viable means for substantively altering outgoing Upper Klamath Basin water quality, even with a TOTAL and unaccountable cessation of ALL Upper Basin agriculture. As it stands, long term agricultural production absorbing and physically removing naturally occurring phosphorous is the ONLY known permanently effective option to reduce nutrient contributory conditions within the Upper Klamath Basin. As a secondary benefit, agricultural irrigation utilizes less water than was previously lost through marshland evaporation and absorption.

Response to Comment ORG30-97

It is not clear from the comment which National Research Council (NRC) document is being cited with respect to Upper Klamath Basin phosphorus levels. The following NRC report is cited multiple times in the Lower Klamath Project EIR:

NRC (National Research Council). 2004. Endangered and threatened fishes in the Klamath Basin: causes of decline and strategies for recovery. The National Academies Press, Washington, D.C. http://www.nap.edu/openbook.php?isbn+0309090970.

The focus of the Lower Klamath Project EIR is on existing and potential future conditions related to water quality within the California portion of the Hydroelectric Reach, where three of the four dams included in the Proposed Project are located, and in downstream reaches of the Klamath River, which could be affected by the Proposed Project. Upper Klamath Lake is upstream of the Hydroelectric Reach. In some instances, the EIR discusses information concerning the Oregon portion of the Proposed Project and/or conditions further upstream in Oregon (e.g., Upper Klamath Lake) in order to provide context and because some Proposed Project impacts or actions in the Oregon portion of the Hydroelectric Reach could significantly impact the California environment. For example, Section 3.2.2.4 *Water Quality – Environmental Setting – Nutrients*

presents a discussion of major upstream sources of nutrients to the Hydroelectric Reach, including Upper Klamath Lake. Please see Volume III Attachment 1 for the final Section 3.2 *Water Quality*. Additionally, Volume I Section 3.4 *Phytoplankton and Periphyton* (specifically pages 3-389 to 3-342) detail the Area of Analysis for the EIR and discuss different species of blue-green algae found in the Klamath River, including species that are found in Upper Klamath Lake when doing so is relevant to the discussion of potential impacts further downstream. Volume I Section 3.4.2.3 *Phytoplankton and Periphyton – Environmental Setting – Hydroelectric Reach – Phytoplankton* Figure 3.4-10 (page 3-406) and the associated text indicate that blue-green algae are transported from the Upper Klamath Lake into the Upper Klamath River, where some die and settle out in the Keno Impoundment, and some are exported into the Upper Klamath River downstream of Keno Dam.

Please refer to Master Response WQ-1 for a discussion of the role of Lower Klamath Project dams/reservoirs with respect to overall water quality, and to Master Response PAP-1 for information regarding the influence of upstream sources of algae and algal toxins.

Comment ORG30-98

Upper Klamath Basin cyclic seasonal biomass senescence and associated short term oxygen depletion is a historically recurrent condition.

Upper Klamath Lake naturally prevalent background nutrients and particularly resident lake sediment phosphorous loads will drive currently un-ameliorable Biological cycles for the foreseeable future, even without any additional naturally occurring inputs.

Currently seasonally dominate cyanobacteria Aphanizomenon flos aquae, a nitrogen fixer, was not present in UKL until modern times, prior to which time the green algae Pediastrum was dominate.

Pediastrum, the predominant Upper Klamath Lake species prior to the Klamath Project is a non-nitrogen fixing alga, and an extremely heavy nutrient feeder most commonly found in sewage ponds.

Microcystis aeruginosa was fully present and active in UKL prior to the 1850s, producing the same biomass.

Current limnologic data shows the only significant UKL change over the 150 years including 'settlement' is a DECREASE of spring/early summer N:P (nitrogen) ratios.

Aphanizomenon currently dominates in Upper Klamath Lake in spring to early summer, supporting that a shift in dominance from Pediastrum may be due in

large part to those presently REDUCED UKL early spring nitrogen levels favoring Aphanizomenon's nitrogen fixing ability.

Blooms of Aphanizomenon occur concurrently with humic acid levels input from springtime Klamath Marsh flows, and both tend to diminish in late spring/early summer, inferring a causative connection.

Senescence of Aphanizomenon releases large amounts of nitrogen into the water column allowing for competitive dominance from alternate species dependent upon available nitrogen, such as Microcyistis aeruginosa, as occurred when nitrogen was historically available.

Naturally available UKL nitrogen may have shifted to lower N:P ratios over the past 150 years, but Aphanzomenon fixated replacement of available nitrogen has resulted in essentially the same overall late summer total cyanobacteria, nutrient loads, and biological mass production available for downstream transport.

Senescence of the secondary Aphanazomenon and Microcystis blooms in later summer re-release those nutrients, with unsettled and un-gassed remaining dissolved amounts becoming available along with undecomposed biomass in outflowing UKL waters delivered to the Klamath Hydroelectric Project.

Response to Comment ORG30-98
The comments relate to conditions in the Upper Klamath Lake and the Upper Klamath Basin upstream of the Hydroelectric Reach. Please refer to response to comment ORG30-97.

Comment ORG30-99
Regardless of initial bloom species, limnologic assessment of sediment indicates the overall biomass and nutrients entering the Klamath from UKL are essentially unchanged from 150 years ago. With the present day inclusion of increased Lost River and Upper Klamath Lake available stored water plus the gains from historically reduced evaporation augmenting the late summer Klamath River flows, even when INCLUDING current agricultural usage, it is probable that present late summer flows are seasonally substantially GREATER than occurred pre-Project, a scenario coinciding with historical accounts and documentation. Even if that were NOT the case, NO attributable statistical benefit for downstream Klamath fisheries has been empirically shown to exist from 'naturally' unsustainable increased UKL levels and flows discharged in over 15 years of implemented and regionally destructive 'Biological Opinions'.

Response to Comment ORG30-99
Please refer to response to comment ORG30-97.

Please note that the Proposed Project does not involve removal of Klamath Irrigation Project Facilities. Please refer to Master Response WSWR-1.

Additionally, comments on the biological opinions for the Klamath Irrigation Project should be submitted to the United States Fish and Wildlife Service (USFWS) the National Marine Fisheries Service (NMFS), and the United States Bureau of Reclamation (USBR).

Comment ORG30-100
With historically similar UKL endemic high biomass and nutrients, including nitrogen, released to the Klamath River Hydroelectric Project during late summer low water flows, conditions are conducive for renewed downstream biological growth, including by Microcystis aeruginosa.

Recent investigation revealing Microcystis characteristics include the potential to: outcompete other species through changing light levels by its ability to adjust float height within the water column; tolerate shadier and cooler conditions; generate LESS toxicity in warmer higher light conditions than in shadier cooler conditions; and create a greater potential for realized toxicity in the food chain from direct cellular ingestion rather than from contact with microcystin dissolved in the water column.

Response to Comment ORG30-100
The comments relate to concerns regarding nutrients, algae growth (e.g., *Microcystis aeruginosa*), and microcystin. Please refer to Master Responses PAP-1 and PAP-2.

Comment ORG30-101
Any subsequent blooms, including Microcystis, occurring in John Boyle, Copco and Iron Gate Reservoirs sequester entering nutrients and delay water and nutrient transport downstream for up to two months during the warmest, lowest Klamath flows, and generally concurrent time of most susceptible salmon entry to the Klamath.

Response to Comment ORG30-101
Please refer to Master Response WQ-1.

Comment ORG30-102
Waters released to the Klamath River from Iron Gate during the time of lowest, warmest incoming UKL flows are of higher quality relative to salmon downstream salmon objectives. Any temperature 'modeled' impacts from Iron Gate released waters have been shown to be minor, ameliorated within 7 to 15 miles, and has demonstrated NO adverse consequence within the limited reach theoretically affected but rather has demonstrated LESS salmon infection rates and GREATER survival than further downstream. Additionally, with the new cost effective 'curtain wall' in place, those downstream releases can now even release historically UNNATURAL cool water at the critical times of salmon migration.

Response to Comment ORG30-102
Please refer to Master Response WQ-2 for a discussion of the potential for releases from the Lower Klamath Project dams/reservoirs cool the Klamath River, and response to comments ORG46-127, ORG46-128, and ORG-129 for a discussion of the distance water temperature impacts from the Lower Klamath Project dams extend downstream of Iron Gate Dam under existing conditions. Please also refer to Volume I Section 4.4.2.1 *Continued Operations with Fish Passage Alternative – Water Quality – Water Temperature* (pages 4-102 to 4-108), Volume III Attachment 1 Section 3.2.2.2 *Water Quality – Environmental Setting – Water Temperature*, and response to comments ORG46-91 and ORG46-92 for a discussion of the influence of the intake barrier/thermal curtain on water temperature in the Klamath River downstream of Iron Gate Dam. Please refer to Master Response AQF-6 for a discussion of the disease risk downstream of Iron Gate Dam. Furthermore, Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Water Temperature* and Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Disease and Parasites* provides a discussion of how the Lower Klamath Project dams affect water temperature and fish disease under existing conditions. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment ORG30-103
Upon senescence of hydroelectric facilities blooms, decomposed biomass and nutrients are partially precipitated, out-gassed, and permanently sequestered within the deep reservoir non turbulent depths before any amounts remaining in the water column are transported downstream.

*Higher concentrations of microcystin have been known to occur under instream conditions in the **lower** Klamath River than within the region released from Iron Gate, confirming a **naturally** compatible Microcystis river habitat.*

Response to Comment ORG30-103
Comments noted. Please refer to Master Responses PAP-1 and WQ-1 for discussion of the role of the Lower Klamath Project dams/reservoirs on water quality and variations in algae and associated algal toxins in the Klamath River.

Comment ORG30-104
Due to the delay of up to two months of UKL incoming highest nutrient loads through the deep water lakes, eventual releases from the facilities reservoirs will effectively deliver those remaining nutrients during the less detrimental time of year bypassing early salmon runs and experiencing lower ambient temperatures, potentially increased available water flows, and conditions less conducive to development of downstream macrophyte/periphyton/polychaete/ceratomyxa salmon disease potential.

Response to Comment ORG30-104
Please refer to Master Responses WQ-1, WQ-2, and PAP-2 for discussion of the role of the Lower Klamath Project dams/reservoirs on water quality, the potential for the dams/reservoirs to cool river water during summer and fall, and the phytoplankton and periphyton response to nutrient alterations under the Proposed Project. Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Disease and Parasites* provides a discussion of how the Lower Klamath Project dams affect fish disease under existing conditions. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment ORG30-105
Removing the Hydroelectric facilities would allow the high nutrient UKL biomass to be delivered downstream to the Iron Gate location within 2 days. Delivered directly instream at the time of highest ambient temperatures and lowest water flows will return the river to experienced pre-dam historical conditions of decomposing biomass and high macrophyte/periphyton salmon disease conducive conditions at the most detrimental time of initiated salmon runs. Nutrient conditions and the instream competitive characteristics of microcystin allow the potential for heavy algae production throughout the entire river length. Without dams, any microcystis growing under in-river cooler shadier locations has a far greater likelihood of toxicity production, direct cellular ingestion, and thereby greater toxicity consequence throughout the entire food chain.

Response to Comment ORG30-105
Comment noted. Please refer to Master Responses PAP-1, PAP-2, and AQF-6 for a discussion of variations in algae and associated algal toxins in the Klamath River, the phytoplankton and periphyton response to nutrient alterations under the Proposed Project, and the disease risk downstream of Iron Gate Dam.

Comment ORG30-106
Rhetoric claims of 'possible salmon disease reductions' with dams destruction fails to comply with current sentinel fish, ceratomyxa shasta, and manayunkia speciose (polychaete) studies.

Polychaete has been shown in 'ideal' habitat and dense populations in the Upper Klamath Basin, typically resulting in 100% lethal rates of exposed sensitive fish from resident ceratomyxa shasta. The river reach immediately below Iron Gate consistently has lower infection and death rates than downstream reaches, with some of the highest having occurred a 150 miles away from dams.

Studies indicate that Upper Basin dense populations of polychaete do not currently harbor the most anadromous lethal genotypes of ceratomyxa.

Polychaete has been demonstrated prevalent in multiple habitats from sediment to bedrock, and able to resist pulse flows and move to protected locations.

Infected salmon transport and release billions of ceratomyxa myxospores upon death, in turn infecting polychaete, which in turn release actinospores to infect ALL susceptible exposed fish species.

In the dams and Upper Klamath Basin region non-conducive to salmon and conducive to increased fish disease exposure with symbiotic infection vectors already in place, lower flows providing greater disease exposure, and given the data-confirmed reduction of disease potential provided by the dams, removing the only barriers to more lethal disease genotypes upstream will virtually guarantee transport of disease as far as salmon are forced to travel, compounding exposure and disease for multiple susceptible and protected species down the entire Klamath, including the very salmon intended to benefit.

Response to Comment ORG30-106
The comments relate to concerns regarding fish disease. Please refer to Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites*. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*. Please also refer to Master Response AQF-5 and Master Response AQF-6.

Comment ORG30-107
Mandated experimental Klamath 'pulse flows' have been shown inconsistent, conflicting, life threatening, and cost ineffective either for original theorized 'sediment and periphyton flushing' or the later substituted 'polychaete disease potential reduction'. Enough 'added' water wasted to the ocean in one pulse alone would have provided for the needs of a half million people for a year, with no demonstrable significant fisheries benefit. Temporary reductions in acknowledged flawed 'indicator' methods during brief high flows often 'rebounded' with even higher potentials afterwards. Failed theorized premise has resulted in 'doubled down' flow demands providing even less positive returns. Regardless, those climatically unsustainable pulses could not have even occurred were it not for stored water behind the dams targeted for destruction. Further claims that pulse requirements 'may' cease subsequent to dams removals contradicts their own studies citing a likely INCREASED need for pulses to reduce disease AFTER the dams are out. After dams destruction, any required additional flows would only be available through confiscation from all other Upper Klamath Basin beneficial uses.

Response to Comment ORG30-107
Please refer to Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites*. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*. Please also refer to Master Response AQF-5 and Master Response AQF-6.

The United States Bureau of Reclamation (USBR) maintains its biological opinion obligations on operations of the Klamath Irrigation Project, which require water to be released to the mainstem Klamath River, regardless of the existence of the Lower Klamath Project. Dam removal would not alter the amount or source of water available for environmental purposes, including management of the potential for fish disease, for the mainstem Klamath River.

Comment ORG30-108

Historical returning salmon counts to the dam facilities region reveal NO perceptible negative pre-dams correlation to facilities existence; an overall 20% average INCREASE of returning salmon numbers realized through the later addition of Iron Gate Reservoir and Hatchery; and a 100% INCREASE in returns to Iron Gate during the so-called 'salmon collapse'. Regional historical documentation, geological impediments, salmon return counts, the archeological Upper Basin midden fish bone study, and the depleted condition of returning salmon to the dams reach conflict with the assumption of pre-dam 'significant salmon numbers' extending far beyond existing facilities reach into the Upper Klamath Basin.

Response to Comment ORG30-108

Please refer to Master Responses WQ-1 and AQF-4.

Comment ORG30-109

Over 15 years of hypothetical KHSA defined 'Biological Opinions' demanded the naturally unsustainable forcefully appropriated increase of flow releases from Iron Gate. Conjectured solely for the advantage of 'endangered' coho, those flows mandated to continue within KRRC amended KHSA policy have clearly demonstrated ZERO proven attributable statistical coho or any other salmon benefit. Even so, 'programmatically', those 'opinions' will receive NO reversionary review until AFTER intended facilities removals occur.

Response to Comment ORG30-109

The United States Bureau of Reclamation (USBR) maintains its biological opinion obligations on operations of the Klamath Irrigation Project, which require water to be released to the mainstem Klamath River, regardless of the existence of the Lower Klamath Project. The biological opinions do not implement the Klamath Hydropower Settlement Agreement (KHSA).

Comments on the biological opinions for the Klamath Irrigation Project should be submitted to the United States Fish and Wildlife Service (USFWS) the National Marine Fisheries Service (NMFS), and the United States Bureau of Reclamation (USBR).

Comment ORG30-110

Removal of the Hydroelectric Facilities will destroy existing optimized and otherwise unavailable environmental habitat for multiple listed KHSA dismissed

species. It also imposes the functionally unsustainable, biologically incompatible, historically unsupported, and regionally devastating regulatory enforced environmental mandate of 'salmon habitat' upon the Upper Klamath Basin. The already failed unfunded, undefined, irreversible, and unaccountable special interest administrative policies entailed within the KHSA logically allow NO possible outcome besides predefined 'adaptively managed' regional attrition and media managed inevitable return to 'rewilded' pre-Project degraded conditions.

Response to Comment ORG30-110
Comment noted. Please note that the State Water Board is not a signatory to the Klamath Hydroelectric Settlement Agreement (KHSA) or the Amended Klamath Hydroelectric Settlement Agreement.

Please refer to Section 3.3.5 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-13 for a discussion of potential impacts to sucker populations from removal of reservoir habitat. As noted in comment response ORG30-7, the Proposed Project would eliminate reservoir habitat in which some individuals of the Lost River and shortnose sucker populations currently reside. Please see Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*. Please also refer to Master Response AQF-1.

Please also refer to Master Response GEN-1.

Comment ORG30-111
As current data reveals, the Klamath Hydroelectric facilities cause NO significant regionally substantiated negative impacts, and provide the ONLY known cost effective substantial improvement of naturally occurring Klamath River conditions towards agenda 'agreement' stated objectives.

Response to Comment ORG30-111
Summary comment noted. In addition to the responses above to points mentioned in this comment, please refer to Master Response WQ-1 for a discussion of the role of the Lower Klamath Project Dams/Reservoirs with respect to overall water quality. Please also refer to Section 3.3.5.8 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Habitat* for a discussion of how the Lower Klamath Project blocks access to a substantial quantity of historical habitat for anadromous fish (Chinook salmon, steelhead, coho salmon, and Pacific lamprey) within the mainstem Klamath River and tributaries upstream of Iron Gate Dam. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*. Additionally, please see Volume III Attachment 1 *Executive Summary* for a table of all potential impacts due to the Proposed Project and the alternatives.

Comment ORG30-112

The above facts and implemented results conflict with agenda proponent assumptions regarding facilities removals and endangered species theoretical benefit. A large part of the agenda-refuting evidence has been unintentionally provided by rewilding and removal proponents themselves. With the demise of the KHSA's 'intrinsically linked' KBRA, upon which exact 'agreement' terms the Department of Interior based its entire EIR/EIS 'peer reviewed' science, the KHSA EIS/EIR became functionally void. No part of the prior KHSA EIR/EIS is still applicable and under the 'amended' KHSA no part of the science-dependent 'agreement' proclaimed 'mitigations' necessarily occur.

Response to Comment ORG30-112

Comment noted. Please refer to Volume I Section 2.6.4 *Proposed Project – Project Background – Prior/Related Environmental Reviews* (pages 2-24 to 2-25) for a brief discussion of prior environmental documents related to the Lower Klamath Project, including the 2012 KHSA EIS/EIR. Please note that the State Water Board is not a signatory to the Klamath Hydroelectric Settlement Agreement or the Amended Klamath Hydroelectric Settlement Agreement.

Comment ORG30-113

Similarly, the previous 2006 FERC considered options are ALSO currently invalid, as the intervening new data, studies, and proven science in the years since now refute prior predicating FERC EIS assumptions and limitations.

Response to Comment ORG30-113

Please refer to Volume I Section 2.6.4 *Proposed Project – Project Background – Prior/Related Environmental Reviews* (pages 2-24 to 2-25) for a brief discussion of prior environmental documents related to the Lower Klamath Project, including the 2007 FERC EIS. Please refer to Master Response WQ-4 for information regarding the water quality data relied upon by the EIR.

Comment ORG30-114

The current 'amended' KHSA desperately seeks FERC to force the immediate irreversible agenda defined objective of facilities removals with NO functional assurances, protections, or provisions in place. Even though the KBRA has NO legal standing or structure, it is the same continuing concealed process and benefiting 'agreement' affiliated individuals who have been exclusively 'appointed' to the unaccountable Dam Removal Entity (DRE) Board now called the KRRC. As a 'private' 501(c)3 'non-profit', the KRRC seeks to use unrepresented ratepayer and public funds to facilitate the political agenda of rewilding and removals under the self-created bylaws provision of secrecy and non-disclosure. Using those public funds, that special interest 'appointed' KRRC Board seeks to secure 'indemnification', NOT for consequential damages resulting from removals imposed upon the majority of regional residents, but ONLY for 'agreement' participating entities' protection from legal liability. That 'indemnification' for benefitting seated participants provides no accountability for policy based failed

decisions to the environment or region, leaving the unrepresented regionally affected residents no reasonable redress for realized damages. Whether pursued under FERC or EPA, ANY consideration of advancing facilities removals going against the most affected regionally opposed supermajority DEMANDS a new and transparent NEPA EIR/EIS. That EIR/EIS MUST be without pre-condition; holistically inclusive of ALL species and habitats; fully accountable for damages and losses to ALL directly impacted vested interests; substantively address ALL relevant information and alternatives; preferentially pursue the LEAST detrimental and most HOLISTICALLY beneficial regional options; and effectively resolve and indemnify ALL identified social, economic, and environmental consequential impacts prior to ANY publically imposed 'determination'. The KHSA established non-representative KRRC has the single professed purpose of unaccountable Klamath dams removals.

Response to Comment ORG30-114
The statements made in the comment provide a summary of other comments provided in the comment letters and are noted. In addition to the responses set forth above, please refer to Master Responses GEN-1 and CEQ-1.

Comment ORG30-115
Given past KHSA/KBRA agenda, performance, non- representative 'process', lack of accountability, and current known standing, any FERC determination based upon 'Agreement' participating 'recommendations' will unquestionably end in irreversible devastation both to the environment and to the most affected and knowledgeable regional supermajority opposed to removals. Approval by FERC for any transfer of assets to the KRRC prior to a full and open EIS/EIR effectively constitutes administrative authorization of that singular defined outcome. Such authorization would allow only minor ineffective amendment to the original agenda outcome of environmental and regionally devastating attrition.

Response to Comment ORG30-115
Comments noted. Comments regarding Federal Energy Regulatory Commission (FERC) decisions that do not relate to the State Water Board's CEQA process should be directed to FERC. Please also refer to Master Responses GEN-1 and CEQ-2.

Comment ORG30-116
At best, removal of those proven facilities threatens a return to historically known downstream flood damage and drought prone degraded environment, including salmon habitat. At worst, removals have the potential of eradicating entire species. The 'expert panel' cited potential of downstream fisheries extirpation resulting from removals extends to the intended 'protected' coho.

Response to Comment ORG30-116
Please refer to Master Responses FLD-1, WSWR-1, and WSWR-3. Additionally, the EIR includes a comprehensive analysis of the effects of dam removal on

aquatic resources, including salmonids, in Section 3.3.5 *Aquatic Resources – Potential Impacts and Mitigation*. Please see Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*. Based on this analysis the EIR finds that dam removal under the Proposed Project would not increase the risk of salmonid species extirpation, but rather is predicted to result in increased abundance of the populations. Further, the Coho Salmon and Steelhead Expert Panel did not conclude that coho salmon extirpation was a likely outcome of dam removal as asserted by the comment. As discussed in Potential Impact 3.3-9, the conclusion of the Coho Salmon and Steelhead Expert Panel was that, in the short term, the difference between the Proposed Project and existing conditions is expected to be small. The Coho Salmon and Steelhead Expert Panel stated that larger (moderate) increases in abundance are possible under the Proposed Project if additional restoration actions are implemented, and mortality caused by the pathogen *C. shasta* is reduced. The Coho Salmon and Steelhead Expert Panel predicted a small increase in the population from a modest increase in habitat area usable by coho salmon, small changes in conditions in the mainstem, and positive but un-quantified changes in tributary habitats where most coho spawn and rear. The Coho Salmon and Steelhead Expert Panel also noted the potential for increased disease risk and low ocean survival to offset gains in production in the new habitat, although no evidence for either increased disease risk or reduced ocean survival was presented. For additional discussion please refer to Master Response AQF-12.

Comment ORG30-117

Removals will also bring inescapable Upper Klamath Basin devastation from forced imposition of now evidenced defective 'objectives' demanding that the same habitat support two incompatible 'endangered' species (suckers and coho). That seems a drastic price to pay when the primary impacts to salmon have long been associated to their majority life ocean based residence subject to cyclic conditions, including decadal oscillations progressively moving food sources and salmon up and down the coast. That association is supported by studies showing the relative lack of upper Klamath marginally conducive riverine importance when compared to the 75% of 'ideal' coastal influenced Klamath tributary spawning habitat that has gone unused. It is further supported by the fact that millions of salmon annual escapement out of the Klamath estuary can result in a fraction of one percent returns from the ocean.

Response to Comment ORG30-117

Comment noted. Please refer to response to comment ORG30-13 and Master Response AQF-4.

Comment ORG30-118

Consequently, to protect the public interest and insure environmental compliance, it is vital to evaluate proposed environmental, social, and economic impacts through an open NEPA public forum encompassing a holistic watershed-

wide multi-species environmental review which includes anadromous ocean interrelated impacts.

Response to Comment ORG30-118
Please refer to Master Response CEQ-1.

Comment ORG30-119
Any proposed Project involving a change of ownership with intended major revisions to the operational function of the facility demands a complete and UNBIASED FERC process and affected public inclusion prior to authorization. In making any subsequent decision, it MUST require provision and capacity that ALL damages to those affected are compensable WITHOUT encountering exhausted ratepayer/taxpayer funds or unending obstructive insurance legal conflict. FERC policy has previously publically proclaimed their internal requirement to perform a complete, open, inclusive, and transparent public EIR/EIS for any significant project. ***The largest dam removal in world history would likely qualify as a significant project. Anything less than FERC requirement for a full and complete EIS/EIR prior to approval of license transfer would abrogate the constitutional, scientific, ethical, and public trust obligations incumbent upon ANY regulatory Agency seeking to exercise subjective agenda authority, and NO FERC approval should be allowed to occur without COMPLETE mitigation for ALL damages imposed upon the affected.***

Response to Comment ORG30-119
The EIR evaluates the potential impacts of the Proposed Project that are recognizable under CEQA and includes mitigation measures for any significant impacts of the Proposed Project. Comments regarding the FERC process should be directed to Federal Energy Regulatory Commission (FERC). Please also refer to Master Response CEQ-1.

Comment ORG30-120
Attached is part 2c of 2a,b,c submittal by Siskiyou County Water Users Assoc. in the matter of the response to 401 Water Certification EIR for the Klamath Dam project. We look forward to any response that the Water Board may make.

Response to Comment ORG30-120
The State Water Board received the comments attached to this email and designated by Siskiyou County Water Users Association as “part 2c” of their submittal. Please note that comments on the California Draft Water Quality Certification for the Lower Klamath Project should be submitted to the State Water Board’s Water Quality Certification Program following the instructions provided at https://www.waterboards.ca.gov/waterrights/water_issues/programs/water_quality_cert/lower_klamath_ferc14803.html.

Trout Unlimited, Cindy Noble, Jason Lindberg, Michael Caranci, Patrick Kallerman, Charlie Schneider, Christy Fischer, Erik Young, Bob Blankenship, Trevor Fagerskog, James Polfer, Sam Davidson

This commenter provided the same set of comments twice. Please see below responses for the first set of comments 1-2.

Comment ORG38-1

This letter transmits the comments of the California Council of Trout Unlimited and various California chapters of Trout Unlimited on the Draft Environmental Impact Report (DEIR) for the Lower Klamath Project License Surrender (FERC Project No. 14803).

Trout Unlimited (TU) is the largest and oldest sportsmen's organization dedicated to the conservation of trout and salmon and their habitats in North America. TU has some 14,000 members in California and Oregon who rely on the Klamath River for sportfishing opportunities and as vital habitat for listed salmonid species, including Coho and winter- and spring-run Chinook salmon. The Klamath River, historically, was the third most productive watershed for salmon and steelhead on the West Coast.

Response to Comment ORG38-1

Thank you for your comment. Please refer to Master Response GEN-2.

Comment ORG38-2

The undersigned strongly support the Proposed Project to remove the Copco Number One and Two and Iron Gate dams located in Siskiyou County, California. Removing these dams is the key to re-establishing a free-flowing Klamath River, and will dramatically improve water quality in the lower watershed and re-open more than 400 stream miles of historic habitat for salmon and steelhead. Our support for other measures in the Klamath Basin to improve water quality and security for both people and fish, including collaborative water supply, economic redevelopment and habitat restoration projects in the upper basin – is just as strong.

The environmental analysis of this project required under the California Environmental Quality Act (CEQA) underscores the scientific rationale for dam removal on the Klamath. Numerous fish species—some of which are listed under federal or state Endangered Species Acts—use the California portion of the Klamath Basin during all or phases of their life histories. The dams harm river ecosystems and aquatic life and provide little or no benefit in terms of water supply or power generation. They block passage to upstream tributaries and mainstem habitat that salmon, steelhead and other native fishes require for population recovery and for sustaining now at-risk recreational, commercial and tribal fisheries.

The draft EIR confirms that the Proposed Project will have long-term beneficial impacts by improving water quality in the river as well as fish migration and riverine and riparian habitat. Removing the Klamath dams will also improve spawning opportunities and reduce the incidence of fish disease that has resulted in massive fish die-offs in some years. Moreover, per the DEIR, impacts related to release or migration of sediment will be temporary while the benefits long-term for improved water quality are considerable. The costs to consumers of power provided by PacifiCorp will be lower if the dams are removed rather than repaired and retrofitted for fish passage. And removing the Klamath dams will not affect summer flows or provision of water use for agriculture.

Returning the Klamath River to a free-flowing state could help facilitate resolution of long-term water conflicts in the Klamath Basin and watershed-scale environmental and habitat restoration. Implementing the Proposed Project will also deliver a beneficial ripple effect for fisheries in both the river and marine environments—recovering the Klamath's legendary runs of salmon and steelhead is key to revitalizing fishing-based communities and cultures in this region and to bolstering the regional economy more broadly.

In summary, we concur with the key findings of the DEIR that the Proposed Project is "the environmentally superior alternative." We urge the Water Board to certify the findings of the DEIR and issue the water quality certification required under Sec. 401 of the Clean Water Act for the Proposed Project.

Response to Comment ORG38-2
Please refer to Master Response GEN-1.

Whale and Dolphin Conservation, Colleen Weiler

Comment ORG28-1
Whale and Dolphin Conservation (WDC) is the leading global charity dedicated to the conservation and protection of whales, dolphins, and their habitats worldwide. We are writing in support of the Lower Klamath Project License Surrender (Proposed Project) to improve water quality conditions in the Klamath River and advance the long-term restoration of Klamath River salmon and recovery of the Southern Resident orca population.

We appreciate the opportunity to provide comments on the Environmental Impact Report (EIR) and the detailed information included in the EIR. We urge the State Water Board to continue its thorough and timely review of the Proposed Project and issue the final certification in time for the Proposed Project to maintain its current schedule of drawdown and full dam removal, to be completed in 2021.

Response to Comment ORG28-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment ORG28-2

In previous comments, we have noted the potential beneficial impact to the endangered Southern Resident orca population from this Project, through an increase in prey stocks that these fish-eating orcas rely on. We appreciate the inclusion of the Southern Resident orcas in this EIR and wish to note some corrections that should be made in the analysis.

Southern Resident distribution

The EIR notes that the Southern Resident orca DPS "primarily occurs in the inland waters of Washington State and southern Vancouver Island" and "(d)uring most of the year Southern Residents are present in Washington inland waters" with "occasional and short-duration winter visits" to the California Coast. However, data from the National Marine Fisheries Service (NMFS) shows that the orcas spend well over 50% of their time on the outer coast[1]. The inland waters of the Salish Sea are historically where the orcas spend time and forage in the summer and early fall months[2], but coastal waters are critical for their survival in the late fall through late spring – particularly for K and L pods, which travel more widely than J pod[3]. The EIR itself also contradicts this information by later noting that K and L pods frequent the outer west coast in the winter, a more accurate statement given the information about Southern Resident coastal distribution.

The coasts of Washington, Oregon, and Northern California are currently under consideration for critical habitat designation for Southern Resident orcas due to the acknowledged importance of this area to the orcas and the significant time spent in coastal habitat. The deadline for a draft revision by the end of 2017 already passed, and NMFS is currently facing litigation over the delay[4]. We urge the State Water Board to acknowledge the importance of Northern California coastal waters to the Southern Resident orcas and consider the area as pending critical habitat.

Importance of Klamath River salmon

We also wish to clarify the importance of Klamath River Chinook and what their recovery could add to the prey supply of the Southern Resident orcas. We have noted in previous comments that the primary threat to this orca population is a lack of their preferred food, Chinook salmon, and that the orcas also consume other types of salmon (chum and Coho), particularly when in coastal habitat[5]. While the EIR states that the very limited information available for the overall composition of the orcas' winter diet indicates a small (<1%) contribution of Klamath River salmon, we wish to note that this information is based on very few samples and likely reflects the small run sizes of salmon in the Klamath Basin, particularly of spring Chinook[6].

Klamath Basin salmon are available in a lower proportion overall in coastal waters, and Klamath spring Chinook are estimated to be reduced by 98% from their historic levels, although it is difficult to determine the size of historic runs[7]. An annual NMFS report to Congress on the status of the Klamath River Basin notes that dam construction eliminated a "substantial amount" of the historical spawning and rearing habitat for spring Chinook salmon, and at least seven spring Chinook populations have been extirpated from the Klamath Basin[8]. The run has further declined in recent years, with three of the six worst years on record occurring in the past decade[9]. In addition, fishing on the fall run has been restricted and the stock determined to be "overfished" in the fall of 2018[10]. The relatively low proportion of Klamath River salmon sampled in Southern Resident orca diet – and again, we note the small dataset available to determine the composition of coastal diet – is likely due to the unnaturally low abundance of Klamath salmon in the ocean.

The Klamath River was once home to the third-largest run of Chinook salmon on the west coast[11], and the Southern Resident orcas have evolved over millennia to specialize on these large and fatty salmon. They rely on Chinook from large watersheds including the Columbia, Central Valley, and Klamath systems, as well as from smaller coastal rivers. Even the level and ratio of contaminants (DDT, PCBs, and PBDEs) measured from individual orcas indicates a "California signature" for K and L pods[12]. This unique signature of contaminants comes from consuming prey that has higher levels of DDT, found in California Chinook runs[13], and indicates regular foraging on salmon from California rivers.

The travel patterns of the Southern Resident orcas also overlap with areas where salmon from the Klamath River and other areas are distributed in the ocean, as noted in the priority stock report from NMFS and the Washington Department of Fish and Wildlife[14]. Different runs of salmon have specific ocean distribution patterns, with fall Chinook generally having narrow distributions closer to natal rivers, and spring Chinook traveling widely north or out to the continental shelf[15]. Klamath fall Chinook tend to distribute between Cape Falcon, Oregon and Point Sur, California, and spring Chinook to the outer coastal waters[16]. The path of tagged Southern Resident orcas and detection on acoustic recorders indicates movement throughout this area, suggesting the orcas are foraging on these widely distributed salmon (Figure 1)[17].



Historical information on the orcas' range and diet, as well as the former abundance of Klamath Chinook, indicates that this run was once very important to the orcas, and might be again if the Proposed Project proceeds. Removing the four Lower Klamath River dams is expected to restore Chinook populations by up to 81% - a significant boost to the coastal food supply of the Southern Resident orcas[18].

Increasing importance of coastal salmon abundance

The dependence of Southern Resident orcas on coastal food sources, such as the Columbia, Klamath, Central Valley, and coastal rivers, may increase in the near future as salmon runs in the Fraser River, their primary source of food in the summer, continue to decline[19]. The orcas are spending less time in Salish Sea waters and are consistently arriving later each year, spending more time on the outer coast[20]. With this shifting distribution and possible increased reliance on prey in coastal waters, removing the four Lower Klamath River dams may be more important than ever to restore a once-abundant Chinook run in the region.

Response to Comment ORG28-2

Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species – Southern Resident Killer Whale* has been revised to clarify the seasonal migration patterns of Southern Resident Killer Whales. Please refer to Volume III Attachment 1 Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species – Southern Resident Killer Whale* for the revisions.

Additionally, Potential Impact 3.3-2 has been revised to clarify how the Klamath River Chinook Salmon could become a larger contributor to the diet of Southern Resident Killer Whale Distinct Population Segment (DPS) under the Proposed Project. Please refer to Volume III Attachment 1 Section 3.3.5 *Aquatic Resources – Potential Impacts and Mitigation* for the revisions.

Comment ORG28-3

Removing dams is an option increasingly applied to restore rivers and ecosystem processes. Examples in the Pacific Northwest and California provide proof of concept that the long-term benefits of dam removal outweigh the short-term impacts to river systems, wildlife, and fish, including changes in sediment flow and water quality. Research into the response of rivers to dam removal indicates that even considering the unique conditions of each river and dam, the ecological responses after dam removal follow similar general patterns, such as the temporary downstream flow of sediment[21]. The Proposed Project follows similar successful dam removal in the Elwha, White Salmon, Sandy, and Carmel Rivers in Washington, Oregon, and California – all projects intended to recover salmon populations and restore river systems[22]. These examples highlight the rapid ecosystem response of rivers and the return to healthy conditions, often faster than originally anticipated, following major dam removals[23].

We urge the State Water Board to approve and certify the Proposed Project for full removal of all three Lower Klamath River dams in California, and to support removal of the J.C. Boyle Dam in Oregon. With continued habitat loss and climate change, salmon and orcas will continue to struggle in the Pacific Northwest and California. Restoring rivers and giving salmon their best chance to survive helps the more than 130 other species who depend on salmon, including the Southern Resident orcas. Extensive analysis has already been done on the benefits of restoring the Lower Klamath River to a free-flowing condition, and what the ecosystem will gain from dam removal – clean water, stronger salmon runs, and more food for endangered Southern Resident orcas.

Thank you for the opportunity to provide comments, and please do not hesitate to reach out with questions or for additional information.

Response to Comment ORG28-3

Comment noted.

2.3.5 Individuals

This section presents written comments received on the Draft EIR from individuals and the State Water Board's responses to those comments. Written comments and responses in this section are organized alphabetically by last name, first name. To determine whether your comment is associated with an affiliation type other than individuals, please refer to Table 2-1 or Table 2-2.

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Zampino, Jerry 2-1570
Zufelt, Steven 2-1571

[No last name given], Aaron

Comment IND63-1

I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND63-1
Thank you for your comment. Please also refer to Master Response GEN-1.

[No last name given], Barry

Comment IND82-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undarn the Klamath!

Response to Comment IND82-1
Thank you for your comment. Please also refer to Master Response GEN-1.

[No last name given], Dennis

Comment IND163-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND163-1
Thank you for your comment. Please also refer to Master Response GEN-1.

[No last name given], Trinity, Ari, and Adam

Comment IND198-1
Hi my name is Trinity, I am 10 and I have lived at Copco my whole life. If you take the dams out how are we going going to fight the fires and how can we get food, we fish in that lake and many animals feed, live and swim in that lake. If you take this lake you will be killing many species and taking our food supply. Let me ask you this how would you feel if people took away you food, water, and animals habitat. But, of course you don't care, about how this will affect kids younger, such as my friends who are 5, 6, 7, 8, or lower. Also every year my family who lives in the city, they come up to rest, fish, and to spend time swimming in this lake. This will also affect elders who love to fish and swim in the lake. There are fish, swans, pelicans, geese, otters, and many other animals that depend on the water supply. This lake has provided many things for us such as, teaching your kid or dog to swim. You are supposed to work with our well being. My mom has been fighting this for many years. My dad has been fighting this for many years also. Last year I walked with my friends in the 4 Of means so much to me, my family, my friends, my animals, and all the trees and wildlife. I July parade, the day after, the beautiful Hornbrook caught on fire and my friends had to let all the R-Ranch horses out and had to go miles out of their way to get far away from the fire. There is only 1 road in and out. If you were really a good person you would work with us. My best friends hated the idea of the lake turning into a creek, my parents hated the idea of the wildlife not being able to eat or swim or fish. This lake hate this idea of the lake coming out. BUT YOU DON'T LISTEN TO THE PEOPLE!!!!!!!! The people have told you NO DAM

REMOVAL! I am a very kind kid this is the first time a kid has probably ever told you this. This hurts me, and my friends who are little. I don't want them to feel the same anger and sadness my parents go through and I go through. As a 10 year old I demand that all people young and old should be heard. Do you listen? NO. Do you care about how this affects the people? NO! You just care about the money and how poor you make people feel! This makes me really sad, not just me, but all the kids who live here at Copco. My friend Adam, a few months ago I told him about this and he said " No that means I can't go fishing or swimming during the summer" tell me how do think my friends feel about this. Are you even human? God made people to be kind and nice. But your rude and disrespectful. That not what God wanted when he created people. Don't want to listen to me, listen to my friends. They'll tell you how bad this makes them feel. Before I have them tell you how bad this makes them feel, I have a few words for you. NO DAM REMOVAL!!!!!! One more thing my friends, Allie and Will like to tube and swim and fish in this lake. Tell me, how will they do this and the things they love? Tell me, how will I swim, fish, and teach my dog to swim? Tell me, how are we going to fight fires if the dams come out? Tell me this, what will happen to the wildlife that live in the lake? Sure there could be trout, but what about the bass, the perch, the otters, the turtles, and all the other creatures that live in this lake. Why do you want to make all the wonderful things at Copco go away?

Response to Comment IND198-1
Thank you for your comment. Please refer to Master Responses GEN-1, GEN-2, TER-1, and HAZ-2.

Comment IND198-2
I want to tell you something, Imagine this your favorite place to fish, swim, and to play, like a lake, and people want to take it out what would you do? Do you really think Copco is that bad? What about all the wildfires and the ancestors that lived and fought for us?

Response to Comment IND198-2
As discussed in Section 3.20.5 *Recreation – Potential Impacts and Mitigation*, no significant loss of flatwater recreation is anticipated under the Proposed Project. Please refer to Volume III Attachment 1 for the final Section 3.20 *Recreation*. Please also refer to Volume I Section 3.8.5 *Water Supply/Water Rights – Potential Impacts and Mitigation* (pages 3-676 to 3-683) where the EIR indicates that no significant impacts to water rights or water supplies are anticipated under the Proposed Project. Additionally, please refer to Master Response HAZ-2.

Comment IND198-3
The blue green algae lie makes me mad. Last year I was at my favorite spot and the guy said " stay away from the water. It has poisonous blue green algae!" Yet I ignored him and went back to what I was doing. We have picnics down by the water, if you take that away we won't be able to do that. My told me about how

the europeans took away the indians rights. This is what the whole dam thing reminds me of.

Response to Comment IND198-3
Please refer to Master Response GEN-2. Please also refer to Master Response WQ-7 for a discussion regarding algal toxicity in the Lower Klamath Project reservoirs.

Comment IND198-4
Hi I am Ari, I am 5 years old. I have lived here since I was 4, and I want to swim, fish, and play here. I have lived here for a little while and really enjoy living and playing here. If the dams come out I will not be able to do the things I love to do. I want to play in the lake with my brother and my family. I will protect the lake. I love it here.

Response to Comment IND198-4
Please refer to Master Response GEN-2.

Comment IND198-5
Hi my name is Adam. I hope you understand that taking the dam out is very bad. You probably won't listen to us but I hope you do. This will affect the environment and the wildlife. You will be destroying many places that have dams. I know I am a kid and you won't listen to us, but please do. :((sad face)

Response to Comment IND198-5
Please refer to Master Response GEN-2.

Abidi, Shayda

Comment IND255-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND255-1
Thank you for your comment. Please also refer to Master Response GEN-1.

About, JR

Comment IND434-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) a:ffirms that dam removal is the best alternative and would comply with water quality requirements.

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It's time to undam the Klamath!

Response to Comment IND434-1
Thank you for your comment. Please also refer to Master Response GEN-1.

Adams, Robert

Comment IND293-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND293-1
Thank you for your comment. Please refer to Master Response GEN-1.

Adler, Marjorie

Comment IND358-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND358-1
Thank you for your comment. Please also refer to Master Response GEN-1.

Allen, Thomas

Comment IND231-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND231-1
Thank you for your comment. Please also refer to Master Response GEN-1.

Alsop, Stewart

Comment IND236-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements
.
I have toured the dams on the Klamath in person and believe that removal satisfies the interests of all the communities on and around the river: tribes, farmers, fisherpeople, and local residents.

Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

Please support this proposal.

Response to Comment IND236-1
Thank you for your comment. Please also refer to Master Response GEN-1.

Anderson, Glen

Comment IND446-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND446-1
Thank you for your comment. Please also refer to Master Response GEN-1.

Anderson, Nicholas

Comment IND328-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND328-1
Thank you for your comment. Please refer to Master Response GEN-1.

Anderson, Ni-Galth

Comment IND324-1
I support the removal of the Klamath river dams

Response to Comment IND324-1
Thank you for your comment. Please refer to Master Response GEN-1.

Andrus, Matt

Comment IND349-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND349-1
Thank you for your comment. Please refer to Master Response GEN-1.

Antoniw, Brittany

Comment IND92-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undarn the Klamath!

Response to Comment IND92-1
Thank you for your comment. Please refer to Master Response GEN-1.

Apodaca, Jacob

Comment IND432-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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It's time to undam the Klamath!

Response to Comment IND432-1
Thank you for your comment. Please refer to Master Response GEN-1.

Armstrong, Chris

Comment IND115-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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It's time to undam the Klamath!

Response to Comment IND115-1
Thank you for your comment. Please refer to Master Response GEN-1.

Arnold, JoEllen

Comment IND409-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of darn removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND409-1
Thank you for your comment. Please refer to Master Response GEN-1.

Arnold, Stephen

Comment IND251-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the

project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND251-1
Thank you for your comment. Please refer to Master Response GEN-1.

Asel, Josh

Comment IND398-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam

removal process will create temporary sediment impacts, the long-term benefits of darn removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND398-1
Thank you for your comment. Please refer to Master Response GEN-1.

Ashmun, Craig

Comment IND127-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND127-1
Thank you for your comment. Please refer to Master Response GEN-1.

Babb, Brian

Comment IND89-1

I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undarn the Klamath!

Response to Comment IND89-1

Thank you for your comment. Please refer to Master Response GEN-1.

Bacigalupi, Jerry

Comment IND269-1

THE KLAMATH RIVER HYDROELECTRIC FACILITIES (FERC Project No. 2082) have been requested for Decommissioning by PacifiCorp (Surrender of License #20160923-5370) for Iron Gate Dam, Copco No. 1 Dam, Copco No. 2 Dam, J.C Boyle Dam, and appurtenant hydroelectric works and to be transferred to a dam removal ("shell") corporation (KRRC).

Klamath River information: 1. The Klamath Basin is the only upside down basin on the west coast (warm poor water quality above J.C. Boyles Dam), with water temperature and quality improving as it travels to the ocean. 2. Moonshine Falls, directly below J.C. Boyles Reservoir, is cited by CFW to be the upper most habitat for anadromous fish.

Response to Comment IND269-1
Thank you for your comment. Please refer to Master Responses WQ-1 and PAP-1. Please also refer to Section 3.2.2 *Water Quality – Environmental Setting* and Appendix C *Water Quality Supporting Technical Information* (pages C-1 to C-119) for further information about the water quality variations in the Klamath River from J.C. Boyle Reservoir to the Pacific Ocean. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality* and Appendix C *Water Quality Supporting Technical Information*.

As described in Section 3.3.5.8 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Habitat*, there is no evidence of an impassible barrier at the location of J.C. Boyle Dam that historically blocked upstream migration of salmonids. Please refer to the available data on historical abundance of salmon in the Klamath River watershed prior to Lower Klamath Project construction, as summarized in the Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species – Anadromous Fish Species* and Table 3.3-2. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment IND269-2
3. The downstream Dams have absolutely nothing to do with the Upper Basin water wars. They improve the DOI Klamath Project regulated flows to farmers and ranchers by providing required minimum instream flows. 4. The California dams have been recently inspected by the Division of Dam Safety and are in good condition. 5. These dams provide a 25+% down river flood and surge protection, based on the 1964 flood hydrograph measured at the gage below Iron Gate Dam, and provides an average yearly water quality improvement.

Response to Comment IND269-2
Please refer to Master Responses WSWR-1, WSWR-2, WSWR-3, FLD-1, and WQ-1**.** The comment regarding the safety inspection of the dams does not focus on the sufficiency of the EIR in identifying and analyzing the possible impacts of the Proposed Project on the environment and ways in which the significant effects of the project might be avoided or mitigated (CEQA Guidelines section 15204(a)).

Comment IND269-3
6. Given the condition of a complete Klamath River cutoff by the DOI or a severe drought, the dams can also provide CDFG/CFW's 700 cfs minimum instream river flows for a three-month period with adequate storage retained for Lake Habitat.

Response to Comment IND269-3
Please refer to Volume I Section 3.6.2.2 *Flood Hydrology –Environmental Setting – Basin Hydrology* (pages 3-590 to 3-621) for a description of hydrology in the Klamath Basin. Klamath River flows are defined by the current operational

standard for the U.S. Bureau of Reclamation's (USBR's) Klamath Irrigation Project, the 2019 Biological Opinion (NMFS 2019).

Comment IND269-4
It is within the SWRCB & FERC's responsibility to consider the public interest to retain and pursue the relicensing of the hydroelectric facilities to a "responsible" entity. Siskiyou and Klamath Counties, and the Cities within, have the statutory responsibility to provide and protect the public's interest and safety to all citizens and protect the environment for present and future generations. Through proper and legal voting procedures in 2010, the voting populous of Siskiyou Co. (79.04%), and in 2016 Klamath Co. (72%), OVERWHELMINGLY voted to retain the Klamath River Dams and Hydroelectric Facilities.

Response to Comment IND269-4
Please refer to Master Response GEN-1.

Comment IND269-5
STOP the largest Proposed Dam Removal Project in the World and preserve the Klamath River Basin economy and ecosystem. It HAS NOT been established that anadromous fish habitat exists above J.C. Boyles Reservoir or that any other listed benefits justify Dam Removals.

Response to Comment IND269-5
Please refer to Master Response GEN-1. As described in Section 3.3.5.8 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Habitat*, there is no evidence of an impassible barrier at the location of J.C. Boyle Dam that historically blocked upstream migration of salmonids. Please refer to the available data on historical abundance of salmon in the Klamath River watershed prior to Lower Klamath Project construction, as summarized in the Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species – Anadromous Fish Species*, and Table 3.3-2. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment IND269-6
As a Registered Engineer and former State Employee with Caltrans Hydraulics and Hydrology Section and the Resources Agency and in private practice, I was responsible for drainage analysis and designs, the preparation and analysis of Environmental Impact Reports (EIRs) and Storm Water Pollution Prevention Plans(SWPPPs). The Department of Interior(DOI) and States of Calif. and Oregon have failed to prepare and complete 401 Clean Water Act and environmental studies to legal and acceptable standards that support Dam Removals for the following reasons:

1. Coho Truck and Haul Studies above J.C. Boyle Dam were demanded but refused by the DOI, probably because they realized anadromous habitat did not exist. A common analogy is that the only way Coho juveniles can get back from

the tributaries of Upper Lake to the ocean is to become flying fish. This study must be completed to support Dam Removals. Without this study the environmental documents fail and will initiate MAJOR LAWSUITS.

Response to Comment IND269-6
Trap and haul is considered as a potential means of providing fish passage at the Lower Klamath Project facilities in Section 4.4 *Continued Operations with Fish Passge Alternative* (pages 4-99 to 4-180).

Comment IND269-7
2. The environmental documents are incomplete. (Fail to analyze alternatives with Dams in place). (Fail to provide a Cost Benefit Analysis). Including substantial crop and property value losses to Farmers and Ranchers due to unjustified DOI water cutoffs.

Response to Comment IND269-7
Lower Klamath Project EIR presents a reasonable range of alternatives to the Proposed Project. Section 4.1 *Alternatives Selection/Overview* (pages 4-1 to 4-15) discusses 17 potential alternatives in relation to the Proposed Project's underlying purpose and objectives, six of which are examined in detail. Of these six alternatives, two involve removal of all four Lower Klamath Project dams, and four involve two or three dams remaining in place. Potential impacts and beneficial effects are identified for each of these alternatives in the EIR and each will be fully considered by the State Water Board before certifying the EIR (CEQA Guidelines section 15090).

Please note that under CEQA, potential effects from implementing a project that are solely social or economic in nature, such as reductions in property values, loss of property tax revenues, and increases in energy costs, do not constitute an effect (i.e., an impact) to the physical environment.

Comment IND269-8
3. The release of 20 +/- million cubic yards of toxic sediments retained behind the Dams down river is irresponsible, violates the 401 Clean Water Act, and requires the preparation of a "Storm Water Pollution Pretention Plan". It will decimate river habitat for decades. It is irresponsible that sediment removal by dredging has been abandoned because of cost!!

Response to Comment IND269-8
The Klamath River Renewal Corporation (KRRC) proposes to implement a Stormwater Pollution Prevention Plan (SWPPP) to prevent construction materials (fuels, oils, and lubricants) from spilling or otherwise entering waterways or water bodies during construction activities associated with removal of the Lower Klamath Project dam complexes. As described in Section 3.2.5.2 *Water Quality – Potential Impacts and Mitigation – Suspended Sediments* Potential Impact 3.2-4, Mitigation Measure WQ-1 requires additional protection of water quality by

requiring that all potentially affected waterbodies within the Limits of Work be protected during all ground-disturbing activities occurring for the Proposed Project and that best management practices required under the Construction General Permit be implemented throughout the construction period. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

The EIR analyses do not find that the release of sediments would decimate river habitat for decades. Please refer to Master Responses AQF-7 and AQF-10.

As stated in Section 3.2.5.2 *Water Quality – Potential Impacts and Mitigation – Suspended Sediments* Potential Impact 3.2-3, physical removal of reservoir bottom sediments prior to drawdown is not feasible because dredging would remove only a maximum of 43 percent of erodible reservoir sediment, would only provide a marginal benefit to fish during drawdown with 57 percent of erodible sediment remaining, and would have a large environmental impact on terrestrial resources and possibly cultural resources (Lynch 2011). Slower drawdown to potentially mobilize less sediment or altering the timing of drawdown to lessen the potential of precipitation after drawdown and before plantings have stabilized sediments have also been suggested as potential approaches to reduce sediment impacts. However, both of these alterations would increase the time elevated suspended sediment concentrations (SSCs) would occur during sensitive fish life-stages, resulting in greater adverse impacts to designated beneficial uses and/or fish (see Volume I Section 4.1.1.4 *Alternatives Selection/Overview – Alternatives Selection Elimination of Potential Alternatives that Would Not Avoid or Substantially Lessen Significant Environmental Effects of the Proposed Project* [pages 4-13 to 4-14]). Thus, the short-term significant impact of increased suspended sediment concentrations due to dam removal in the Hydroelectric Reach cannot be avoided or substantially decreased through feasible mitigation.

Comment IND269-9

4. The Calif. Division of Dam Safety under existing law requires that Dam Removal Plans be submitted and approved, and verify Dam Removal Plans and Conditions are followed.

Response to Comment IND269-9

Comments on the Definite Plan should be submitted to the Klamath River Renewal Corporation. Additionally, please refer to Volume III Attachment 1 Section 3.6.5.3 *Flood Hydrology – Potential Impacts and Mitigation – Risks of Dam Failure* Potential Impact 3.6-6 for a discussion of the potential for dam failure to flood areas downstream of the Lower Klamath Project during reservoir drawdown and dam removal and following dam removal.

Comment IND269-10

5. Siskiyou and Klamath Counties have and are mandated (within their existing regulations and public safety authorities) to require and approve Klamath River

Dam Removal Permits (They are not preempted by State and Federal Governments)

Response to Comment IND269-10
Please refer to Master Response CEQ-2.

Comment IND269-11
6. The DOI and State Agencies have circumvented State and Federal Laws by certifying bogus scientific studies to justify dam removals, commonly cited by recognized professional Biologist, Scientist and Engineers as SWAGs (Scientific Wild Ass Guesses)

Response to Comment IND269-11
This comment raises a concern that the U.S. Department of the Interior (DOI) and state agencies have circumvented state and federal laws by certifying "bogus" scientific studies to justify dam removals. Comment noted.

Comment IND269-12
7. The Flood Control provided by the Dams proposed for removals is substantial: My comments on the Klamath Facilities Removal Final EIS/EIR to the BOR is attached for your review showing that my 100 yr. flood calculation of 37,000 cfs below I.G. Dam, based on the 1964 flood hydrograph, reduces peak flow by 26%. My 100 yr. peak flow should be much lower than what is being used for the Klamath River flows for the Lower Klamath Project. (Table 3.6-9 shows that the Dams only provides a 6.9% reduction in flood attenuation). See Attachment #1. I expect a response.

Response to Comment IND269-12
The comment asserts that the Lower Klamath Project reservoirs provide substantially greater flood attenuation than what is reported in Volume I Section 3.6.5.2 *Flood Hydrology – Potential Impacts and Mitigation – River Floodplain* Table 3.6-12 (page 3-631). The comment provides results from an independent calculation of Iron Gate and Copco No. 1 reservoirs' 100-year flood attenuation capacity. Note that the analysis of flood attenuation reported in Table 3.6-12 and USBR (2012a) uses a standard level-pool routing approach to estimate the attenuation effects of Iron Gate and Copco No. 1 reservoirs, as described in the following equation:

$$\frac{S_{n+1} - S_n}{\Delta t} = \frac{I_{n+1} + I_n}{2} - \frac{O_{n+1} + O_n}{2}$$

where:

S_n = storage within reservoir at time n
I_n = inflow to reservoir at time n
O_n = outflow from reservoir at time $n = CWH^{1.5}$
W = width of spillway
H = depth over spillway
C = discharge coefficient

The above level-pool routing equation is applied to each reservoir in series to provide the combined flood attenuation capacity, and this method assumes that the reservoir water surface elevation remains level throughout the flood period. USBR (2012a) used the above equation to estimate flood attenuation for a synthetic 100-year flood event by applying the December 1964 hydrograph, as well as hydrographs for multiple other smaller flood events. As noted by USBR (2012a), the flood attenuation values calculated by United States Bureau of Reclamation (USBR) are overestimates of the actual attenuation because a substantial portion of the peak flow that would occur in the Hydroelectric Reach is from Jenny Creek, which enters Iron Gate Reservoir downstream of Copco No. 1 Reservoir. While Copco No. 1 Reservoir does not affect flows from Jenny Creek, the level-pool routing method assumes both reservoirs attenuate the entire flood flow from this creek and thus overestimates the flood attenuation of these reservoirs (i.e., flood attenuation of Copco No. 1 and Iron Gate reservoirs is actually less than reported in Volume I Section 3.6.5.2 *Flood Hydrology – Potential Impacts and Mitigation – River Floodplain* Table 3.6-12 [page 3-631] and USBR [2012]).

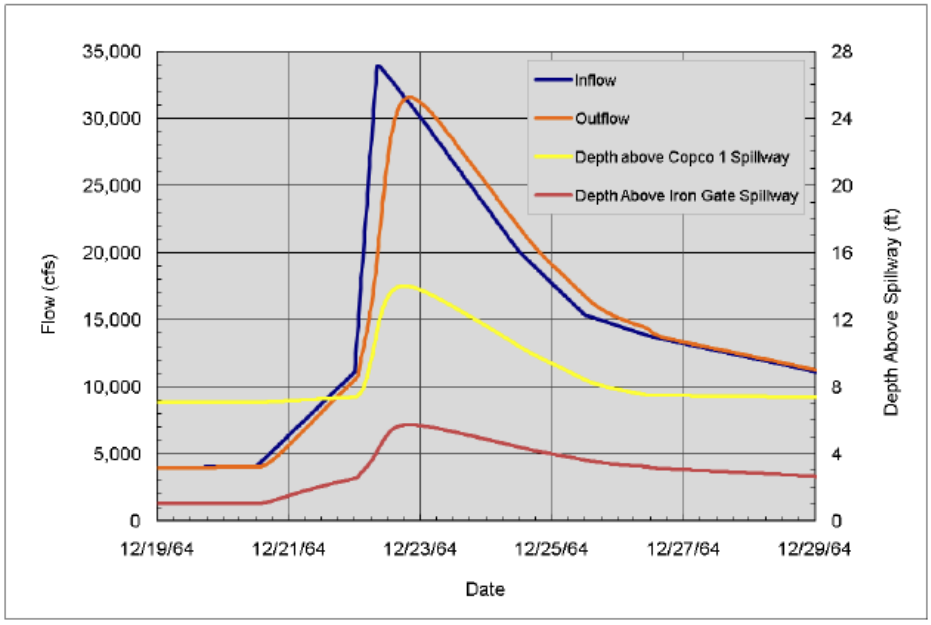

Figure IND269-12-1. Inflow into Copco No. 1 Reservoir and outflow from Iron Gate Dam for December 1964 flood. Source: USBR 2012a.

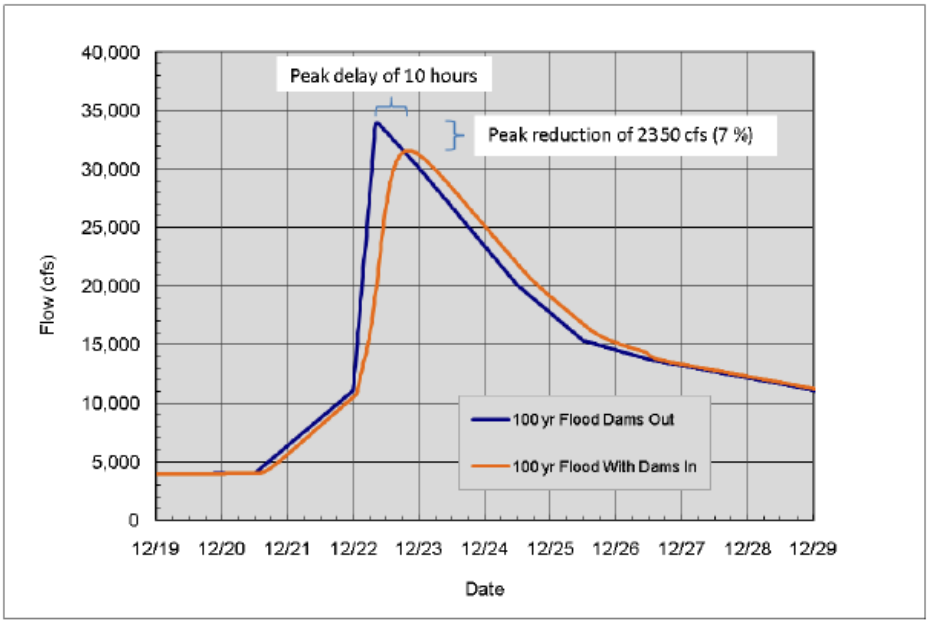

Figure IND269-12-2. Difference in modeled 100-year flood between the Proposed Project (i.e., "Dams Out") and Existing Conditions/No Project Alternative (i.e., "Dams In"). Source: USBR 2012a.

Based on the limited information provided in this comment letter and its attachments (which are copies of comment letters submitted by Mr. Bacigalupi in response to the 2012 KHSA EIS/EIR), it is not possible to evaluate the validity of the independent calculation. Thus, in order to provide a more complete response to this comment on the Lower Klamath Project Draft EIR, the State Water Board obtained a letter from USBR that was submitted to the Siskiyou County Board of Supervisors by Mr. Bacigalupi on April 1, 2010; this letter appears to contain the original calculations referenced in this comment. Based on the State Water Board's review of the April 1, 2010 letter, the original calculations provided by Mr. Bacigalupi do not appear to use a standard level-pool flood routing approach through the reservoirs and no explanation or rationale for the selected variables listed is provided to estimate the flood attenuation in a reservoir. More specifically, it is unclear why the change in reservoir storage appears to be calculated as the net flow (Q) times a factor of 0.25 ("VOL. net = Q(0.25)"; whether these calculations use a hypsographic relationship between reservoir elevation, area and volume, as would be expected. That is, the rate of stage increase should decrease with elevation in the reservoir. Additionally, the spillway dimensions for each reservoir, which control the rate of flow out of each reservoir, do not appear in the calculations. While the response from USBR to the related comment on the 2012 KHSA EIS/EIR suggested reducing the calculation time step from 3 hours to 15 minutes to improve accuracy, that suggestion does not address the multiple non-standard variables included in the original calculations, interim computations with little to no rationale, an

oversimplification of the reservoirs as a single, combined waterbody, and the lack of consideration for spillway controls on outflow and hence flood attenuation capacity.

As discussed in Volume I Section 3.6.5.2 *Flood Hydrology – Potential Impacts and Mitigation – River Floodplain* (pages 3-630 to 3-635), J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate dams are not designed or currently operated for flood control purposes. Please refer to Master Response FLD-1 and Volume I Section 3.6.5.2 *Flood Hydrology – Potential Impacts and Mitigation – River Floodplain* Potential Impact 3.6-3 (pages 3-630 to 3-633) for discussion of flood hydrology and attenuation related to the Proposed Project.

Comment IND269-13

8. The Draft EIR fails to consider feasible and public supported Alternatives with the Dams remaining in place.

9. My comments on the Klamath Facilities Removal EIR Public Draft EIS/EIR are also attached to address deficiencies and failures in the EIS/EIR process that need addressing. See Attachment #2.

10. Failure to address the above listed deficiencies, documentations, studies and permits WILL INVOLVE MAJOR LAWSUITS.

Response to Comment IND269-13

With respect to whether the EIR considers alternatives to the Proposed Project that leave dams in place, please refer to response to comment IND269- 7.

Please refer to Volume I Section 2.6.4 *Proposed Project – Project Background – Prior/Related Environmental Reviews* (pages 2-24 to 2-25) for a brief summary of past environmental documents associated with Klamath River dam removal, including the 2012 KHSA EIS/EIR, as well as a list of the reasons that the State Water Board determined it should develop a separate EIR, rather than adopting one of the existing environmental reviews.

The final comment in the commenter's list (Item No. 10) is noted.

Comment IND269-14

THE FOLLOWING PROJECTS (ALTERNATIVES WITH DAMS IN PLACE) HAVE BEEN PROPOSED TO FACILITATE "FERC" RELICENSING, PROMOTE THE PUBLIC AND ENVIRONMENTAL INTEREST, COMPLY WITH THE BI-STATE COMPACT, AND PRESERVE THE KLAMATH R. BASIN

1. Implement the Shasta Nation Tunnel Unassisted Anadromous Fish Passageway around Iron Gate, Copco 1 and Copco 2 Dams at a cost of $50 million (1/6th the $300 million cost estimated for installing fish ladders and 1/20th the $1+ billion estimated for dam removals and restoration). This will provide

anadromous fish passage around Iron Gate, Copco 1, and Copco 2 reservoirs to the pre-dam 20 miles of native river habitat above Copco 1 Reservoir. This proposal has a very positive write up in the DOI's EIR. (It was not considered because it required retaining the Dams). A former DFG official stated that he could not support this alternative. He also stated that he could not support proposed fish ladders either because there is no habitat above the Dams to warrant the expense of either.

2. Implement the 60,000 ac.ft. Klamath River/Shasta Valley Reserved Water Right (A0169580), transfer canal and storage facilities to supplement Montague Irrigation District's irrigation water with Klamath R. water (poor water quality containing high nutrients). This project augments current irrigation supplies, allows for additional land to become irrigated, and replaces naturally impaired Upper Klamath R. water with higher quality water. A portion of the reduced water demands (good water quality) can be released by the District from Lake Shastina or from their wells into the Shasta River, improving the water quality in both the Shasta River and in the Klamath River below Iron Gate Reservoir per FERC recommended requirements for relicensing. The Shasta Valley RCD & CDFG contracted a similar augmentation study in 2007 that has since been politically shelved. (Because it depends on retaining the dams scheduled for removals) Ref: (CDFG Project No. P0310329) I recommend combining Alternatives 1 & 2

3. Establish additional reliable storage facilities within the Klamath River Basin, including increasing storage capacities of high-elevation lakes as recommended in the October 1991 Department of Water Resources Study: SCOTT RIVER FLOW AUGMENTATION STUDY, and introduce juniper removal projects. Added storage facilities and juniper removals projects will provide thousands of ac-ft. of additional surface and ground water storage, provide additional wildfire protection, increase late summer and fall instream flows, and augment irrigation waters.

4. Establish a Public Utility District within Siskiyou and Klamath Counties to take possession of the hydroelectric facilities and pursue FERC re-licensing. Note: This process is underway in Siskiyou Co. and planned to involve Klamath Co. and the Shasta Nation in the future.

<u>These proposals will:</u>

- *Save the Hydro-electric Dams which generate <u>clean, green, renewable</u> power to 70,000 homes and protect the lake habitat and homes in and around the reservoirs by removing dam removals from the proposed Lower Klamath Project and the Klamath Basin Restoration Agreement (KBRA), and eliminating the Klamath Hydroelectric Settlement Agreement (KHSA).*
- *Save Iron Gate Fish Hatchery, which is dependent on cool low level water releases from Iron Gate Reservoir, which releases over six million salmon and steelhead fingerlings per year into the Klamath River. Note: A former Ca. DFW Game Warden stated, "It is impossible for the Klamath River*

Habitat above Iron Gate Dam to duplicate the production of fish generated from the Iron Gate Hatchery."

- *Save future impacts on the Fall Creek Hydro-electric Facilities and Yreka City Fall Creek water supply.*
- *Save the Klamath River from complete destruction by eliminating the proposed and irresponsible releasing of 20 million cubic yards of sediments and pollutants retained behind the dams down river. This equates to sediment 3ft. thick all the way to the estuary, assuming that the River is 150ft. wide & 190 miles to the ocean. (Violates Clean Water Act Section 401)*
- *Save future Klamath River water demands from the Scott R. and Shasta R. by State and Federal Agencies to satisfy requirements proposed in the KBRA for Environmental Waters.*
- *Preserve the sacred Shasta Nation Villages and Burial Sites beneath the waters of Iron Gate and Copco Reservoirs.*
- *Provide additional storage facilities and instream flows which will enhance fisheries and benefit the Tribes, NGOs and fishing interests, and improve Klamath River water quality.*
- *Eliminate increased electricity rates for On and Off Project irrigators and all ratepayers and provide substantial power rate reductions with the establishment of a PUD.*
- *Provide Governmental Agencies common sense and professionally supported and engineered alternatives.*

Response to Comment IND269-14

As discussed in response to comment IND269-7 above, the Lower Klamath Project EIR presents a reasonable range of alternatives to the Proposed Project. Volume I Section 4.1 *Alternatives Selection/Overview* (pages 4-1 to 4-15) discusses 17 potential alternatives in relation to the Proposed Project's underlying purpose and objectives, six of which are examined in detail. Please refer to Volume I Section 4.1 *Alternatives Selection/Overview* pages 4-7 to 4-8 for a discussion about why a potential bypass tunnel around Iron Gate, Copco No. 2, and Copco No. 1 dams was not analyzed further. Please also refer to pages 4-10 to 4-11 for a discussion of both the Scotts/Quarts Valley water storage alternative and the Shasta River water transfer alternative and why they were not analyzed further. Additionally, transferring the Lower Klamath Project facilities to a Public Utilities District potentially would change the applicant but it is not clear that any other project details would change. Please refer to Volume I Sections 4.2 *No Project Alternative* (pages 4-15 to 4-74) and 4.4 *Continued Operations with Fish Passage Alternative* (pages 4-99 to 4-180) for a detailed analysis of these alternatives. There are potential impacts and beneficial effects identified for each of these alternatives in the EIR and each will be fully considered by the State Water Board before certifying the EIR (CEQA Guidelines section 15090).

Comment IND269-15

My final recommendation as a Professional Engineer, if overseeing the Lower Klamath Project, which is very controversial, does not have local public support, and is flawed with questionable environmental documents, is to implement the following study to justify that Dam Removals:

If Dam Removals are selected as the preferred alternative and prior to any decommissioning or work on Dam Removals, perform the following: 5-year study:

1. Remove plugs on bypass tunnels to allow maximum flows through the existing tunnels.

2. Plan controlled plug removals to sequence with anadromos fish runs and weather conditions.

3. Perform a 5yr. study to determine if anadromous fish can or will utilize the upper Klamath Basin tributaries and their juveniles return to the estuary.

4. Study the impacts of sediment release down the K. River.

5. Study the impacts on the Iron Gate Fish Hatchery.

6. Study the impacts on ground water recharge.

7. Study the impacts on the Upper Klamath Basin agricultural water availability without Dam storage for minimum flow releases.

8. Study the impacts from the release of lake aquatic life to the K. River.

9. Study the impacts on lake fishing and recreation.

Note:

During this study period the Dams will provide flood control and the Fish Hatchery can be shut down to study the benefits of the Hatchery.

After the study period, when it is determined that anadromous fish habitat does not exist in the Upper K. Basin and other studies support retaining the Dams and hatchery, the bypass tunnels can be re-plugged and the Hydro-electric Facilities can be put back into normal operation.

Response to Comment IND269-15

The comment suggests drawing down the reservoirs without removing the dams and associated facilities to allow the potential environmental impacts of the reservoir drawdown to be studied (i.e., Item No. 4 sediment release; Item No. 6 groundwater recharge; Item No. 7 agricultural water supply; Item No. 8 release of

aquatic species in the reservoirs to the Middle and Lower Klamath River; Item No. 9 impacts on reservoir fishing and recreation) and the potential for environmental benefits of dam removal to be studied (i.e., Item No. 3 habitat expansion for anadromous fish in the Upper Klamath Basin associated with upstream and downstream volitional fish passage), while the dams remain in place and provide interim flood control. The comment also suggests that Iron Gate Hatchery be shut down as part of the proposed 5-year study to assess the benefits of the hatchery. The comment then states that the 5-year study will show that anadromous fish habitat does not exist in the Upper Klamath Basin.

Please note that for each of the suggested study items listed in the comment and discussed in more detail below, the EIR relies upon numerous scientific studies and analyses, based on environmental sampling and/or modeling, that are sufficient to provide decision makers with information that accounts for environmental consequences of the Proposed Project and the alternatives (CEQA Guidelines section 15151), such that the studies and interim operations suggested in the comment are unnecessary, and in some cases, may result in greater environmental impacts than the Proposed Project.

With respect to Item No. 1, please note that simply removing plugs on the Lower Klamath Project diversion tunnels (referred to as "bypass" tunnels in the comment) would draw down the reservoirs in an uncontrolled manner in the first year of the 5-year study proposed by the comment. Please refer to Volume II Appendix B: *Definite Plan* – Section 4.2.2 *Reservoir Drawdown and Diversion Plan – Copco Lake,* Section 4.2.3 *Reservoir Drawdown and Diversion Plan – Iron Gate Reservoir,* and Section 4.2.4 *Drawdown Controls* (pages 84 to 89) for discussions of the diversion tunnel modifications proposed by the Klamath River Renewal Corporation (KRRC) to draw down the reservoirs in a controlled manner. Further, the Lower Klamath Project dams were designed for hydropower operations, which support primarily full pool conditions with relatively small variations in water level for power generation, and any proposal to undertake fully drained reservoir conditions for long periods of time (e.g., five years) would require dam stability investigations to ascertain the potential effects that prolonged exposure and changes in pore pressures could have on the dams.

With respect to Item No. 2, other than the mechanisms for controlling flows that move through the diversion tunnels (see Item No. 1 above), it is not clear how the study suggested in the comment (i.e., planning controlled plug removals of the diversion tunnels sequenced to occur with anadromous fish runs and weather conditions) is different from the Proposed Project, which would undertake reservoir drawdown at a period when winter flows and levels of suspended sediment are naturally high in the river and only a portion of fish populations are likely to be present in the mainstem Klamath River immediately downstream of the Hydroelectric Reach. As discussed in Volume I Section 2.7 *Proposed Project* (page 2-26), drawdown timing for J.C. Boyle, Copco No. 1, and Iron Gate reservoirs was selected to minimize impacts to salmonids and other aquatic

species. Based on the distribution and life-history timing of aquatic species in the Klamath Basin, only a portion of fish populations are likely to be present in the mainstem Klamath River during the periods of greatest sediment transport between January and March (please refer to Volume III Attachment 1 Section 3.2.5.2 *Water Quality – Potential Impacts and Mitigation – Suspended Sediments* – Potential Impact 3.2-3). Most species are in tributaries which would be unaffected by the Proposed Project or are further downstream during this time where river conditions would be less influenced by sediment transport by the Proposed Project due to dilution by tributary inflows. Additionally, the timing of drawdown coincides with periods of naturally high suspended sediment in the Klamath River, to which aquatic species have adapted through avoidance and tolerance.

The EIR relies upon a number of detailed studies, an analysis by the Federal Energy Regulatory Commission (FERC), and two scientific expert panel reports to assess the amount of potential anadromous fish habitat that is located upstream of Iron Gate Dam and that would be utilized by the various freshwater life history stages of anadromous fish under the Proposed Project (please refer to Volume III Attachment 1 Section 3.3.5.8 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Habitat*). Performing a 5-year study to determine if anadromous fish can or will utilize the Upper Klamath Basin tributaries, and if juveniles would return to the Klamath River Estuary, as suggested by Item No. 3 in the comment, would require the implementation of volitional upstream and downstream fish passage at the Lower Klamath Project facilities for the period of the proposed study, where the comment assumes that the dams and other hydropower facilities would remain in place. It is not clear that the diversion tunnels, modified as described in the comment, would provide volitional passage. Please note that implementation of upstream and downstream fish passage for the Lower Klamath Project facilities is analyzed in the EIR as an alternative to the Proposed Project (please refer to Volume I Section 4.4 *Alternatives – Continued Operations with Fish Passage Alternative* [pages 4-99 to 4-180]).

With respect to Item No. 4, the EIR also relies upon the results of detailed sediment sampling and modeling efforts to assess the potential for environmental impacts due to the release of sediment deposits from behind the Lower Klamath Project dams. Please refer to Master Response GEO-1 for a discussion of the EIR's overall approach to sediment modeling and analysis for the Proposed Project and alternatives, the downstream extent of potential fine sediment impacts during and following dam removal, and the analysis approach for addressing spatially discrete fine sediment impacts. Please also refer to Master Response WQ-3 for a discussion of the adequacy of modeling for sediment deposits and suspended sediments during reservoir drawdown and Master Response WQ-6 for a discussion of potential contaminants in sediments. Please note that the Proposed Project includes a Reservoir Area Management Plan that would provide for restoration of reservoir sediments remaining on the floodplain and the surrounding slopes during and immediately following drawdown to

stabilize the sediments (Volume I Section 2.7.4 *Proposed Project – Restoration Within the Reservoir Footprint* [pages 2-69 to 2-76] and Volume II Appendix B: *Definite Plan – Appendix H: Rare Natural Communities in the Area of Analysis*). Simply drawing down the Lower Klamath Project reservoirs for the duration of a 5-year study would not control the frequency and duration of elevated suspended sediment impacts on fish and other aquatic organisms in the Klamath River, such that the study suggested in the comment would likely result in greater sediment-related impacts than the Proposed Project.

Regarding Item No. 5, Iron Gate Reservoir currently provides the water supply for Iron Gate Hatchery. Any study of the impacts of drawing down the reservoirs on Iron Gate Hatchery, as suggested in the comment, would necessarily conclude that the hatchery could not be operated without an alternate water supply.

With respect to Item No. 6, please refer to Master Response GRW-1 for a discussion of the effects of the Proposed Project on groundwater wells. Please note that the study suggested in the comment would not avoid any potential impacts to groundwater wells in the vicinity of Iron Gate and Copco No. 1 reservoirs due to reservoir drawdown, and it does not propose mitigation for those potential impacts during the 5-year period of the study. In contrast, the Proposed Project proposes mitigation for potential impacts to groundwater wells.

With respect to Item No. 7, please refer to Master Response WSWR-1 for a discussion of the potential effects of the Proposed Project on agricultural water supply for California water users in the United States Bureau of Reclamation (USBR) Klamath Irrigation Project.

Regarding the comment's suggestion to study the impacts from the release of lake aquatic life to the Klamath River in Item No. 8, please refer to Volume III Attachment 1 Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resources Impacts* Potential Impact 3.3-17 for the analysis of potential interactions between introduced reservoir fish species, including largemouth bass, yellow perch, bluegill, and brown bullhead, and the native aquatic species in the Klamath River downstream of the Hydroelectric Reach. This analysis determines that there would be no significant impact due to the Proposed Project. Please also refer to responses to comments ORG46-14 and ORG46-260. Please note that the study suggested in the comment would not avoid any potential interactions between introduced reservoir fish species and native aquatic species in the Klamath River due to reservoir drawdown.

Regarding the comment's suggestion to study the impacts of reservoir drawdown on lake fishing and recreation in Item No. 9, please refer to Volume III Attachment 1 Section 3.20.9 *Recreation – Potential Impacts and Mitigation* Potential Impact 3.20-2 and Potential Impact 3.20-3 for the EIR's analyses of long-term adverse changes to or loss of reservoir-based recreation activities and facilities due to removal of Iron Gate and Copco No. 1 reservoirs, and the

potential for a significant increase in the use of regional recreational facilities due to loss of Iron Gate and Copco No. 1 reservoirs, respectively. Please note that both of these analyses determined that there would be no significant impact of the Proposed Project. The study suggested in the comment would not avoid any potential impacts on recreation due to reservoir drawdown during the 5-year study.

With respect to the comment's assertion that the Lower Klamath Project dams would provide flood control during the 5-year study period, please refer to Master Response FLD-1 for a summary of the key points from the EIR concerning the potential impacts related to the Proposed Project's changes to downstream flood hydrology, as well as the Proposed Project's proposal to reduce or avoid such impacts. As noted above, it is not clear how fully drained reservoir conditions for long periods of time (e.g., five years) would affect dam stability and, as such, the comment's assumption that the dams would provide flood control under conditions of prolonged exposure is not supported by substantial evidence.

Lastly, with respect to the comment's suggestion to study the benefits of the hatchery by ceasing hatchery operations for the 5-year duration of the proposed study, please note that Volume I Section 4.7 *Alternatives – No Hatchery Alternative* analyzes the potential elimination of hatchery produced fall-run Chinook salmon, and explains that it would delay the attainment of one of the Project Objectives, namely the long-term restoration of the natural fish populations in the Klamath Basin, with particular emphasis on restoring the salmonid fisheries used for subsistence, commerce, tribal cultural purposes, and recreation.

As discussed in Volume I Section 4.7.12 *Alternatives – No Hatchery Alternative – Historical Resources and Tribal Cultural Resources* (pages 4-318 to 4-319), elimination of hatchery produced fall-run Chinook salmon under the No Hatchery Alternative would likely result in a reduction (averaging 35 percent, potentially ranging from 19 to 50 percent based on existing conditions) in adult returns in the fall beginning in post-dam removal year 3 and continuing for an indeterminate period of perhaps one to five years (i.e., short-term), before the benefits of dam removal are realized (please also refer to Volume I Section 4.7.3 *Alternatives – No Hatchery Alternative – Aquatic Resources*, Potential Impact 3.3-7 [pages 4-306 to 4-308]). The elimination of hatchery produced coho salmon would likely result in a reduction in adult returns for a period of one to five years before the benefits of dam removal are realized (please also refer to Volume I Section 4.7.3 *Alternatives – No Hatchery Alternative – Aquatic Resources*, Potential Impact 3.3-9 [pages 4-310 to 4-313]). This potential impact to the fishery would be greater under the No Hatchery Alternative than under the Proposed Project, because under the Proposed Project the hatcheries would continue to supplement natural adult returns (albeit at a reduced rate of production) until after seven generations or cohorts of fish have been hatched with the benefit from expanded habitat and improved water quality conditions. The short term

reduction in the fishery due to elimination of hatchery-produced fall-run Chinook and coho salmon under the No Hatchery Alternative would represent a material impairment of the Klamath Riverscape as a resource and a substantial restriction of tribal access to the fishery relative to existing conditions. As noted above, the comment suggests ceasing hatchery operations for the 5-year duration of the proposed study without ensuring volitional fish passage around the Lower Klamath Project dams and associated facilities, such that the study suggested in the comment would likely result in substantially greater impacts to salmonid fisheries used for subsistence, commerce, tribal cultural purposes, and recreation than would the Proposed Project.

Bailey, Michael

Comment IND345-1

I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND345-1

Thank you for your comment. Please refer to Master Response GEN-1.

Baker, Carli

Comment IND105-1

I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND105-1

Thank you for your comment. Please refer to Master Response GEN-1.

Ballinger, Doug

Comment IND191-1

I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND191-1
Thank you for your comment. Please refer to Master Response GEN-1.

Ballinger, Scott

Comment IND263-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND263-1
Thank you for your comment. Please refer to Master Response GEN-1.

Bamberger, Cole

Comment IND124-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.
Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND124-1
Thank you for your comment. Please refer to Master Response GEN-1.

Barger, Christian

Comment IND116-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles

of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND116-1
Thank you for your comment. Please refer to Master Response GEN-1.

Barlow, Kelly

Comment IND383-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of darn removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND383-1
Thank you for your comment. Please refer to Master Response GEN-1.

Bartlett-Ré, Stephen

Comment IND250-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steel11ead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to free the Klamath! We need to improve the future of the fisheries and the water.

Response to Comment IND250-1
Thank you for your comment. Please refer to Master Response GEN-1.

Bauer, Nick

Comment IND326-1

I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND326-1

Thank you for your comment. Please refer to Master Response GEN-1.

Beardsmore, Loy and John

Comment IND368-1

We believe that the SWRCB's Draft EIR is grossly deficient and should be redone due to many factors, such as incomplete/omitted/obsolete data within the studies, and the report is based on biased studies and opinions skewed towards dam removal without adequately exploring other alternatives. Much of the DEIR, like the KRRC's Definite Plan, is based on the 2012 Detailed Plan, and is a cut-and-paste document with outdated, as well as, inaccurate information. After reading through what the KRRC calls their "Definite Plan" we find it to be far from definite! They have taken much of the 2012 USBR Detailed Plan and pasted it into their own document. The SWRCB has done the same. We are not alone with that line of thinking as FERC has said the same to the KRRC asking for more specifics, studies, etc. The KRRC claims they will perform various

mitigation measures where significant impacts occur, IF it can be shown to be a result of the project, but there is no direct accountability, and no certainty that the funding necessary for mitigation will be there. The KRRC, as well as the SWRCB's data/plans, are filled with errors, incorrect facts, lacking information, and they are grossly deficient in specificity. The Water Board has not concluded enough new studies to make the DEIR more definitive and specific. They are also ignoring pertinent studies, both past and current, that refute their science. They lack local information, or don't want to make the effort to seek it. Parts of the report, that didn't meet their needs, were ignored and left out.

The Proposed Project and the DEIR is based entirely upon the Definite Plan submitted last year which FERC has requested a revision. How can the SWRCB present its EIR based on a document that is being revised since the original plan was considered lacking in technical adequacy? Since the Definite Plan is inadequate, by definition, the SWRCB's EIR is inadequate.

Response to Comment IND368-1
Thank you for your comment. As stated in Volume I Section 2.7 *Proposed Project – Proposed Project* (page 2-25), the Detailed Plan (USBR 2012c) and the Definite Plan (AECOM et al. 2018) constitute the applicant's Proposed Project. To the extent that there is conflicting information in the Definite Plan relative to the Detailed Plan, the Klamath River Renewal Corporation (KRRC) has indicated that information in the Definite Plan supersedes the information in the Detailed Plan.

Consistent with CEQA Guidelines section 15126.6 (a), the Lower Klamath Project EIR presents a range of reasonable alternatives to the Proposed Project. Volume I Section 4.1 *Alternatives – Alternatives Selection/Overview* (pages 4-1 to 4-15) discusses 17 potential alternatives in relation to the Proposed Project's underlying purpose and objectives, six of which are examined in detail. Of these six alternatives, two involve removal of all four Lower Klamath Project dams, and four involve two or three dams remaining in place. Potential impacts and beneficial effects are identified for each of these alternatives in the EIR and each will be fully considered by the State Water Board before certifying the EIR (CEQA Guidelines section 15090).

The EIR evaluates the potential environmental impacts of the Proposed Project and evaluates feasible measures to mitigate those impacts and alternatives to the Proposed Project. The concerns regarding KRRC's accountability and liability for other problems are general and not related to the potential physical impacts of the Proposed Project on the environment (CEQA Guidelines section 15384). For information on this non-CEQA issue, please refer to KRRC (2019b) here: http://www.klamathrenewal.org/wp-content/uploads/2019/07/KRRC-July-29-FERC-Filing.pdf. Briefly, in its 2019 update to the Definite Plan, KRRC explains that the states of California and Oregon and PacifiCorp must be assured that sufficient funding is available to successfully implement the Proposed Project

and that risks of the Proposed Project have been mitigated. Through the process stipulated in the Klamath Hydroelectric Settlement Agreement (KHSA) Section 7.1, the States would affirmatively endorse the license transfer, assuring the Federal Energy Regulatory Commission (FERC) of the sufficiency of resources to protect the States' interests.

To the extent the comment raises concerns about the enforceability of requirements that the applicant address the environmental impacts of the Proposed Project, and of the ability of the applicant to do so, please note that pursuant to CEQA section 15126.4 subdivision (a) (2), mitigation measures must be fully enforceable through permit conditions, agreements, or other legally binding instruments. Please refer to Master Response CEQ-2 for further discussion of the enforceability requirement for CEQA mitigation measures in the context of FERC proceedings. The State Water Board has issued a draft water quality certification and will issue a final certification that includes implementing water-quality related requirements as a condition of certification. These requirements would become enforceable through incorporation into any Federal Energy Regulatory Commission (FERC) surrender license, as well as under the Clean Water Act (CWA). Please note that potential environmental impacts that are not mitigable are analyzed in the EIR as significant and unavoidable. Volume III Attachment 1 Table ES-1 summarizes the results of the EIR impact analyses, including identifying impacts that are significant and unavoidable and impacts that are avoidable with mitigation.

Please note that the applicant explains mitigation surety for the Proposed Project in updates to the Definite Plan. Klamath River Renewal Corporation (KRRC) has identified Resources Environmental Solutions LLC (RES) as the entity that would assume responsibility for long-term maintenance and adaptive management of mitigation measures, and would function as a specialty corporate indemnitor to cover risks not otherwise fully covered by the Project Agreement or insurance and bond programs (KRRC 2019b, 2020). Please also refer to: http://www.klamathrenewal.org/wp-content/uploads/2019/07/KRRC-July-29-FERC-Filing.pdf and http://www.klamathrenewal.org/wp-content/uploads/2020/02/Public-02-28-2020-Supp-Response-Letter.pdf.

The comment does not specify which past and current studies it is concerned are being ignored in the EIR or other types of local information that it asserts are missing from the EIR. In general, the EIR includes the best available information to support the analyses contained within, and it recognizes that there are a number of areas of controversy associated with the Proposed Project (Volume I *Executive Summary – Areas of Controversy* Table ES-2 [pages ES-22 and ES-23]).

Comment IND368-2

There are many sections of the Definite Plan that refer to future studies in the project impact areas. Again, one of these are the Groundwater wells. The data

in the Groundwater section of the DEIR is inadequate. We could ascertain that a minimum of 4 wells around Copco 1 were NOT studied in the BOR report in 2012, nor were any studies done since. The Water Board has performed a "cut and paste" exercise, similar to what the KRRC has done, rather than perform new studies or collect available data.

The KRRC has not obtained their stated number of sentinel wells around Copco, through resident volunteers, nor have they drilled any wells, and we doubt they have done this at Irongate as well. They have done absolutely no public outreach to do that. In fact, the KRRC saying they are doing community outreach is an outright lie. They have not performed the work or studies that they say they will do. Again, a study with incomplete data is not usable.

Without this data to allow for baseline well conditions and data within the area, any analysis is not reliable. This pertains not only to groundwater data, but sediment studies, and all areas of environmental concerns. There have not been enough studies to give a baseline to compare to after the project is implemented. How else can the environmental impacts of this project be determined? We need adequate studies and those have not been performed.

Response to Comment IND368-2
Please refer to Master Responses GRW-1 and GRW-2.

Comment IND368-3
With the DEIR Groundwater data studies, thirty-four studies are from 1973-2002, and ninety-six are from 2004-2011. Only twenty-two cited documents are from 2012-2018. We believe these studies are considerably outdated. We asked Parker Thaler, of the SWRCB, about the studies of the wells around Copco saying that they did not use all the well logs in their studies, but Mr. Thaler said they were not available from DWR. This is patently NOT TRUE, as they were available, and we could obtain them. In a conversation with Parker Thaler, we pointed out the lack of a complete study, but was told that it "didn't matter, that our well was within the 2.5 miles of the reservoir and therefore would be "covered" under the KRRC's Groundwater Well Management Plan." Thaler saying it was unimportant and didn't matter because our well would be mitigated by the KRRC is absurd! Is incomplete data now the norm for the SWRCB? This is just one section of the Draft EIR!! How can the DEIR base any report based on such incomplete, out-of-date data?

If one were to use an analogy of someone needing surgery, would doctors consider using CT scan, X-rays, or lab results that are 8-15+ years old and only those results that supported the surgeons reason for surgery?? If the surgery was not necessary or successful, the doctor would surely be faced with a malpractice lawsuit. How is this DEIR any different? Obviously past studies can be helpful, but an informed report must be performed using the most current, unbiased studies.

Response to Comment IND368-3
Please refer to Master Response GRW-2.

Comment IND368-4
While the Water Board assumes Resident's wells affected would be mitigated by the KRRC, they would not be responsible for making certain that this happens. The Water Board shifts this responsibility to FERC to enforce. The SWRCB also states in the Executive Summary, "State Water Board cannot ensure implementation of good neighbor agreements" so what certainty will the KRRC's plan be for mitigation? The KRRC states in their literature that "IF wells were to be adversely affected and IF it can be shown to be due to reservoir drawdown, then they would mitigate." What proof will a resident need to show to the KRRC to have their wells made 'whole' again, and in what time period would the KRRC mitigate? Who will make sure that the KRRC does what they say they will? In the meantime, a resident's home will be uninhabitable and yet the SWRCB claims that there would be "No significant impact" because of mitigation measures!! This statement is based on nothing, but the KRRC's claim of a "Groundwater Management Plan". This is a document that is based on incomplete data, no specificity, inadequate funding numbers, and a claim of instituting a "good neighbor" policy. While the SWRCB may trust the KRRC, residents have seen and heard little to instill that trust. If wells go dry, do residents call FERC to be certain that the KRRC will do what they say to make residents whole again? Will the KRRC still have the funds necessary to make residents whole again? For the Water Board to say that mitigation measures will be implemented to prevent or avoid significant environmental impacts is a false statement because the Board cannot guarantee that those actions will occur.

Response to Comment IND368-4
Volume I Section 3.7.5 *Environmental Setting, Impacts, and Mitigation Measures – Groundwater – Potential Impacts and Mitigation* Potential Impact 3.7-1 (pages 3-663 to 3-665) discusses the potential adverse effects to water levels in groundwater wells adjacent to the Lower Klamath Project reservoirs and how the Groundwater Well Management Plan would address potential impacts. The Groundwater Well Management Plan describes how impacts would be determined and the short- and long-term measures to address them. As a condition of the project being submitted to the Federal Energy Regulatory Commission (FERC) for its approval, the Groundwater Well Management Plan would also become a condition of FERC's approval. The State Water Board's draft water quality certification also details the monitoring and reporting requirements associated with the Groundwater Well Management Plan. Please also refer to Master Response CEQ-2.

Comment IND368-5
Section 15126.4(a) of the CEQA Guidelines states "(a) An EIR must include a description of the physical environmental conditions in the vicinity of the project,

as they exist at the time the notice of preparation is published, or if no notice of preparation is published, at the time environmental analysis is commenced, from both a local and regional perspective. This environmental setting will normally constitute the baseline physical conditions by which a lead agency determines whether an impact is significant."

As we stated above there are many parts of the plan that have yet to be studied. There are habitats in the area that require more study and yet the SWRCB is making a report based on inadequate and incomplete information. The KRRC is currently conducting sediment studies, so that data is NOT in the DEIR. How can the Water Board issue a draft report on the impact of the project based on studies that are currently being done or have yet to be performed?

Response to Comment IND368-5
With respect to sediment studies being conducted by Klamath River Renewal Corporation (KRRC), please refer to response to comment ORG46-57.

With respect to habitat-related studies, the EIR analysis incorporates 2017 and 2018 data collected and provided by KRRC (e.g., western pond turtle, bat, and eagle surveys). Additional surveys conducted by KRRC include special-status wildlife surveys (2018, 2019), bat surveys (2019), and eagle surveys (2019).

The State Water Board has included Mitigation Measure TER-6 Gray Wolf to assess known wolf activity every six months, and further coordinate with California Department of Fish and Wildlife (CDFW) to identify appropriate measures if Project activities pose any potential impact on gray wolves. The State Water Board has also included Mitigation Measure Mitigation Measure TER-7 Bald and Golden Eagle to conduct surveys, including a pre-construction survey within two weeks prior to commencing ground-disturbing activities, and if eagle nests are documented, a restriction buffer shall be identified in coordination with the United States Fish and Wildlife Service (USFWS) and CDFW and established around the nest to ensure that nets are not disturbed. Please refer to Volume III Attachment 1 Section 3.5.5.3 *Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities* for the full TER-6 and TER-7 mitigation measures.

As identified in Volume I Section 3.5.5.3 *Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities*, Mitigation Measure TER-3 Western Pond Turtle Pre-construction Surveys would occur (pages 3-530 and 3-531), and Mitigation Measure TER-4 incorporates western pond turtle rescue after reservoir drawdown operations (pages 3-569 and 3-570). KRRC proposed a pre-construction nesting bird survey, in which the State Water Board incorporated additional components under Recommended Terrestrial Measure 9 Nesting Birds to reduce impacts to less than significant (pages 3-536 538 through 3-540). The State Water Board Recommended Terrestrial Measure 7 General Special-status Wildlife Surveys and Pre-

construction Surveys would include a pre-construction survey for all special-status species with the potential to occur (page 3-531), to reduce potential impacts to less than significant. The State Water Board Recommended Terrestrial Measure 3 On-site Biologist/Construction Monitoring Plan to conduct a pre-construction clearance of the work area prior to implementing construction activities (page 3-532), and Recommended Terrestrial Measure 7 General Special-status Wildlife Surveys and Pre-construction Surveys to conduct a general special-status wildlife survey within 24 months of initial habitat modification for all-special status species with the potential to occur (Page 3-535). As identified in these recommended measures, if special-status species are documented, a biologist may implement a buffer, delay construction, or contact agencies to discuss further measures.

Comment IND368-6

Under Public Resources Code section 21104, "[p]rior to completing an environmental impact report, the state lead agency shall consult with, and obtain comments from, each responsible agency, trustee agency, any public agency that has jurisdiction by law with respect to the project, and any city or county that borders on a city or county within which the project is located unless otherwise designated annually by agreement between the state lead agency and the city or county, and may consult with any person who has special expertise with respect to any environmental impact involved." I do not believe that the Water Board has done this. Did the board meet with Siskiyou County Board of Supervisors, and what about other agencies that are direct stakeholders?

Did the Water Board meet with the Copco Fire Department, Montague Fire Department, Cal Fire, and the USFS Fire personnel to discuss how the loss of the reservoirs would affect their ability to fire wildfires? After the deadly wildfire season, we just experienced last year, the significant impact to Public Services, aka Fire Protection, has been downplayed in this DEIR. Stating that the impact is unavoidable is not true, because if you leave the reservoirs in place, the impact IS avoidable!! The Water Board did NOT meet with the Copco Fire Department, nor did it meet with the Montague Fire Department. These are two of the foremost agencies that respond initially in case of fire near Copco and yet they were not consulted!! This is a travesty!

Cal Fire officials I spoke with are seriously concerned with losing these reservoirs for firefighting. Although Cal Fire does not have water scooping fixed wing aircraft, they can call upon these resources and this type of aircraft cannot be used on a river. All firefighting agencies, including the USFS, have expressed serious concerns over loss of these resources. The KRRC's Fire Management plan is grossly deficient in a deadly way because it increases fire response time! Ask the families of those that have suffered the loss of a family member due to wildfire, what an increase in response time means to them! Beyond the reservoirs providing a water resource, they also provide a significant fire break as well as a refuge for those that might not have time to evacuate. The river cannot

provide either of these resources, nor can this loss be mitigated. Some residents have only been able to obtain homeowner's insurance, living in a fire high danger area, because they were able to document that they lived near a lake. The KRRC's plan of mapping of deep water pools is insufficient, IF they will even exist in times of drought, low seasonal flows, as well as sediment deposition after dam removal. The dry hydrants are laughable as firefighting agencies do NOT all possess the connections, equipment, and engines needed to utilize these hydrants, therefore making them ineffectual. These are not mitigation measures, just meaningless words on paper! The loss of the reservoirs for firefighting cannot be mitigated, nor are there any mitigation measures that would come close to comparing to what water resources these reservoirs provide for public safety!

Response to Comment IND368-6

Please refer to Master Responses HAZ-2 and CEQ-2. Please note, on December 3, 2019, the Klamath River Renewal Corporation (KRRC) submitted to the State Water Board an updated water quality certification application in which KRRC stated its intent to avoid a material net increase of fire risk as compared to baseline conditions in the Project Area as defined in the Definite Plan. The KRRC further explained that it is developing an updated Fire Management Plan that will include effective and feasible strategies and concepts to enhance both short-term and long-term fire prevention, detection, and suppression in the Klamath River Basin, and will submit the updated Fire Management Plan to Federal Energy Regulatory Commission (FERC) in support of the pending surrender application. The updated Fire Management Plan is being developed in consultation with federal, California, Oregon, and local fire agencies. During construction, these measures include, but are not limited to meeting or exceeding federal, Oregon, and California requirements for fire prevention and suppression during construction activities; implementation of best management practices following National Fire Protection Association standards; and the designation of a safety officer on site that is responsible for overseeing fire responsibilities for construction operations 24 hours a day, seven days a week. The Fire Management Plan will also address long-term fire management to ensure that the Klamath River Basin's fire-fighting resources are not diminished due to the implementation of the Project, including the potential deployment of technology that will rapidly detect wildfire ignitions in the Basin allowing fire agencies to respond quickly to fire ignitions. KRRC is also consulting with fire agencies on identifying replacement water sources and access, including identification of aerial river access points.

Comment IND368-7

Section 2.1 of the DEIR, Project Purpose and Objectives, outlines the SWRCB identified objectives of the Proposed Project as well as the underlying purpose. The purpose is "timely improving water quality related to the Lower Klamath Project within and downstream of the current Hydroelectric Reach and restoring anadromous access upstream of Iron Gate Dam." This purpose does not take

into consideration the citizens of Siskiyou county, but more specifically the residents that live near and around Copco and Irongate. The SWRCB should consider the them in their project objectives. How does the objective, "Restore volitional anadromous fish passage in the Klamath Basin to viable habitat currently made inaccessible by the Lower Klamath Project dams" but, does not specifically address improving water quality, nor does it specifically address upstream access. Wouldn't fish ladders, trap and haul or other methods of assisting the fish past the dams, meet the same objectives and yet we do not see those options discussed.

Mitigation Measures Proposed to Mitigate Significant Impacts Section 15126.4(a) of the CEQA Guidelines states:

(1) An EIR shall describe feasible measures which could minimize significant adverse impacts, including where relevant, inefficient and unnecessary consumption of energy.

(A) The discussion of mitigation measures shall distinguish between the measures which are proposed by project proponents to be included in the project and other measures proposed by the lead, responsible or trustee agency or other persons which are not included but the lead agency determines could reasonably be expected to reduce adverse impacts if required as conditions of approving the project.

(B) This discussion shall identify mitigation measures for each significant environmental effect identified in the EIR.

(2) Mitigation measures must be fully enforceable through permit conditions, agreements, or other legally-binding instruments. In the case of the adoption of a plan, policy, regulation, or other public project, mitigation measures can be incorporated into the plan, policy, regulation, or project design.

In the Draft EIR, the SWRCB refers to "measures that would be not be considered feasible for the purposes of CEQA because the SWRCB cannot ensure that they would occur." In these cases, recommended measures are provided that would reduce potential impacts IF implemented by KRRC. However, the impact analysis herein cannot rely on the implementation of these measures. In many of these cases the DEIR concludes that a significant and unavoidable impact would result.

We have serious concerns over the above statement. If the SWRCB cannot hold the KRRC accountable to perform mitigation measures, then the SWRCB should have serious concerns about such significant environmental impacts! These significant environmental impacts and any mitigation measures should be definitively outlined BEFORE the project is approved. It seems that the SWRCB is exempting itself from making any mitigation measures enforceable because

they cannot be certain that they would occur and cannot require the KRRC to comply with regulations. We were told by the Water Board that FERC would be the responsible party in regulating compliance. We believe that the SWRCB should revise the DEIR to definitively state these mitigation measures as they apply to state and federal law as well as the ESA. If the SWRCB does not think this is possible, then they should explain the reasoning behind this lack of specificity.

Response to Comment IND368-7
Please see Master Response CEQ-2.

Comment IND368-8
The Executive Summary to the DEIR states:

Below is a summary, by resource area, of impacts found to be 'significant and unavoidable' with or without mitigation (Table ES-1). Please note, the KRRC proposes to further develop Proposed Project actions relating to certain state and local regulatory requirements for several resource areas that fall outside of State Water Board's water quality certification authority. The State Water Board anticipates implementation of additional measures (e.g., good neighbor agreements between the KRRC and relevant state or local agencies, recommended measures in this EIR, and any modifications developed through the FERC process that provide the same or better level of protection for the resource in question) would reduce impacts. The EIR notes where such protection would eliminate the potential for a significant impact. However, the State Water Board cannot ensure implementation of good neighbor agreements, recommended measures included in this EIR, or modifications anticipated to be developed through the FERC process. Therefore, the State Water Board has identified impacts that rely on implementation of such agreements or recommended measures in this EIR as significant and unavoidable."

We find the above statements very concerning and disturbing. This is the SWRCB exempting itself from any liability claiming that it cannot ensure that anything in the KRRC's Definite Plan will be implemented. Furthermore, by such a statement, the Water Board is underestimating the significant environmental impacts!

This section included significant and unavoidable impacts on the following resources: Water Quality, Aquatic Resources, Phytoplankton and Periphyton, Terrestrial Resources, Flood Hydrology, Air Quality, Historical Resources and Tribal Cultural Resources, Public Services, Aesthetics, Recreation, Hazards and Hazardous Substances, Transportation and Traffic, and Noise. Most of the resource areas also included recommended mitigation measures that the SWRCB states are not enforceable and therefore cannot be relied upon. In other words, the SWRCB is relying on other agencies for enforcement rather than

ensuring that any mitigation measures would be implemented to lessen the significant impacts.

Response to Comment IND368-8
Please see Master Response CEQ-2.

Comment IND368-9
Impacts to aquatic life cannot be underestimated and dam removal would have a significant impact and yet we see nothing in the DEIR about alternatives. In addition, the Endangered Species Act was founded to protect species that are endangered of extinction. This project contends that the salmon and other aquatic life (not ESA listed species) take precedence over the ESA Lost River and Shortnose Suckerfish. This project also contends that salmon take precedence over bass, perch, sunfish, and catfish. We have yet to see the list of "preferred species" that declares a rank of importance for non-ESA listed aquatic species. Where does it state that one species should be placed above another with regards to their importance with environmentalists and fisherman? In addition, there is lack of scientific studies that are required by ESA law to study the Suckerfish. Some members of the California state legislature are so determined to remove these dams that they are willing to sacrifice these suckerfish species in favor of others by passing legislation overriding ESA law. What gives any governmental agency the right to do this? There are no laws authorizing the government to decide which species survive and those that should not. Many fish protectionist groups are claiming that dam removal is essential for the survival of the salmon, while never addressing the gill netting of the Klamath River by the tribes, rising ocean temperatures, and commercial over-fishing.

In addition, dam removal will likely endanger the very existence of salmon, and other species by inundating their spawning beds with sediments. Salmon need deep, cool water pools to survive and thrive! The KRRC states this about pool depths, "KRRC does not propose mechanical intervention in the main channel of the Klamath River at any substantial scale because the disturbance of the bed could cause more ecological impact than the sediment in the bed. Moreover, as mentioned above, KRRC does not believe that it is reasonable or prudent to want to recover pre-removal pool depths downstream of the dam. " We believe this would further endanger the salmon, yet little is said about this.

Response to Comment IND368-9
The Lower Klamath Project EIR presents a range of reasonable alternatives to the Proposed Project. Section 4.1 *Alternatives Selection/Overview* (pages 4-1 to 4-15) discusses 17 potential alternatives in relation to the Proposed Project's underlying purpose and objectives, six of which are examined in detail. Of these six alternatives, two involve removal of all four Lower Klamath Project dams, and four involve two or three dams remaining in place. Potential impacts and beneficial effects are identified for each of these alternatives in the EIR and each

will be fully considered by the State Water Board before certifying the EIR (CEQA Guidelines section 15090).

The EIR does not make determination of the importance of any listed species over another listed species. Each of the focal species are assessed independently, without comparison of relative harm or importance. However, federal Endangered Species Act (ESA) law mandate the protection of native listed species, whereas there is no such protection for introduced exotic non-native fish species, such as bass.

The EIR is required to fully analyze the Proposed Project based on best available and most current scientific and factual data. The effects of other actions that may impact aquatic focal species are discussed in Section 3.3.2 *Aquatic Resources – Environmental Setting*. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Effects of sediment on aquatic resources are fully analyzed in the EIR. Please refer to Master Response AQF-10.

Comment IND368-10

Sediment sampling has been inadequate both with the 2012 Detailed Plan and with the KRRC's Definite Plan. The sediment sampling done in the past has not gone deep enough to be accurate. Without a complete, thorough study of the sediments to be released by dam removal, there is no clear picture if the KRRC will be able to meet the 401-water certification. We are concerned with PCBs as well as lead, mercury, DDT, and many other contaminants. We believe the discharge from the dams will not meet the levels necessary to comply with California laws despite the KRRC stating otherwise. We are very concerned with water quality after all these sediments have been released downstream. We contend that all of this has not been adequately studied as to the significant and potential major environmental damage that may ensue if dam removal is permitted to occur. When the lake is drained, we question how this will affect the underground aquifers.

Response to Comment IND368-10

Please refer to Master Response WQ-6 for a discussion of inorganic and organic contaminants in reservoir sediments, including references to the various EIR sections that summarize of the inorganic and organic contaminants measured in the Klamath River waters, reservoir sediments, and aquatic biota along with analysis of the potential impacts from these inorganic and organic contaminants under the Proposed Project.

Please refer to Volume I Section 3.7.2.1 *Environmental Setting, Impacts, and Mitigation Measures – Groundwater – Environmental Setting – Regional Groundwater Conditions* (page 3-641 to 3-644) and Section 3.7.2.2 *Environmental Setting, Impacts, and Mitigation Measures – Groundwater –*

Environmental Setting – Local Groundwater Conditions (page 3-644 to 3-661) for a summary of the existing groundwater conditions. Regional groundwater mapping and the presence of numerous groundwater springs in the Groundwater Area of Analysis indicate that regional conditions support a groundwater table that is near the ground surface, and also suggest that local groundwater systems are not likely to be receiving water directly from the reservoirs (USBR 2012a). That is, at the regional scale, groundwater and water discharging from groundwater springs in the Area of Analysis are not likely to be reservoir water (USBR 2012a).

Please also refer to Volume I Section 3.7.5 *Environmental Setting, Impacts, and Mitigation Measures – Groundwater – Potential Impacts and Mitigation* Potential Impact 3.7-1 (page 3-663 to 3-665) and Potential Impact 3.7-2 (page 3-665) for analysis of the potential impacts to groundwater following drawdown of the reservoirs under the Proposed Project.

Comment IND368-11

We have concerns with the release of 20-30 million cubic yards of estimated sediments to be released. As with past dam removals, estimated sediments have been grossly underestimated and we do not expect any differences with this dam removal project. The Condit Dam sediments amounts were estimated to be 1.7 million cubic yards. The reality was it was three times that amount. If the sediments to be released are underestimated with Klamath River Dams to the extent as with the Condit Dam removal, the proportional release of sediments could be as much as 60 million cubic yards of sediment!

After the millions of cubic yards of sediment are released, just where are they proposing to get the deep, cool water pools that the fish will need to survive and propagate? Are they not planning any mechanical intervention because they do not have the funds to do so? Are they planning to create this disaster and then hope that state and federal funds will mitigate this problem they have created? Where is the KRRC's liability in this? Do they have the proper liability insurance to fund any lawsuits that may arise out of these proposed actions? We contend that dam removal will further hurt the salmon rather than help them! Dam removal is an experiment at the costs of millions of dollars with no certainty of a positive outcome for fish. Do we believe these studies? Are they adequate? Have their sediment studies gone deep enough?

Even those advocating for dam removal such as Curtis Knight, executive director of the nonprofit California Trout said, "The removal of sediment is one of the biggest wild cards in dam removal. Is there unfound toxicity in there? We haven't found any yet, but that doesn't mean there isn't some there. What is the composition of the sediment really like and how is that going to move itself downriver? What are the impacts on fish? Those are some of the bigger unknowns."

The amounts of sediment have been estimated at 20-30 million cubic yards of sediment. We have no certainty as to the accuracy of this estimate.

Lynda V. Mapes, of the Seattle Times on 1/2/13 reported on the Elwha Dam removal, "It turns out the dam-removal project on the Elwha River—already the biggest anywhere in the world—is even larger than originally thought. In the project, long predicted to affect more than 24 million cubic yards ment, the amount of sediment once impounded by the dams is actually about 34 million cubic yards, said Barb Maynes, spokeswoman for the National Park Service."

If you look at the amounts of sediment estimated to have been released with the Condit Dam removal, the reality was that it was three times the modeled amount! Sixty-foot-deep pools were completely filled with sediments, and there are issues at the delta where the White Salmon River meets the Columbia River only 3.3 miles from where the Condit Dam was located. They are currently attempting to clear that delta of all the sediments. The White Salmon River is a clear, cold-water river with temperatures of forty-three degrees. The Klamath River is much shallower, considerably warmer river with historic low flows before the dams were constructed. How can the Water Board consider allowing all this sediment to be released down the river? It will raise the bed height of the river by an unknown number of feet which will negatively raise water temperatures, water quality, as well as decimate fish habitat and spawning beds. With the Condit Dam, the spawning beds have been inundated with sediments, and this will be a certainty with the Klamath River, despite the KRRC claiming this won't occur and by their own admission they will not mitigate this as they are afraid of causing more damage. Does the Water Board have enough assurances from the KRRC to believe they will be able to take mitigation measures to avoid significant water quality impacts?

Response to Comment IND368-11

For a discussion of sediment erosion, transport, and deposition, associated with dam removal under the Proposed Project, please refer to Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 and to Master Response GEO-1. Uncertainty of the stored sediment quantities has been accounted for in the EIR, as explained in the response to comment ORG46-8. Sediment model sensitivity is discussed in USBR (2012; see pages 9-18 to 9-32).

Note that Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 has been clarified to discuss reach-averaged sediment deposition or erosion and bed elevation change results of both sets of SRH-1D simulations that were undertaken by the U.S. Bureau of Reclamation [USBR](i.e., forty eight 2-year simulations and three 50-year simulations) (USBR 2012a). The clarifying edits do not change the conclusions or significance determinations in Potential Impact 3.11-5. Please refer to Volume

III Attachment 1 Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 for the revisions.

Regarding the differences between the Proposed Project and other dam removal projects, please refer to response to comment IND15-ORAL-3.

As described in Section 3.2.5.2 *Water Quality – Potential Impacts and Mitigation – Suspended Sediments* Potential Impact 3.2-3, mechanical dredging of reservoir sediments is not feasible. Sediment jetting is proposed by the Klamath River Renewal Corporation (KRRC) as a means to support erosion and transport of the reservoir sediments during reservoir drawdown in particular locations along the floodplain of the original river channel to support restoration of wetland and riparian habitat. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

For information on potential sediment-related impacts to salmonids, including spawning beds, please refer to Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impacts 3.3-1, 3.3-4, 3.3-7, 3.3-8, and 3.3-9. Substantial declines in the abundance of coho and chinook salmon population are not expected for more than one year class (i.e., one generation). Removal of the J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate dams as part of the Proposed Project would enable less impeded sediment transfer downstream as part of the natural river dynamics, which would have beneficial effects for salmon in the long term. Please also refer to Master Responses AQF-7 and AQF-10 for additional information on sediment-related impacts to aquatic resources. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Regarding sediment-related impacts to water quality, please refer to Section 3.2.5.2 *Water Quality – Potential Impacts and Mitigation – Suspended Sediments*. Water temperature is considered in Section 3.2.5.1 *Water Quality – Potential Impacts and Mitigation – Water Temperature*, as well as in Section 3.3 *Aquatic Resources*.

To the extent the comment raises concerns about the enforceability of requirements that the applicant address the environmental impacts of the Proposed Project, and of the ability of the applicant to do so, please note that pursuant to CEQA section 15126.4 subdivision (a) (2), mitigation measures must be fully enforceable through permit conditions, agreements, or other legally binding instruments. Please refer to Master Response CEQ-2 for further discussion of the enforceability requirement for CEQA mitigation measures in the context of FERC proceedings. The State Water Board has issued a draft water quality certification and will issue a final certification that includes implementing water-quality related requirements as a condition of certification. These requirements would become enforceable through incorporation into any Federal Energy Regulatory Commission (FERC) surrender license, as well as under the

Clean Water Act (CWA). Please note that potential environmental impacts that are not mitigable are analyzed in the EIR as significant and unavoidable. Volume III Attachment 1 Table ES-1 summarizes the results of the EIR impact analyses, including identifying impacts that are significant and unavoidable and impacts that are avoidable with mitigation.

Please note that the applicant explains mitigation surety for the Proposed Project in updates to the Definite Plan. Klamath River Renewal Corporation (KRRC) has identified Resources Environmental Solutions LLC (RES) as the entity that would assume responsibility for long-term maintenance and adaptive management of mitigation measures, and would function as a specialty corporate indemnitor to cover risks not otherwise fully covered by the Project Agreement or insurance and bond programs (KRRC 2019b, 2020). Please also refer to: http://www.klamathrenewal.org/wp-content/uploads/2019/07/KRRC-July-29-FERC-Filing.pdf and http://www.klamathrenewal.org/wp-content/uploads/2020/02/Public-02-28-2020-Supp-Response-Letter.pdf.

Comment IND368-12

Water quality and sediment sampling issues are also a concern, as in the past and going into the future, the USBR has had to release water to meet seasonal pulse flows to avoid fish disease. With the dams removed, this water must be released from the Upper Klamath Lake where there are well known water quality issues. This will be water that will come into California from Oregon, not meeting our water quality standards, IF there is enough water after meeting wildlife and agricultural needs in Oregon.

Response to Comment IND368-12

Please refer to Master Responses WQ-1 and PAP-1.

Comment IND368-13

Another area of weakness is the fact that the KRRC's plan lacks specificity as to how they intend to do water quality monitoring. How does the Water Board intend to make the KRRC accountable for this monitoring? While it may appear to be technically adequate, without their specific plans to do monitoring there is no way to hold them accountable or no way to be certain that they will follow through and do what they say. We also do not have adequate assurance that they will have the financial capacity to follow through. Aside from the original studies, only an extremely limited section of the Klamath River was evaluated, and not all the creeks and rivers from above and below Iron Gate Dam to the mouth of the Klamath River, that make up the entire river system. The actions of all parties that impact the river, were and need to be taken into consideration.

Response to Comment IND368-13

The State Water Board's draft water quality certification (available online at: https://www.waterboards.ca.gov/waterrights/water_issues/programs/water_quality_cert/docs/lower_klamath_ferc14803/lkp_dwqc.pdf [Accessed December 11,

2018]) incorporates conditions that require the Klamath River Renewal Corporation (KRRC) to monitor water quality and measures to control erosion and stream sedimentation (Conditions 1, 2, and 9).

Regarding the comment on the KRRC's liability, please note that this issue does not constitute substantial evidence regarding the potential physical impacts of the Proposed Project on the environment (CEQA Guidelines section 15384). For information on this non-CEQA issue, please refer to KRRC (2019b) here: http://www.klamathrenewal.org/wp-content/uploads/2019/07/KRRC-July-29-FERC-Filing.pdf. KRRC has identified Resources Environmental Solutions LLC (RES) as the entity that would assume responsibility for long-term maintenance and adaptive management of mitigation measures, and would function as a specialty corporate indemnitor to cover risks not otherwise fully covered by the Project Agreement or insurance and bond programs.

Comment IND368-14

There is also the issue of Yreka's water supply. The KRRC is submitting three proposals to meet current water needs of the city of Yreka, but they have not taken into consideration the future growth in water demands. This needs to be addressed prior to dam removal. There is also the additional concern of having piping above ground being more vulnerable. There is also the issue of fish mitigation with Fall Creek and will fish needs trump the City of Yreka's water demand needs. Also, we find it ironic that now the City of Yreka is so concerned with the KRRC's inability to adequately protect the integrity of the City's water supply that they have now filed a request for late intervention with FERC in this process. Does the Water Board believe that the KRRC is capable of mitigating this significant impact?

Response to Comment IND368-14

Please refer to Master Response WSWR-5.

Comment IND368-15

Regarding air quality, the sediments left behind will cause problems for residents around the reservoirs, especially Copco, and yet there is NO mention of this in the DEIR!! Look at the Condit Dam removal when they encountered toxic dusts storms when people experienced Mercury poisoning. What about when these sediments from the Klamath dams become airborne? What about the PCB's, evidence of DDT, etc.? In a recent drawdown of Copco Lake, there were days when dust from the sediments became airborne. Where are the plans to mitigate this for homeowners that live around the lakes? The only mention of dust issues relates to during dam deconstruction, but there are absolutely no plans to mitigate sediment dust issues after dams are removed! Again, the Definite Plan and DEIR are a plan/report that is far from definitive or complete!

Response to Comment IND368-15
With respect to the comment regarding dust during construction activities, this topic pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Air Quality*). Please also refer to Master Response R-2.

Comment IND368-16
Regarding soils and geology, an area of concern is slope stability and what slope failure could mean for the reservoir footprint and consequently the river. We see little in the DEIR about slope stability. We are concerned with the KRRC's plan recognizing Instability of the Reservoir Rim. The KRRC states, "Approximately 2,800 linear feet of slope adjacent to private property (approximately 8.7% of south shore length) require additional field investigation and analysis to gain a more refined understanding of slope stability in those areas. Up to eight parcels along the referenced-reservoir rim segments appear to have existing habitable structures that could potentially be impacted." Their plans are: "For segments adjacent to property or structures: a) Move structure or purchase property b) Engineer structural slope improvements (e.g. drilled shafts or other structural elements that could be installed to resist slope movement) " While they have done "field investigation and analysis" we believe that they need to do much more! We believe that their current estimates of only 8 parcels being affected, will be at least twice that number! The KRRC also doesn't know where the septic tanks for these properties are located, nor have they even considered that as a potential problem! Some septic tanks exist between homes and the slopes that are in danger of collapse! How do they intend to mitigate those factors? Are they even aware of that fact? Also, we have looked at the slopes the KRRC has identified as "at risk" and they are not the ones that have had previous slides. There are slopes with a 90-degree incline, to the existing reservoir. These slopes are not even "red-lined" for concern! During previous drawdowns, the slopes have sloughed off. Even when there are no drawdowns, the slopes continually erode into the lake. Trees have fallen into the lake from these slopes, and as the rims have eroded and fallen, some docks have been lost through the years. Does the KRRC even know of these facts? We know of at least one home that has been experiencing foundation cracks, but does the KRRC know which house this is? How can the Water Board begin to believe that the KRRC has the technical ability to take on this project when they have not begun to do adequate studies and are these studies even accurate and reliable? Besides their technical abilities being sorely lacking, do they have the financial capacity to mitigate such problems? The DEIR makes very little mention of slope stability.

Response to Comment IND368-16
Regarding slope instability, please refer to Volume I Section 3.11.5 *Environmental Setting, Impacts, and Mitigation Measures – Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-3 (pages 3-761 to 3-765) and revisions to this impact in Volume III Attachment 1, as well as to Master Response GEO-2. Please also refer to the geologic

assessment and slope stability analysis conducted by the Klamath River Renewal Corporation (KRRC) (Volume II Appendix B: *Definite Plan* – see Appendix E of the *Definite Plan* for the *Reservoir Rim Stability Analysis*). Comments on the *Definite Plan* should be submitted to KRRC.

The analysis of parcels and structures on potentially unstable slopes conducted by KRRC (Volume II Appendix B: *Definite Plan* – see Appendix E of the *Definite Plan* for the *Reservoir Rim Stability Analysis*) identifies approximately 1,780 linear feet of shore-parallel length with potential for failures to impact existing structures outside the reservoir rim. These areas include approximately 430 linear feet of slopes along Copco Road (north shore segment N11a) and approximately 1,350 linear feet of slope adjacent to private property (south shore segments S5, S11a, and S12b). Twelve parcels and four habitable structures in these potentially unstable areas could potentially be impacted by slope failure. An additional five parcels and four habitable structures may experience damage and/or deformation due to nearby slope failure. Therefore, there are a total of 8 habitable structures identified as potentially affected by slope failure during drawdown. It is noted that the funding and actions listed in the third paragraph of Mitigation Measure GEO-1 apply to slope failures (if any) that occur upon implementation of the Proposed Project, regardless of whether they are in areas identified as having potential for instability or not. Additionally, please note that Mitigation Measure GEO-1 requires KRRC to address adverse impacts to "structures," which include facilities connected to homes, like septic tanks.

Regarding the part of the comment that relates to KRRC's financial capacity for mitigation, please refer to response to comment IND368-11.

Comment IND368-17

In the DEIR, the report concludes questionable references towards the aesthetics. Aesthetics are a major factor as to why homeowners built homes around the lakes. The report does little to address what will be lost in aesthetics for years looking onto mud flats, etc. Homeowners that live around the Copco 1 Reservoir and others have been grossly overlooked in both the USBR report as well as the KRRC's plan. We are the most impacted stakeholders and were NEVER represented at any of the meetings with the KHSA, KBRA, state, or any meetings! Our property values have dropped by over half and are continuing to decline in value! Whatever value is left in our homes, becomes almost nothing when we cannot sell our homes, unless we do so at a small fraction of what they were originally worth IF anyone even is interested in buying! The Siskiyou County Assessor-Recorder and Senior Appraiser, have both been quoted as saying there have been noticeable changes in the Copco market, including increased marketing times, much lower sale prices and a refusal by some realtors to list homes in the area, and in calling to get appraisals of our homes have been refused by appraisers! Any homeowner now wishing to sell their home that border the reservoir must disclose dam removal, possible loss of well water, slope instability resulting in foundation movement and loss of property,

and no certainty of river access. Siskiyou County Board of Supervisors, among others, have on multiple occasions, expressed a desire to see mitigations put in place requiring that property owners be reimbursed for lost property value if the dams are removed.

While the KRRC has said, "KRRC's study and planning will evaluate various ways to mitigate impacts (property values) to landowners." October 2017. Despite the KRRC stating, "Based on this outreach and the information obtained from state and local jurisdictions and other stakeholders, KRRC has made changes or modifications to the Definite Plan to address these agencies' and stakeholders' interests and concerns." We see absolutely nothing about compensation for homeowners in this Definite Plan, despite homeowners having repeatedly asked if and how we will be compensated for our loss of property values! Just where in this DEIR does it address mitigation for lost property values?? We also see absolutely nothing in the Definite Plan to address school funding losses and loss of county funding due to loss of taxes in the Definite Plan. There are no offers of compensation of any type and absolutely no plans to mitigate this loss!

There is a legal position here on a state or federal project for "hardship" loss of value. It is a public project cost. In the KRRC's "cut and paste" from the 2012 Detailed Plan, ironically, they eliminated any mention of lost property values although they certainly added much of the Detailed Plan in their Definite Plan, if it favored their proposed agenda. Although the 2012 Plan was highly deficient, as it didn't take into consideration improved land values, but it did address Property Values and stated, "Kruse and Ahmann (2009) is the only study to model the effects of lot size and proximity to the Klamath River, Copco 1 and Iron Gate reservoirs on private residential property values. The study concluded that lake adjacency does have a positive and significant impact on residential property values and that, all things being equal, properties on a lake, with lake proximity or a lake view are worth more than properties without these characteristics. This group of impacted parcels consists of parcels with views of Iron Gate Reservoir and parcels with views or frontage/access to Copco I in the "before" condition. The value of these properties was deemed to be negatively affected as a result of dam removal. It is important to note that, in addition to examining the potential impacts to private property values from dam removal, the articles reviewed for this research analyzed numerous potential effects that can result during and after dam removal. Some of these other effects include issues related to:

The cost of dam removal and economic impacts on the surrounding areas; Future ownership of reclaimed land following dam removal; Future access to the stream/river compared to lake access with the dams. Lake bottom and flood plain restoration following dam removal; The need to dispose of contaminated sediments; Potential impacts on the water table and corresponding effects on nearby wells; The loss of hydropower; Potential impacts on recreation resources including fishing, canoeing and kayaking. "

"U.S. Department of the Interior, U.S. Bureau of Reclamation. 2008. Evaluation and Determination of Potential Liability Associated with the Decommissioning and Removal of four Hydroelectric Dams on the Klamath River. Prepared by Camp Dresser and McKee. The report found that there could be a loss of property values as a result of dam removal. The potential property value loss and PacifiCorp property reimbursement has the potential to equal $13 million to $27 million. In addition, the report concluded that real estate values could drop in certain areas such as Copco Reservoir where owners "will lose access to a major amenity." Where does the DEIR address loss of property values due to aesthetics, as we could not find it and this is definitely a VERY significant impact that IS avoidable if dam removal does not take place.

Response to Comment IND368-17
Please refer to Section 3.19.5 *Aesthetics – Potential Impacts and Mitigation* Potential Impact 3.19-1 for a discussion of the loss of open water vistas under the Proposed Project. Please refer to Volume III Attachment 1 for the final Section 3.19 *Aesthetics*.

Please note that CEQA documents analyze significant effects on the physical environment; CEQA does not address potential social or economic effects from implementing a project. (CEQA Guidelines, section 15131(a).) However, to inform the public and decisionmakers regarding the potential economic consequences of the proposed project, Volume I Section 5.4.1 *Other Required CEQA Discussion and Consideration of Social and Economic Factors – Social and Economic Factors Under CEQA – Consideration of Economic Information for Resources Potentially Affected by Dam Removal* (pages 5-4 to 5-11) summarizes the results of prior economic studies conducted by the U.S. Department of the Interior (DOI) to characterize potential effects on property value.

Comment IND368-18
We additionally question whether the funds the KRRC claim to have are adequate to cover cost overruns to implement mitigation measures necessary to prevent or avoid significant environmental impacts. As we have stated in numerous instances, we wonder if they won't run out of money before the project is finished. We believe they have underestimated the number of wells that will go dry or be compromised, we are concerned with slope instability and the number of homeowners that will be affected and therefore properties needing to be purchased, and we are concerned with problems with dam removal itself when they say they may have to wait a year if they run into problems. We question if funds will still be available for recreational sites after dam removal. We believe they have grossly underestimated the costs of revegetation and other unforeseen problems and challenges they will be facing. We are also concerned with the lack of number of years that they intend to do monitoring of the many facets of

this project for mitigation measures. This nonprofit will cease to exist just a short time after they achieve their goal of removing the dams.

To further our concerns with lack of adequate funding, the KRRC is planning to implement a Progressive Design Build Plan for dam removal. In the past, this was referred to as "time and material", a plan that is infamous for cost overruns. The KRRC would have us believe that this is a considerably new way of operating in the industry, but it has no proven record with dam decommissioning and yet the Water Board is trusting that the KRRC can do what it says it can do. The danger of a Progressive Design Build plan is that it is basically a project that has no certainty of having enough funding to complete the project as defined in the KRRC's plan. If they run out of money to complete the project, then what they are claiming they will do in the Definite Plan, will not be a reality and there will be no consequences and no accountability. Their cost overrun statements are less than 10-20%. We would ask you what government projects that you have seen overruns that have ever been so low?? Does Oroville Dam ring a bell? The SWRCB cannot base their DEIR on such a plan that lacks specifics, because we do not know what plan the KRRC will follow if they run out of money to complete the project and meet the stated mitigation plans to prevent or avoid significant environmental impacts.

While we have not addressed such other resources such as Flood Hydrology, Historical and Tribal Resources, Noise, Phytoplanton and Periphyton, Recreation, Terrestrial Resources, Transportation and Traffic, we have considerable concerns for the protection of these resources as well. The significant impacts to all these and other resources are fully avoidable if dam removal does not take place. If fish ladders or some other type of fish passage (trap and haul, etc.) were to take place, the overall environmental impacts would be greatly lessened! We believe other alternatives need to be looked at as there is much more CERTAINTY!

If the Federal Government, through Congress, did not want to underwrite this project, do you confidently believe that a little nonprofit, with no dam removal experience, has the capacity to accept such liability and meet mitigation measures to avoid the significant environmental impacts? It is inconceivable that the SWRCB can trust that its Draft EIR is a reliable, accurate report based on such uncertainty.

Response to Comment IND368-18

Regarding the comment's concern about the Klamath River Renewal Corporation's (KRRC)'s financial capacity to successfully implement the Proposed Project, please refer to IND368-11.

Becker, Stacy

Comment IND254-1

I support removal of all Klamath dams. Analysis shows that dam removal will greatly reduce unhealthy conditions in the Klamath River, and will improve water quality. It will also bring the salmon home to hundreds of miles of habitat and the Klamath Tribes in the upper Klamath basin. This is an environmental and social justice issue of utmost concern.

Response to Comment IND254-1

Thank you for your comment. Please refer to Master Response GEN-1.

Bender, Jerry

Comment IND416-1

I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of darn removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND416-1

Thank you for your comment. Please refer to Master Response GEN-1.

Benkert, Andy

Comment IND73-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

My personal experience with the Klamath River and its tributaries goes back a couple decades, as I am an avid steelhead angler. Protecting this species, currently threatened under the ESA, is important not only for anglers, but for the ecosystem.

It's time to undam the Klamath!

Response to Comment IND73-1
Please refer to Master Response GEN-1.

Bentz, Keith

Comment IND385-1
I strongly support the removal of the Klamath River dam.

Response to Comment IND385-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment IND386-1
I strongly support the removal of the Klamath River Dam.

Removing the dam will restore the Klamath to the status of a free-flowing river and open 400 miles of spawning and rearing habit to salmon and steelhead.

And it will improve water quality and comply with the Clean Water Act

Please vole to remove the dam.

Response to Comment IND386-1
Thank you for your comment. Please refer to Master Response GEN-1.

Bernard, Jeffry

Comment IND417-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND417-1
Thank you for your comment. Please refer to Master Response GEN-1.

Beste, David

Comment IND141-1

I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND141-1

Thank you for your comment. Please refer to Master Response GEN-1.

Black, Stephen

Comment IND249-1

I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND249-1
Thank you for your comment. Please refer to Master Response GEN-1.

Blaich, Ryan

Comment IND276-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND276-1
Thank you for your comment. Please refer to Master Response GEN-1.

Bland, Michael

Comment IND344-1
It's time to get rid of unnecessary dams that are blocking the migration passage of our endangered salmon and steelhead runs. Please support the removal of the 4 dams on the Klamath and let the river run free!

Response to Comment IND344-1
Thank you for your comment. Please refer to Master Response GEN-1.

Bliss, Alexander

Comment IND67-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND67-1
Thank you for your comment. Please refer to Master Response GEN-1.

Boero, Paul

Comment IND313-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND313-1
Thank you for your comment. Please refer to Master Response GEN-1.

Boggess, David

Comment IND142-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND142-1
Thank you for your comment. Please refer to Master Response GEN-1.

Bohannan, Scott

Comment IND262-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND262-1
Thank you for your comment. Please refer to Master Response GEN-1.

Bramley, William

Comment IND197-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complieis with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND197-1
Please refer to Master Response GEN-1.

Bright, Jeff

Comment IND423-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the

project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND423-1
Thank you for your comment. Please refer to Master Response GEN-1.

Brink, Diane

Comment IND172-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam

removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND172-1
Thank you for your comment. Please refer to Master Response GEN-1.

Briscoe, Laura and Ken

Comment IND382-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND382-1
Thank you for your comment. Please refer to Master Response GEN-1.

Bucklin, Christine

Comment IND120-1

Yes! I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND120-1

Thank you for your comment. Please refer to Master Response GEN-1.

Burdon, Thomas

Comment IND230-1

I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND230-1
Thank you for your comment. Please refer to Master Response GEN-1.

Burnett, Brenda

Comment IND87-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undarn the Klamath!

Response to Comment IND87-1
Thank you for your comment. Please refer to Master Response GEN-1.

Burton, Don

Comment IND448-1
As a cattle producer who purchases all my winter hay and alfalfa needs from the Klamath basin, I strongly support the full removal of the lower four Klamath River darns. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND448-1
Thank you for your comment. Please refer to Master Response GEN-1.

Callow, David

Comment IND143-1
The lower four Klamath dams produce a limited amount of electricity, no agricultural water, but are very harmful to salmon.

I support progress, which in this case would be removing these dams.

Response to Comment IND143-1
Thank you for your comment. Please refer to Master Response GEN-1.

Campbell, Bruce

Comment IND97-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural di versions.

It's time to undam the Klamath!

Response to Comment IND97-1
Thank you for your comment. Please refer to Master Response GEN-1.

Campbell, Derek

Comment IND169-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam

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The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND169-1
Thank you for your comment. Please refer to Master Response GEN-1.

Campbell, Don

Comment IND179-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND179-1
Thank you for your comment. Please refer to Master Response GEN-1.

Campbell, Jack

Comment IND433-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of darn removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND433-1
Thank you for your comment. Please refer to Master Response GEN-1.

Cantwell, Austin

Comments IND79-1 and IND80-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undarn the Klamath!

Response to Comments IND79-1 and IND80-1
Thank you for your comment. Please refer to Master Response GEN-1.

Carpenter, John

Comment IND274-1
I strongly DO NOT support the removal of the lower four Klamath River dams.

Response to Comment IND274-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment IND274-2
The Klamath is the third most productive fishery for salmon and steelhead on the West Coast IN LARGE PART DUE TO WATER MANAGEMENT ENABLED BY THE INPLACE DAM SYSTEM. Dam removal is A POOR QUICK FIX TO A COMPLEX WATER MANAGEMENT CHALLENGE.

Response to Comment IND274-2
Please refer to Master Response GEN-1.

Comment IND274-3
Dam removal DOES NOT improve water quality.

Response to Comment IND274-3
Please refer to Master Response WQ-1. Please also refer to Section 3.2.5 *Water Quality –Potential Impacts and Mitigation* for analysis of the variations in water quality resulting from dam removal under the Proposed Project, including the following: 1) short-term and long-term water temperature improvements in the Hydroelectric Reach and the Middle Klamath River to the confluence with the Salmon River; 2) short-term and long-term elimination of summer and fall extremes in dissolved oxygen concentrations in the Hydroelectric Reach and the Middle Klamath River immediately downstream of Iron Gate Dam; 3) short-term and long-term decreases in summer and fall pH and daily pH fluctuations in the Hydroelectric Reach from Copco No. 1 Reservoir to Iron Gate Dam; and 4) short-term and long-term reduction of chlorophyll-a and algal toxins for the Hydroelectric Reach, the Middle and Lower Klamath River, and the Klamath River Estuary. Please see Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Comment IND274-4
The dams are NOT a leading cause of salmon declines in the Klamath Basin. WITHOUT THE l ABILITY TO CONTROL RIVER FLOWS WE WOULD HAVE MANY ENDANGERED FISH DIE EACH YEAR.

Response to Comment IND274-4
Please refer to Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species – Fish* for a discussion of the environmental setting and effects of Lower Klamath Project facilities on salmon. Additionally, please see Section 3.3.2.1 *Aquatic Resources – Environmental Setting –Aquatic Species – Fish – Anadromous Fish Species Table 3.3-2 Historical and Recent Status of Klamath River Anadromous Fish* for a comparison of historical run estimates to current run estimates. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources.*

Please refer to Master Responses AQF 3 and AQF 4.

Comment IND274-5
The reservoirs created by these dams host NATURALLY OCCURING blooms of toxic algae FOR A SHORT TIME SOME YEARS. which impairs water quality and poses health risks for people and pets. IF WE WERE TO USE THIS LODGIC STATE WIDE WE'D BE DRAINING THE DELTA AND CHANGING OUR STATE WATER POLICY. THIS IS AGAIN AN OVERLY SIMPLISTIC AND EMOTIONAL ARGUMENT, NOT AN APPROPRIATE SOLUTION.

Response to Comment IND274-5
Please refer to Volume I Section 3.4.2 - *Phytoplankton and Periphyton - Environmental Setting* (pages 3-392 to 3-422) for a summary of the available data on blue-green algae in the phytoplankton and periphyton Area of Analysis for the Proposed Project.

Comment IND274-6
IT IS TIME TO IMPLEMENT LONGTERM SOLUTIONS THAT WILL PROTECT THE NEEDS OF THE KLAMATH RIVER STAKEHOLDERS.
DAM REMOVAL IS NOT THE ANSWER.

Response to Comment IND274-6
Please refer to Master Response GEN-1.

Carter, Ken

Comment IND381-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of darn removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND381-1
Thank you for your comment. Please refer to Master Response GEN-1.

Casas, Dan

Comment IND135-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND135-1
Thank you for your comment. Please refer to Master Response GEN-1.

Caudana, Nicole

Comment IND325-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND325-1
Thank you for your comment. Please refer to Master Response GEN-1.

Cavellini, Steve

Comment IND246-1
I began fishing the Klamath river with my father in 1956. We would go up to the river for a week or so in late August and stay until my school started right after Labor Day. We would stay at Klamath Glen in a small trailer or camp. We would rent a boat with a small outboard motor. Our normal day of fishing was to fish the riffles in the morning either up or down river in the morning and run down to the mouth to fish for king salmon in the afternoon.

At that time the big Caterpillar tractors were put in the riffles to build wing dams so logs rafts could pull logs down the river being toes by tugs being driven by Yurok Indians. The logs were from upstream logging operations and the logs were removed from the river near the town of Klamath.

The whole area from Klamath Glen to the mouth was bustling with activity with campers, tents house trailers boat and trailers. The Yuroks were busy acting as guides and smoking salmon and steelhead. The economic activity derived by the fishery was substantial.

Now when you go up to the Glen at the same time, the salmon fishery is virtually nonexistent and the steelhead fishery is minimal. The area is virtually deserted. I would think that the economic activity is 10% of it once was.

The river used to be full offish rolling and jumping and now seeing a fish rolling or jumping is a rare occasion.

I visited the dams scheduled to be removed during the recent summers and the lakes are clogged with algae. There is vi1tually no tourist activity or construction activity. i do not think that removal of the dams will do anything but improve the fisheries and economic activity along the whole course of the river.

Electricity can be produced in a number of way, but a fishery and recreation resource like the Klamath need a free flowing river.

The dams should be removed as soon as possible. It will be a boon to the local economy along the whole course of the river, the local towns the ocean fisheries along the north coast.

Response to Comment IND246-1
Thank you for your comment. Please refer to Master Responses GEN-1 and GEN-2.

Cederwall, Mark

Comment IND357-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND357-1
Thank you for your comment. Please refer to Master Response GEN-1.

Chacon, Robert

Comment IND295-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND295-1
Thank you for your comment. Please refer to Master Response GEN-1.

Charles, Cindy

Comment IND449-1
i am the Conservation Chairperson for the Golden West Women Flyfishers and I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND449-1
Thank you for your comment. Please refer to Master Response GEN-1.

Cheek, Bruce

Comment IND93-1
I have some concerns about the dam(s) removals. As we all know, the many year drought has caused a large number of California reservoirs to dry up or/and reach dangerously low levels. This has had a detrimental effect on our water usage and caused the local water management company to place our community on water rations..

What will be done if the four dams are removed to improve water storage? How will this additional water storage be financed? Many other questions beyond just better fish habitat.

Response to Comment IND93-1
Thank you for your comment. Please refer to Master Responses WSWR-1 and WSWR-3. Additionally, please refer to Volume I Section 3.8.2.1 *Water Supply/Water Rights – Environmental Setting – Upper Klamath Basin* (pages 3-670 to 3-671) for a more detailed discussion of the Lower Klamath Project's water rights.

Clapp, Heather

Comment IND437-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND437-1
Thank you for your comment. Please refer to Master Response GEN-1.

Clark, Matthew

Comment IND348-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND348-1
Thank you for your comment. Please refer to Master Response GEN-1.

Cohen, Corrina

Comment IND126-1
I am a mother of 3, homeowner and business owner on the Klamath River which flows right below our property. We started and sold an online plant nursery, still raise native plants for restoration work, and have an an online nursery that sells propagation wood. I have lived here with my family for 22 years. Every year we watch the water heat up and the bluegreen algae explode. I support removing all the 4 dams as quickly as possible to improve and save the health of indigenous elders, the river water, the salmon and build resilience for our rural communities. I watched my son get sick when he was young and we were new to the river, after he gulped a bunch of water and then quickly looked sick and in an hour or two spiked a fever I want our children to have a future with fresh clean water and salmon in it. I want them to see that we can make good healthy choices with sound science and indigenous wisdom behind them. That we value the environment and the health of people who live in it. That we cherish clean water as something precious and irreplaceable. That we need healthy fish so we can stay healthy and nourished as the indigenous people here did for centuries. Please continue to work to remove these dams, and quickly. It is the only way, our lives depend on it.

Response to Comment IND126-1
Thank you for your comment. Please refer to Master Responses GEN-1 and GEN-2.

Collins, James

Comment IND431-1

I was a commercial fisherman in the late 70's and early 80's out of Crescent City. In those years, the Coho salmon population was massive, but it has declined horribly since then due, in large part, to the bad conditions in the Klamath River. I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

TI1e Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND431-1

Thank you for your comment. Please refer to Master Response GEN-1.

Connolly, Leo

Comment IND371-1

I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam

removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of darn removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND371-1
Thank you for your comment. Please refer to Master Response GEN-1.

Cook, Nathan

Comment IND330-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND330-1
Thank you for your comment. Please refer to Master Response GEN-1.

Cotsirilos, George

Comment IND447-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND447-1
Thank you for your comment. Please refer to Master Response GEN-1.

Counts, Thomas

Comment IND229-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) a:ffinns that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND229-1
Thank you for your comment. Please refer to Master Response GEN-1.

Covault, Jonnel

Comment IND400-1
Thank you for the opportunity to express my full support for removal of all four dams on the Klamath River. The benefits to the vitality of our fisheries and local economy cannot be overstated:

The removal would " ... advance the long-term restoration of natural fish populations in the Klamath Basin, including having a significant beneficial effect on commercial fisheries and associated significant beneficial economic impact on the coastal commercial fishing industry."
(Environmental Impact Report)

The EIR report brings more good news for the Crescent City Harbor. Although dam removal will unlock some sediment trapped in the reservoirs, Crescent City Harbor should not be affected, with the DEIR stating:

" ... it is expected that the amount of sediment released during the year of draw down and dam removal would be similar to that transported by the Klamath River

to the Pacific Ocean in a year with average flow, much less than that transported by the Klamath River in a wet year. ... "

As a former commercial salmon fisher who loves fish, I am alarmed at the dwindling numbers of salmon in the Klamath and it's tributaries. For many years my family owned a home on Copco Lake. We saw first hand how warm and filled with algae the water is. With ranches and piles of manure along its bank we know the water quality was/is bad. No one swims in Copco Lake.

I appreciate all the hard work and persistence by my community to make this dream come true. Many organizations and Tribes are working to save the salmon runs, but they cannot undo the damage caused by these dams. These dams must go ASAP.

Response to Comment IND400-1
Thank you for your comment. Please refer to Master Responses GEN-1 and GEN-2.

Crosby, Peter

Comment IND311-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND311-1
Thank you for your comment. Please refer to Master Response GEN-1.

Cuningham, Bruce

Comment IND94-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural di versions.

It's time to undam the Klamath!

Response to Comment IND94-1
Thank you for your comment. Please refer to Master Response GEN-1.

Cunningham, Storm

Comment IND235-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles

of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND235-1
Thank you for your comment. Please refer to Master Response GEN-1.

Dana, Mark

Comment IND356-1
Hello. My name is Mark Dana. I would have liked to have been there today, but I got stuck in Friday/holiday traffic in Vacaville coming from Oakland. Then, I couldn't get my Apple to show the webcast when I turned back. Now I'm listening to the webcast but it says it is on break.

Shasta Dam/Lake provides the same benefits as the Klamath Dams/Lakes only Shasta provides them on a larger scale. I am sure you all know that the Sacramento River salmon production was historically second only to the Colombia Riveron the West Coast. Dramatic declines in returning salmon numbers have been experienced over the last century on the Sacramento and were especially disastrous following the construction of Shasta Dam.

Why then, is nobody seriously proposing the removal of Shasta Dam to revitalize the salmon runs on the Sacramento?

It is because it is a stupid idea.

Shasta Dam provides significant hydropower that supplies electrical energy to customers throughout northern California. It provides water storage for drought years and flood control for wet ones. Shasta Lake and the surrounding forest are one of the top recreational areas in California. In addition, recent California fire

events have shown the importance of readily available water sources for fighting wildfires.

These are the same benefits the lakes on the Klamath River system provide.

Response to Comment IND356-1
Thank you for your comment. As discussed in the EIR, the Klamath River Renewal Corporation (KRRC) applied to the Federal Energy Regulatory Commission (FERC) to remove the dams and associated facilities that together form the Lower Klamath Project (FERC Project No. 14083). As noted in the comment, Shasta Dam and Shasta Lake are a part of the Sacramento River system. The United States Bureau of Reclamation (USBR) operates Shasta Dam as part of the Central Valley Project, which is not connected to the Lower Klamath Project. Please also refer to Master Responses GEN-1, FLD-1, HAZ-2, and ENR-1.

Comment IND356-2
What are the differences between the Shasta Dam/Lake and Copco and other lakes on the Klamath? It is all about size. Shasta Dam and Lake is much larger and provides the same benefits, except that Shasta provides the benefits to a larger population, agriculture, and industrial base.

Guess what though, projections reported by California Department of Finance are that California population growth between 2016 and 2036 will increase by 6.5 million people. While you can expect this to impact already large population centers, it will also have major impacts to infrastructure and resources in the Klamath River Basin.

As with the Sacramento River, the impacts from population growth are much more than just the pressure on salmon numbers, whose importance unfortunately begins to pale in comparison. While hydroelectric is strangely no longer classified as "green energy" any power generation to support the growing demand for power should not be abandoned. The dams/lakes will be needed to control floods and fight wildfires that will threaten increased residential and commercial development in the region.

Response to Comment IND356-2
This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Greenhouse Gas Emissions and Energy*). Regarding flood control, please to Master Response FLD-1. Regarding wildfires, please refer to Master Response HAZ-2.

Comment IND356-3
As more strain from population is placed on the recreational opportunities throughout California, including the Shasta region, the Siskiyou County Lakes that previously were always popular but relatively underutilized for recreation and

commercial development to support those recreational benefits will be a major benefit to the regional economic and societal wellness.

Response to Comment IND356-3
Please refer to Potential Impact 3.20-2 for an analysis of the long-term changes to or loss of reservoir-based recreation activities and facilities due to removal of Iron Gate and Copco No. 1 reservoirs. Potential Impact 3.20-3 (pages 3-1009 to 3-1010) discusses the potential for a significant increase in the use of regional recreational facilities due to loss of Iron Gate and Copco No. 1 reservoirs and concludes that there would be no significant impact of the Proposed Project. The final Section 3.20 Recreation is presented in Volume III Attachment 1.

Moreover, please note that CEQA documents analyze significant effects on the physical environment; CEQA does not address potential social or economic effects from implementing a project. (CEQA Guidelines, section 15131(a)).

Comment IND356-4
Regrettably, the threat of dam destruction and lake elimination has already impacted the local economy. Less visitors and tourists are returning and with loss of business, the Copco Lake Store that once catered to seasonal tourism has shut its doors. The rafting companies and boaters that had previously enjoyed their stops for supplies and refreshments at the store no longer have it as an option, and have modified their habits to bypass the other amenities that the lake provides.

Response to Comment IND356-4
Comment noted. Please note that CEQA documents analyze significant effects on the physical environment: CEQA does not address potential social or economic effects, such as reductions in tourism revenue, from implementing a project. (CEQA Guidelines, section 15131(a).

Comment IND356-5
Meanwhile, at Shasta Dam, instead of proposing dam destruction, design work is currently in progress to actually raise the height of the dam and increase the storage capacity of theLake. One of the other benefits touted is that this change will improve Sacramento River temperatures and water quality in the Sacramento River for anadromous fish survival.

Response to Comment IND356-5
As noted in response to comment IND356-1, Shasta Dam and Shasta Lake are a part of the Sacramento River system. The United States Bureau of Reclamation (USBR) operates Shasta Dam as part of the Central Valley Project, which is not connected to the Lower Klamath Project. Please also refer to Master Response WQ-1 for a discussion of the role of Lower Klamath Project dams/reservoirs with respect to overall water quality in the Klamath River, and Master Response WQ-

2 for a discussion of the potential for the Lower Klamath Project dams/reservoirs to cool river water during summer and fall.

Comment IND356-6

Which reminds us there are other options available. I have worked with numerous EIR/EIS reports in my career designing and managing large construction projects, but you don't have to have my experience to understand that almost any project can be environmentally cleared if there is enough demand for it and written properly with sufficient mitigations of significant impacts. Instead of removing the Klamath Dams, they need to be made better, like Shasta.

You don't just get rid of a structure that is beneficial in most ways and just scrap the investment. We can keep the benefits of the dan1s and mitigate the impacts to salmon by installing fish ladders or other structures to provide access around the dams to the upper river.

This is already in the EIR and all it takes is a desire and money.

Response to Comment IND356-6

The Lower Klamath Project EIR analysis assesses the potential impacts of the Klamath River Renewal Corporation's (KRRC's) Proposed Project and feasible alternatives against existing environmental conditions, consistent with CEQA Guidelines section 15125 (a). Lower Klamath Project EIR presents a range of reasonable alternatives to the Proposed Project. Volume I Section 4.1 *[Alternatives Selection/Overview]* (pages 4-1 to 4-15) discusses 17 potential alternatives in relation to the Proposed Project's underlying purpose and objectives, six of which are examined in detail. Of these six alternatives, two involve removal of all four Lower Klamath Project dams, and four involve two or three dams remaining in place. Potential impacts and beneficial effects are identified for each of these alternatives in the EIR and each will be fully considered by the State Water Board before certifying the EIR (CEQA Guidelines section 15090).

Comment IND356-7

Should one assume I am against salmon? Not at all. My father owned a sporting goods store and I have been a fisherman all ofmy life. While I recognize the efforts and the accomplishments of organizations such as Trout Unlimited in protecting habitat for salmon and trout, and promoting benefits for fly-fishermen, I think it is elitist to not respect the other fisherman who still enjoy fishing for what might be viewed as less-prestigious fish species like perch, bass, catfish and other fish species in addition to trout that reside in the lakes.

We appreciate the diversity and beauty and the abundant wildlife at the lakes. We see the destruction of the lakes as a major loss to the region that can't be replaced by additional river frontage. We enjoy the sunset cruises on a patio

boat and the ability to paddle a canoe peacefully on slow moving water but still easily get access to the raging river sections nearby. Lakes offer so much more than the river does, especially when most of the river remains.

Response to Comment IND356-7
Please refer to Master Responses REC-1, GEN-1, and GEN-2. Please also refer to response to comment IND356-3.

Comment IND356-8
The darns began to be installed on the Klamath about onehundred years ago, and while salmon may not be present in pre-Columbian numbers, they have been shown to be sustainable through the last 100 years. The question really is, would there really ever be enough salmon and eventually won't even these numbers be inadequate to support the population explosion, and how much will be able to be increased given other formidable obstacles that need to be overcome given the need for increased water flows, the pressure from commercial fisheries, and increased predation from protected mammals.

Response to Comment IND356-8
Please refer to Master Response AQF-4 for a brief discussion relating to the historical abundance of salmonids in the Klamath Basin.

Comment IND356-9
Otherwise, the benefits realized by dam demolition, like it would be in the case of Shasta Dam, the demolition project really isn't worth a dam.

Response to Comment IND356-9
Please refer to Master Response GEN-1.

Dau, Bruce

Comment IND95-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The

Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural di versions.

It's time to undam the Klamath!

Response to Comment IND95-1
Thank you for your comment. Please refer to Master Response GEN-1.

Devine, Timothy

Comment IND216-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

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Response to Comment IND216-1
Thank you for your comment. Please refer to Master Response GEN-1.

Dexter-Durham, Robin

Comment IND282-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

Summer water quality along the river has been poisonous to man and beast. The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. I am aware that the dam removal process will create temporary sediment impacts, but the long-term benefits of dam removal far outweigh the shortcomings. The benefits include stronger salmon runs and better water quality. And better quality of life for humans, their pets, and wildlife!

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

Please undam the Klamath!

Response to Comment IND282-1
Thank you for your comment. Please refer to Master Response GEN-1.

Distad, David

Comment IND144-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND144-1
Thank you for your comment. Please refer to Master Response GEN-1.

Douglas, Peter

Comment IND310-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND310-1
Thank you for your comment. Please refer to Master Response GEN-1.

Dow, Gordon

Comment IND444-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND444-1
Thank you for your comment. Please refer to Master Response GEN-1.

Draeger, R.B.

Comment IND300-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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Response to Comment IND300-1
Thank you for your comment. Please refer to Master Response GEN-1.

Dryg, Edward

Comment IND200-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam

removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND200-1
Thank you for your comment. Please refer to Master Response GEN-1.

Durack, Justin

Comment IND390-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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It's time to undam the Klamath!

Response to Comment IND390-1
Thank you for your comment. Please refer to Master Response GEN-1.

Ebert, Carl and Linda

Comment IND178-1

About eighteen and a half years ago, my husband and I came to Copco Lake to settle due to complications of his Parkinsons Disease. If he had to retire early, Steve wanted to be able to fish near his back door. And fish he did – for perch, bass, catfish, crappie and trout, often from his small Boston Whaler. Though the boat now sits idle, he can still fish from our deck when it's warm enough. He can also view the many beautiful woods of the lake from our deck and from his all-terrain scooter.

Many forms of wildlife can be spotted on their excursions, always the inquisitive deer, many timer geese, ducks and occasionally a fox. One time, standing still, a family of coyotes, suddenly moving in water, made it look like the hillside across the road, was moving. We've also seen a bobcat take a goose in our yard, otters throng our deck, ospreys take fish away from bald eagles over the lake, and cougars leap in front of our car near our lakeside home. Herons fish from our shore or sit on our dock watching pelicans find their fish.

Now, dam removal threatens our relatively tranquil existence by polluting our surrounding land with dust, noise, traffic and toxic sediment that will kill fish, mammals and waterfowl.

Response to Comment IND178-1

Thank you for your comment. Please see Master Response GEN-2. With respect to the comment's expressed concerns regarding short-term construction-related impacts of the Proposed Project please refer to Master Response AQF-10, Volume I Section 3.22.5 *Transportation and Traffic – Potential Impacts and Mitigation* (pages 3-1069 to 3-1078), and Volume I Section 3.23.5 *Noise – Potential Impacts and Mitigation* (pages 3-1093 to 3-1101). Please also refer to Master Response TER-1 regarding the wildlife habitat effect of removing the reservoirs. Regarding the comment's concerns about dust during construction, please refer to Master Response R-1.

Comment IND178-2

Our own health and safety will be compromised by the blockage of ingress and egress routes along the lake with heavy machinery that will disallow our passage and that of medical and fire vehicles in times of emergency. We won't have the deep lake for fire suppression in remote areas of the canyon by quick-fill fixed wing planes and helicopters.

Response to Comment IND178-2

Please refer to Volume I Section 3.22.5 *Transportation and Traffic – Potential Impacts and Mitigation* (pages 3-1069 to 3-1078) for a discussion of transportation-related impacts. As noted in response to comment ORG47-56, KRRC has committed to addressing all potential traffic conflicts as part of their Final Traffic Management Plan (TMP). Klamath River Renewal Corporation

(KRRC) states that they are committed to ensuring that the TMP *"will maintain efficient and safe movement of the vehicles through the construction zone covered by activities in the Definite Plan".* KRRC also states that the *"Final TMP would be informed by KRRC's contractor's specific measures and methods for construction and input received from relevant local jurisdictions."* The TMP specifically describes a public input process.

In addition, please see Master Response HAZ-2 for discussion of the potential for increased wildfire risk due to the loss of the Lower Klamath Project reservoirs. For additional information regarding Mitigation Measure TR-1 to address traffic and transportation impacts, please see Master Response CEQ-2.

Comment IND178-3

Should dam removals occur, the heavy toxic sediment discharged from behind the dams will change the river channel bed, destroying spawning habitat for salmon while poisoning the water and the river shelves. The lighter sediment will deoxygenate the water for the fish and other aquatic life dependent upon it.

Response to Comment IND178-3

Information regarding sediment deposition on the channel bed is available in Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 (pages 3-765 to 3-775), which is partially modified in Volume III Attachment 1, and Master Response GEO-1. For the reasons explained in Potential Impact 3.11-5, deposition in the Middle Klamath River between Iron Gate Dam and Cottonwood Creek would be *significant and unavoidable* in the short term, whereas there would be *no significant impact* farther downstream. Long-term sediment deposition effects would be *beneficial* or *no significant impact*.

Note that Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 has been clarified to discuss reach-averaged sediment deposition or erosion and bed elevation change results of both sets of SRH-1D simulations that were undertaken by the U.S. Bureau of Reclamation (i.e., forty eight 2-year simulations and three 50-year simulations) (USBR 2012a). The clarifying edits do not change the conclusions or significance determinations in Potential Impact 3.11-5. Please refer to Volume III Attachment 1 Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 for the revisions.

Regarding potential impacts of sediment deposition on salmon redds, please refer to Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-9. There would be *no significant impact* to coho salmon. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*. Please also refer Master Responses GEO-1 and AQF-7.

Information on the potential impacts of short-term elevated sediment loads on water quality (including dissolved oxygen) and aquatic resources is available in Sections 3.2.5.2 *Water Quality – Suspended Sediments* and 3.3 *Aquatic Resources*. Please refer to Volume III Attachment 1 for final Sections 3.2 *Water Quality* and 3.3 *Aquatic Resources*.

Comment IND178-4

As retirees who live on the lake, we will watch a toxic mudflat appear in place of the lovely reservoir of water we've come to know. Our property values have already been decimated and will plummet in the event of dam removals.

Response to Comment IND178-4

As discussed in Volume I Section 2.7.4 *Proposed Project – Restoration Within the Reservoir Footprint* (pages 2-69 to 2-76), the Klamath River Renewal Corporation's (KRRC) Proposed Project includes establishing native vegetation within the reservoir footprints to stabilize newly exposed reservoir sediments and support a functioning ecosystem. Additional information on planned restoration efforts during and following dam removal can be found in the KRRC's Reservoir Area Management Plan (Volume II Appendix B: *Definite Plan − Appendix H*). Please also refer to Master Response WQ-6 for a discussion of potential contaminants in the reservoir sediments and Volume III Attachment 1 Section 3.19.5 *Aesthetics – Potential Impacts and Mitigation* for discussion and analysis regarding visual impacts from the Proposed Project, including, but not limited to, Potential Impact 3.19-1 *Loss of open water vistas and replacement with riverine and canyon vistas* and Potential Impact 3.19-4 *Visual changes resulting from reservoir drawdown and restoration including temporarily bare/unvegetated banks*.

Please note that CEQA documents analyze significant effects on the physical environment; CEQA does not address potential social or economic effects, such as reductions in property values, loss of property tax revenues, and increases in energy costs, from implementing a project (CEQA Guidelines, section 15131(a).

Comment IND178-5

The water storage of Copco Lake on the Klamath that has provided clean green energy for man and that has enabled many a fish near to occur in periods of drought, will be destroyed forever with dam removals, much like our retirement dream of living by a lake.

Response to Comment IND178-5

With respect to the comment regarding water storage, please refer to Master Responses WSWR-1 and WSWR-2**.** With respect to the comment about hydropower (energy), this topic pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (Greenhouse Gas Emissions and Energy).

Eckersley, April

Comment IND153-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND153-1
Thank you for your comment. Please refer to Master Response GEN-1.

Ellis, Lynn

Comment IND365-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of darn removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND365-1
Thank you for your comment. Please refer to Master Response GEN-1.

Enders, Todd

Comment IND214-1
I am a Moss Beach resident and member of the Pillar Point fishing community of California citizens in Half Moon Bay, whose business and family rely upon a vibrant Pacific Salmon fishery to feed our state and earn a living to pay our taxes, and keep our community strong.

I am also a lifelong recreational fisherman, who wants more wild and undammed rivers in California to create recreation for all.

Finally, I an an American, who wants obsolete destructive dams removed so there is still a planet left for my children.

Please remove the lower Klamath dams.

Response to Comment IND214-1
Thank you for your comment. Please refer to Master Response GEN-1.

Englert, Lissa

Comment IND170-1
PLEASE, PLEASE REMOVE THE DAMS WE DESPARATELY NEED THE FISH!!!

Response to Comment IND170-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment IND170-2

I'VE BEEN WRITING A VERSION OF THIS LETTER, NOW, FOR ABOUT TEN YEARS. BUT HERE WE GO AGAIN.

I LIVE AT THE CONFLUENCE OF THE CAL SALMON AND KLAMATH RIVERS. I MOVED HERE 20 YEARS AGO FROM THE BAY AREA TO LIVE OUT MY LIFE IN THIS WILDLY BEAUTIFUL PLACE. WHAT I HAVE EXPERIENCED, HOWEVER, IS TO BEAR WITNESS TO THE DEATH OF A RIVER AND THE NEAR EXTINCTION OF AN INCREDIBLY ICONIC SPECIES. THIS ACCELERATED DEGRADATION OF AN ECOSYSTEM IS UNBELIEVABLY SAD.

WHAT HAPPENS HERE AFFECTS THE IMMEDIATE ENVIRONMENT, AN INDIGENOUS PEOPLE AND THEIR CULTURE, A LOCAL COMMUNITY, AND A STATE, NATIONAL, AND EVEN GLOBAL COMMUNITY. THERE ARE MANY ISSUES AROUND THE PROPOSAL TO REMOVE THE DAMS. FOR ME, THE GREATEST REASON IS THE SALVATION OF THE SALMON. I CAN'T EXPRESS HOW IMPORTANT THE MAGICAL, BLESSED EXISTENCE OF SALMON IS. IT IS HARD TO FIND A HEALTHIER PROTEIN IN THIS AGE OF OBESITY AND HEART DISEASE. IMAGE THE SAVINGS IN MEDICAL COSTS IF WE CONSUMED MORE SALMON AND LESS RED MEAT. THIS IS A MAGNIFICENT SPECIES THAT IS DISAPPEARING AND WE MUST DO EVERYTHING TO PREVENT THIS FROM HAPPENING. IT'S A NO-BRAINER!!!

I UNDERSTAND THERE ARE MULTIPLE FACTORS FOR THE DECLINE OF THE SALMON AND DAM REMOVAL IS ONLY ONE OF MANY FIXES BUT IT'S THE ONE ON THE TABLE. WE PUT THEM IN, NOW, WE MUST TAKE THEM OUT.

FOR EONS THIS RIVER RAN WILD AND TEAMED WITH FISH. THE NATIVE PEOPLES TELL US THIS. EARLY SETTLERS TALK OF CROSSING RIVERS ON THE BACKS OF THE SALMON. THERE WERE MILLIONS. NOW THERE ARE NEXT TO NONE. I AM WATCHING EXTINCTION!!! WE MESSED WITH THE RIVER. WE MINED IT. WE LOGGED IT. OUR POPULATION GREW AND WE OVERFISHED. AND WE DAMNED THE RIVER. NOW WE HAVE A CHANCE TO TRY AND UNDO THE DAMAGE WE HAVE WRECKED UPON THIS ECOSYSTEM AND BEGIN TO RESTORE WHAT WORKED PRETTY WELL AT ONE TIME.

I AM FULLY IN FAVOR OF DOING WHATEVER IT TAKES TO IMPROVE THE LOT OF THESE FISH. REMOVING THE DAMS IS A START. NO MORE DELAYS. WITH THE RAPID DECLINE IN NUMBERS OF FISH THAT I'VE SEEN IN FAR TOO FEW YEARS, I FEEL, THE FISH CAN'T SURVIVE ANY MORE DELAYS.

AND THERE ISN'T ENOUGH TIME OR SPACE TO GO INTO THE FACT THAT CALIFORNIA'S THIRD LARGEST RIVER, AND ARGUABLY IT'S WILDEST IS SO POLUTED I CAN'T EVEN SWIM IN IT AND MY DOGS COULD DIE IF THEY DID.

I FEEL FOR THE FARMERS. THEY ARE CAUGHT BETWEEN A ROCK AND A HARD PLACE. BUT, IN THE END, THE CROPS GROWN AT THE HEADWATERS CAN BE GROWN ANYWHERE. THESE FISH CAN ONLY LIVE HERE!!!

I IMPLORE YOU TO RECOMMEND DAM REMOVAL. THE COST OF NOT DOING SO WILL BE FAR GREATER ON SO MANY LEVELS.

Response to Comment IND170-2
Please refer to Master Response GEN-1.

Farrell, Devin

Comment IND171-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND171-1
Thank you for your comment. Please refer to Master Response GEN-1.

Fee, Kevin

Comment IND375-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of darn removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND375-1
Thank you for your comment. Please refer to Master Response GEN-1.

Feller, Fred

Comment IND215-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam

removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND215-1
Thank you for your comment. Please refer to Master Response GEN-1.

Ferguson, John

Comment IND408-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of darn removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND408-1
Thank you for your comment. Please refer to Master Response GEN-1.

Ferroggiaro, Robert

Comment IND292-1
I have spent a lot of time on the Klamath below the dams and have seen their ill effects. I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

Dam removal will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

Response to Comment IND292-1
Thank you for your comment. Please refer to Master Response GEN-1.

Filice, Ed

Comment IND196-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND196-1
Thank you for your comment. Please refer to Master Response GEN-1.

Fischer, Mark and Lisa

Comment IND294-1
While the water board assumes residents of wells would be mitigated by the KRRC, they will not be responsible for making certain that this happens. The Water Board shifts this responsibility to FERC to enforce. The SWRCB also states in the executive summary the Water State Board cannot ensure implementation of Good Neighbor agreements. What certainty will the KRRC's plan be for mitigation? The KRRC states in their literature that IF wells were to be adversely affected and IF it can be shown to be due to reservoir drawdown, then they would mitigate. What proof will the residents need to show to the KRRC to have their wells made whole again? What time period would the KRRC mitigate?

KRRC's Ground Water Management Plan is a document that is based on incomplete data with no specificity on inadequate funding numbers and a claim of instituting a Good Neighbor Policy. While the SWRCB may trust the KRRC, residents have seen and heard little to instill that trust. If wells go dry, do residents call FERC to be certain that the KRRC will do what they say to make the residents whole again? Will the KRRC still have funds necessary to make residents whole again?

There is nothing in the KRRC Plan that talks about how they intend to fix wells temporarily while fixing wells permanently. How can we live at home? Is KRRC trucking in water? Who pays for hooking up water to existing pipes to the homes? Who will pay to remove these pipes, clean up and hooking up to the new well, returning the home to its original state? Who is paying for the permits for well drilling? It could take numerous attempts to find a good site for one property. Who will pay to dig up the holding tanks some of which are underground, pump house to the new well site if needed? This could cost $20,000.00 plus. Who will fill in the old well site? Who will repair driveways, fences or other property that can be damaged in the repair of the wells? What happens if a new well cannot be found on the property? Who will pay for temporary housing? There is nothing mentioned about landscape that will perish

without wells. There will be no water for fire prevention during well repair work on private properties. Nothing in the KRRC Plan covers who pays for all of the above. It cannot be a verbal understanding. It must be in writing. This is not written in the plan.

Response to Comment IND294-1
Thank you for your comment. Please refer to Master Responses GRW-1 and GRW-2. Additionally, Volume I Section 3.7.5 *Groundwater – Potential Impacts and Mitigation* Potential Impact 3.7-1 (pages 3-663 to 3-665) discusses the potential adverse effects to water levels in groundwater wells adjacent to the Lower Klamath Project reservoirs and how the Groundwater Well Management Plan would address potential impacts. The Groundwater Well Management Plan describes how impacts would be determined and the short- and long-term measures to address them. The State Water Board's draft water quality certification details the monitoring and reporting requirements associated with the Groundwater Well Management Plan.

Comment IND294-2
If dams are removed, 5 species of fish will be killed. The lost river and short-nose suckers are endangered species of fish. They are protected by law. Removing the dams will kill the lost river and short-nose sucker fish that live behind these dams. AB2640 grants a waiver against these protections. How can federal government and state turn a blind eye to this issue. We are a nation of laws and the lost river and short-nose suckers are protected. Yet in May 2018, the Klamath tribes filed a lawsuit. In the US District Court seeking to shut down the water supply to California and Southern Oregon farmers because of these very same ESA-listed sucker fish.

Response to Comment IND294-2
Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resources Impacts* describes the effects of the Proposed Project on Lost River and shortnose sucker, specifically in Potential Impact 3.3-13. Please see Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment IND294-3
There is an article from wildlife.ca.gov about the history of Iron Gate Hatchery. The article quote:

The environmental license plates funds were used to operate Fall Creek Hatchery. These funds were eliminated in May 2004 and no fish have been raised at this facility since then. The facility has retained its water rights but will need substantial renovation to become operational again. Iron Gate Fish Hatchery will be destroyed with dam removal. Tax payers' money will be used to restore the Fall Creek Hatchery that was closed in May 2004. Why are we destroying a fully functional fish hatchery to spend millions of tax pay payers' dollars to reopen an outdated fish hatchery.

Response to Comment IND294-3
The priorities for the Klamath River Renewal Corporation's (KRRC) proposed Fish Hatchery Plan were determined by the National Marine Fisheries Service (NMFS) and the California Department of Fish and Wildlife (CDFW) and are described in Volume II Appendix B Section 7.8.3 *Proposed Fish Hatchery Plan* of the Definite Plan (page 276). Please refer to Volume I Section 2.7.6 *Proposed Project – Proposed Project – Hatchery Operations* (pages 2-77 to 2-84) for a detailed discussion of hatchery operations.

Comment IND294-4
Yreka currently gets its water from Fall Creek at 15CFS. When the salmon runs come up river, and the river water is low, will salmon trump Yreka's water once the dams are removed? Currently the salmon have plenty of water with the dams in. During the salmon run, these dams provide ample water for the fish.

KRRC plans to run Yreka's water pipe above ground across the Klamath River. That pipe will be vulnerable to rock slides, vandalism, or worse terrorism. The water pipe is currently underground under the Iron Gate Reservoir, PROTECTED.

Response to Comment IND294-4
Please refer to Master Response WSWR-5.

Comment IND294-5
Ranches that have water rights on Bogus Creek were told recently by Fish and Game that they would have to cut water consumption in half for irrigation. These water rights go back for a long time. This project for dam removal is looking more and more like water control, not about the fish.

Response to Comment IND294-5
Please refer to Master Responses WSWR-1 and WSWR-3.

Comment IND294-6
Water quality should be tested at the California Oregon state line. It should not be tested below Iron Gate Reservoir. The Upper Klamath Lake is only 14 feet deep on average at max. It will always be warm. Algae blooms start in the Klamath Lake. In the past decades, the algae blooms have moved south to the lower reservoirs. History shows this. History also shows the Klamath River is warm and has given off a stench before JC Boyle, Copco Lake 1, Copco Lake 2 and Iron Gate were built. This is a fact. Until the water is clean coming into California, we should not think of dam decommission.

Response to Comment IND294-6
Please refer to Master Responses WQ-1 and PAP-1.

This comment also expresses concerns regarding water quality monitoring locations in the Klamath River. Water quality monitoring locations associated with the Proposed Project are elements of the Klamath River Renewal Corporation's (KRRC's) Definite Plan and/or the California Draft Water Quality Certification for the Lower Klamath Project. Comments on the Definite Plan should be submitted to the Klamath River Renewal Corporation. Comment noted.

Please also refer to Master Responses FLD-1, HAZ-2, and REC-1.

Please also refer to Section 3.20.5 *Recreation – Potential Impacts and Mitigation* for a discussion of potential impacts of the Proposed Project on recreation. Please refer to Volume III Attachment 1 for the final Section 3.20 *Recreation*.

Comment IND294-7

These dams provide flood control, fire prevention, clean power and an abundance of recreational activities. On April 4, 2013, the US Department of Interior released a final environmental Impact Statement (EIS). It talked about for-dam removals and is awaiting approval from congress before the Secretary of Interior could make a determination of whether the removal of four facilities would advance restoration of the salmonid fisheries of the Klamath Basin and was in public interest. The EIS was developed under provisions of the KHSA and the National Environmental Policy Act. The EIS reveals that over the next few decades after dam removal it could help the salmon, eliminate toxic algae blooms and other water quality problems in the Klamath Basin.

Now 20-30 or more years is a long time to wait on a "could happen" plan. Meanwhile, all the water problems in the Upper Klamath Lake come into California and continue downstream.

Response to Comment IND294-7

Please refer to Volume 1 Section 2.6.4 *Proposed Project – Project Background – Prior/Related Environmental Reviews* (pages 2-24 to 2-25) for a brief summary of past environmental documents associated with Klamath River dam removal, including the 2012 KHSA EIS/EIR, as well as a list of the reasons that the State Water Board determined it should develop a separate EIR, rather than adopting one of the existing environmental reviews.

Comment IND294-8

All the residents around these reservoirs are left with decades of lost home values, loss of fire prevention, higher electricity costs and loss of recreational activities. Where is our compensation for our lost values? NOTHING is mentioned in the KRRC Plan.

Response to Comment IND294-8
Comment noted. Please note that CEQA documents analyze significant effects on the physical environment; CEQA does not address potential social or economic effects from implementing a project. (CEQA Guidelines, section 15131(a).) However, to inform the public and decisionmakers regarding the potential economic consequences of the proposed project, Volume I Section 5.4.1 *Other Required CEQA Discussion and Consideration of Social and Economic Factors – Social and Economic Factors Under CEQA – Consideration of Economic Information for Resources Potentially Affected by Dam Removal* (pages 5-4 to 5-11) summarizes the results of prior economic studies conducted by the U.S. Department of the Interior (DOI) to characterize potential effects on property value.

Please also refer to Section 3.20.5 *Recreation –Potential Impacts and Mitigation* for a discussion of potential impacts of the Proposed Project on recreation as well as Master Response REC-1. Please refer to Volume III Attachment 1 for the final Section 3.20 *Recreation*.

Please also refer to Master Response HAZ-2.

Comment IND294-9
The KRRC Plan states up to eight years that will be liable for any problems. That is not enough time when we are talking decades for this river basin to recover. Dave Meurer (KRRC) stated at a June 12, 2018 Copco Lake Meeting that results of dam removal will not be known for 50 years.

Response to Comment IND294-9
The EIR evaluates the potential environmental impacts of the Proposed Project, and evaluates feasible measures to mitigate those impacts and alternatives to the Proposed Project. To the extent the comment raises concerns about the enforceability of requirements that the applicant address the environmental impacts of the Proposed Project, and of the ability of the applicant to do so, please note that pursuant to CEQA section 15126.4 subdivision (a) (2), mitigation measures must be fully enforceable through permit conditions, agreements, or other legally binding instruments. Please refer to Master Response CEQ-2 for further discussion of the enforceability requirement for CEQA mitigation measures in the context of FERC proceedings. The State Water Board has issued a draft water quality certification and will issue a final certification that includes implementing water-quality related requirements as a condition of certification. These requirements would become enforceable through incorporation into any Federal Energy Regulatory Commission (FERC) surrender license, as well as under the Clean Water Act (CWA). Please note that potential environmental impacts that are not mitigable are analyzed in the EIR as significant and unavoidable. Volume III Attachment 1 Table ES-1 summarizes the results of the EIR impact analyses, including identifying impacts that are significant and unavoidable and impacts that are avoidable with mitigation.

Please note that the applicant explains mitigation surety for the Proposed Project in updates to the Definite Plan. Klamath River Renewal Corporation (KRRC) has identified Resources Environmental Solutions LLC (RES) as the entity that would assume responsibility for long-term maintenance and adaptive management of mitigation measures, and would function as a specialty corporate indemnitor to cover risks not otherwise fully covered by the Project Agreement or insurance and bond programs (KRRC 2019b, 2020). Please also refer to: http://www.klamathrenewal.org/wp-content/uploads/2019/07/KRRC-July-29-FERC-Filing.pdf and http://www.klamathrenewal.org/wp-content/uploads/2020/02/Public-02-28-2020-Supp-Response-Letter.pdf.

Comment IND294-10
March 13, 2017 Jeremy P Jacobs, EE News Reporter wrote:

"The Klamath River originates from the Upper Klamath Lake, a sprawling fresh water lake in Southern Oregon's high desert that expands to 80,000 acres when full. It is remarkably shallow however and prone to low inflow as well as algae."

This is where the SWRCB and the water quality control group should start their research in Oregon at Klamath Lake. This is where the algae runs downstream into California. It has always run downstream into California since day one before dams were built. The Indians and settlers did not live along the shores of the Klamath River because of the stench, again before dams. One hundred fifty years later, it is the dams fault for water quality?

Response to Comment IND294-10
Please refer to Master Responses WQ-1 and PAP-1.

Comment IND294-11
Jeremy P Jacobs in the same article mentioned above, quotes:

"The four dams at issue, proponents note, serve virtually no purpose. They are outdated and produce hardly any electricity. They don't store or divert water for anyone, and they provide no flood control."

This is a lie. This is what the residents of these reservoirs deal with on a daily basis. Yes, the dams have been operating since 1918, 1925, 1958 and 1962. They supply 77,000 residents and businesses with electricity. The dams have storage for electricity, fish, food storage for all animals, water storage for irrigation, storage for fire prevention and storage for when the salmon come up river. These reservoirs release water for the salmon runs twice a year. These dams provide flood control for everyone that lives around the Klamath River. Without the dams, there is no flood control.

Response to Comment IND294-11
Please refer to Master Responses FLD-1, ENR-1, HAZ-2, WSWR-1, WSWR-2, AQF-1, and TER-1. With respect to the comment about hydropower (electricity), this topic pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (Greenhouse Gas Emissions and Energy).

Comment IND294-12
The reservoirs store water for recreation-like boating, water skiing, canoeing, kayaking, rafting, swimming, fishing and duck and goose hunting. The reservoirs also provide the residents that live around these reservoirs improved property and home values. If the dams are removed we, as residents, lose all around. No one talks of these loses. This is a fact.

Response to Comment IND294-12
Please refer to response to comment IND294-8.

Comment IND294-13
KRRC should put into place how properties around these reservoirs will be reinforced due to slope instability. KRRC should establish cooperation with US Geological surveys (USGS) engineers, National Park Service (NPS) and other public land organizations to establish a landslide observer(s). Emergency response funding has sometimes been used for short-term landslide (rock fall, toppling, creeping, lateral spread) observations and safety determinations following a hazardous failure. This may include aerial reconnaissance combined with NPS search and rescue operations. Designated observers can establish liaison relationships with relevant scientists, general NPS observations and monitoring procedures should be checked, corroborated, or ridiculed by scientists (US NPS).

Response to Comment IND294-13
Regarding potential for landslides, please refer to Volume I Section 3.11.5 Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation, Potential Impact 3.11-3 (pages 3-761 to 3-765) and Master Response GEO-2. Scientific investigations have found no potential for slope failure at Iron Gate Reservoir and J.C. Boyle Reservoir and there would be no significant impact. There is some potential for instability of diatomaceous deposits along the rim and below the Copco No. 1 Reservoir, and Mitigation Measure GEO-1 provides for monitoring and exclusion, if required.

Comment IND294-14
KRRC plan to spend up to $450 million on this project. July 12, 2018, KRRC also said it would cost up to $400 million for fish ladders. No talks about alternative ways NONE, EVER. KRRC also says tax payers would not want to pay for fish ladders.

Response to Comment IND294-14
The EIR presents a range of reasonable alternatives to the Proposed Project. Volume I Section 4.1 *[Alternatives Selection/Overview]* (pages 4-1 to 4-15) discusses 17 potential alternatives in relation to the Proposed Project's underlying purpose and objectives, six of which are examined in detail. Of these six alternatives, two involve removal of all four Lower Klamath Project dams, and four involve two or three dams remaining in place. Potential impacts and beneficial effects are identified for each of these alternatives in the EIR and each will be fully considered by the State Water Board before certifying the EIR (CEQA Guidelines section 15090).

Comment IND294-15
The Indian Tribes are with the KRRC to remove the four dams. Obviously, the Indians Tribes have a lot of pull and are federally recognized. They want the dams removed. 85% plus of Siskiyou residents and 85% plus of Klamath Basin residents voted "NO" against dam removal. We are also federally recognized. We vote and pay taxes. Our voices are not heard nor are our votes being counted at all.

Response to Comment IND294-15
Please refer to Master Response GEN-1.

Comment IND294-16
We are hopeful that SWRCB will finally listen to the real stakeholders in this process. We need more current and updated data before anyone takes another step. KRRC and SWRCB should not be relying on data that was gathered 7 years ago.

Response to Comment IND294-16
As described in Volume I Section 3.1.2 *Introduction – Environmental Setting*, the EIR establishes and evaluates the relevant baseline as part of each resource area. The EIR incorporates available existing information to describe the baseline under CEQA. The environmental setting analysis relies on a range of available information, including studies that are relevant to the description of existing conditions. In some instances, the analyses discuss new or updated studies like those noted in the comment, to confirm the presence and/or extent of a particular resource that has been identified as potentially present using existing information, or to confirm whether associated impacts have the potential to occur. These additional studies can be relevant for a range of reasons, including the abundance of available data for characterizing a resource, the likelihood that data collected in prior studies would change over time and the rate of that change, and the degree of granularity in the existing data. Where the analyses discuss new or updated studies, the EIR conservatively assumes the presence and extent of resources in light of available information, and appropriately evaluates the breadth of potential impacts as well as feasible mitigation. This approach is consistent with CEQA's requirement to describe the environmental

setting in order to "give the public and decision makers the most accurate and understandable picture practically possible of the project's likely near-term and long-term impacts" (CEQA Guidelines section 15125, subd. (a)).

Please also refer to Master Response WQ-4.

Flanagan, Robert

Comment IND290-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND290-1
Thank you for your comment. Please refer to Master Response GEN-1.

Flannes, Steve

Comment IND245-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND245-1
Thank you for your comment. Please refer to Master Response GEN-1.

Flo, Mark

Comment IND355-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND355-1
Thank you for your comment. Please refer to Master Response GEN-1.

Flynn, Pierce

Comment IND306-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND306-1
Thank you for your comment. Please refer to Master Response GEN-1.

Fochetti, John

Comment IND407-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of darn removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND407-1
Thank you for your comment. Please refer to Master Response GEN-1.

Ford, Julie

Comment IND393-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND393-1
Thank you for your comment. Please refer to Master Response GEN-1.

Forster, Mitchell

Comment IND333-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND333-1
Thank you for your comment. Please refer to Master Response GEN-1.

Forsythe, Bruce

Comment IND98-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND98-1
Thank you for your comment. Please refer to Master Response GEN-1.

Friedman, Linda

Comment IND370-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the

project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of darn removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND370-1
Thank you for your comment. Please refer to Master Response GEN-1.

Fujimura, Robert

Comment IND283-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam

removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND283-1
Thank you for your comment. Please refer to Master Response GEN-1.

Gallegos, Jeff

Comment IND422-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of darn removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND422-1
Thank you for your comment. Please refer to Master Response GEN-1.

Gee, Brad

Comment IND86-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undarn the Klamath!

Response to Comment IND86-1
Thank you for your comment. Please refer to Master Response GEN-1.

Gehring, Delbert

Comment IND162-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND162-1
Thank you for your comment. Please refer to Master Response GEN-1.

Gierak, Richard and Chris Stein

Comment IND268-1
It has come to our attention that the removal of four hydroelectric dams on the Klamath River is in violation of five federal laws in addition to exposing all in the affected areas to greter dangers should these dams be removed. Not only Oregon fires but consider the number of California fires that would have been much worse without the reservoirs from these dams.

Response to Comment IND268-1
Thank you for your comment. Please refer to Master Response HAZ-2.

Comment IND268-2
This communication is in reference to the proposed removal of four hydroelectric dams on the Klamath River. The entire proposal is based on the recovery of Coho Salmon which Federal Judge Michael Hogan in 1999 deemed were not indigenous and all listings in Southern Oregon and California waters were deleted. These Coho were planted from the Cascadia hatchery in Central Oregon

Response to Comment IND268-2
Please refer to Master Response AQF-11.

Comment IND268-3
Thank you for your understanding of the seriousness of this proposed action. Proposed dam removal will kill all fish and wildlife dependent on the Klamath for ten years or more. Fire danger will increase without reservoirs used by fire helicopters and homes, businesses and towns along the river will be subject to

severe flooding without the dams protecions. It will also destroy tens of thousands of acres of agricultural lands in Northern California and Southern Oregon.

Response to Comment IND268-3
Please refer to Master Responses AQF-10, TER-1, FLD-1, HAZ-2, WSWR-1, and WSWR-3.

Comment IND268-4
Elections in Siskiyou County California and Klamath County Oregon voted 80% to retain the dams and removal of these dams would be in direct violation of the will of the people and the Constitution. Jackson County in Oregon has also indicated that their voters also want the dams to remain to assure them of irrigation waters and power costs.

Response to Comment IND268-4
Please refer to Master Response GEN-1.

Comment IND268-5
The Reclamation Act of 1902 (43 U.S.C. 391 et seq.) authorized the Secretary of the Interior to locate, construct, operate, and maintain works for the storage, diversion, and development of water for the reclamation of arid and semiarid lands in the western States.

Congress facilitated development of the Klamath Project by authorizing the Secretary to raise or lower the level of Lower Klamath and Tule Lakes and to dispose of the land uncovered by such operation for use under the Reclamation Act of 1902. Starting around 1912, construction and operation of the numerous facilities associated with Reclamation's Klamath Project significantly altered the natural hydrographs of the upper and lower Klamath River. Reclamation's Klamath Project consists of an extensive system of canals, pumps, diversion structures, and dams capable of routing water to approximately 200,000 ac (81,000 ha) of irrigated farmlands in the upper Klamath Basin. Water diversions from from UKL for the Klamath Project affects river flows downstream of Link River and Iron Gate dams. It has come to my attention that in section 372 of the Act the water right becomes an integral part of the property and cannot be taken or reduced.

The headwaters of the Klamath River originate in Southern Oregon and flow through the Cascade Mountain Range to the Pacific Ocean south of Crescent City, California. The river extends nearly 250 miles and is just one of three waterways that pass through the Cascades to the Pacific. It is named after a native American name - klamet - meaning swiftness.

Response to Comment IND268-5
Comment noted.

Comment IND268-6

The Klamath River was designated a Recreational River within the National Wild & Scenic Rivers System in 1981. The Klamath River enters California from Oregon just north of the Goosenest Ranger District. Heading west it is impounded by two dams forming Copco Lake and Iron Gate Reservoir. Nine miles further west it turns south and follows Interstate 5 for a few miles before again turning west and entering the Happy Camp/Oak Knoll Ranger District. The next 85 miles provide many opportunities for recreation and scenic vistas before the river enters the Six Rivers National Forest.

Dam removal would release toxic material that would destroy the habitat for all species in addition to physically changing the course of the Klamath River in direct violation of the National Wild & Scenic Rivers designation.

Response to Comment IND268-6

Section 3.20.5 *Recreation – Potential Impacts and Mitigation* Potential Impact 3.20-7 provides an analysis of the potential effects of the Proposed Project on Wild and Scenic River resources, designations, or eligibility for listing. Contrary to the comment's assertion, the EIR finds that the Proposed Project would either have no impact or would be beneficial, depending on the river reach, for Wild and Scenic River resources designations, or eligibility for listing. Please refer to Volume III Attachment 1 for the final Section 3.20 *Recreation*. Please also refer to Master Response WQ-6.

Comment IND268-7

No State may impose any regulatory action against navigable rivers in the US of which the Klamath River is considered a navigable river. This would also prohibit removal of any dams located on a navigable river in the US by States.

Response to Comment IND268-7

This comment pertains to the application of the U.S. Constitution's dormant Commerce Clause to regulation of navigable waters and thus does not relate to the potential physical impacts of the Proposed Project on the environment (CEQA Guidelines section 15384).

Comment IND268-8

Under the Federal ESA only indigenous species can be listed and under the Final report of Coho Salmon by the Klamath Expert Panel Coho Salmon were planted from Cascadia, Oregon and are not indigenous to the Klamath. In early September 1999, federal district Judge Michael Hogan agreed, throwing out the coho's status as threatened under the Endangered Species Act.

Response to Comment IND268-8

Please refer to Master Response AQF-11.

Comment IND268-9
Removal of these dams would reduce approximately 40% of water from the Klamath River that now goes to Southern Oregon for agriculture which would result in serious loss of agriculture that now stabilize the economy of Southern Oregon

Response to Comment IND268-9
Please refer to Master Response WSWR-1.

Comment IND268-10
I have discovered that the proposed removal of four hydroelectric dams on the Klamath are also in violation of the Klamath River Basin Compact which was ratified by Congress on August 30, 1997.

Response to Comment IND268-10
Please refer to Master Response CEQ-4.

Comment IND268-11
Hydro electric dams supply Northern California and most of Oregon homes and businesses with the least expensive power available. The average homeowner is liable for approximately $200 per month and with the proposed natural gas power supply it would increase their costs to approximately $600 per month.

Response to Comment IND268-11
Please refer to Master Response ENR-1.

Comment IND268-12
It has come to my attention that on the banks of the Klamath River in Northern California that there exists a Union Veterans of the Civil War cemetery that will be destroyed should they illegally remove four hydroelectric dams on the Klamath

Response to Comment IND268-12
Please refer to Section 3.12.5 *Historical Resources and Tribal Cultural Resources – Potential Impacts and Mitigation* Potential Impact 3.12-3 and Potential Impact 3.12-14 for an analysis of potential erosion or flood disturbance impacts to historic and tribal cultural resources located along the Klamath River, by reach. It is the State Water Board's understanding that the cemetery noted in the comment is included in the set of known Tribal Cultural Resource (TCR) sites located along the Klamath River between J.C. Boyle Dam and Copco No. 1 Reservoir and is discussed in Potential Impact 3.12-3. Therefore, the analysis of impacts provided in that section also would apply to the cemetery noted in the comment. Please refer to Volume III Attachment 1 for the final Section 3.12 *Historical Resources and Tribal Cultural Resources.*

Comment IND268-13
At the present time Shasta Indian Tribe burial grounds are protected by Iron Gate Reservoir and removal of this dam their burial grounds could be exposed, plundered and desecrated.

Response to Comment IND268-13
Please refer to Section 3.12.5.1 *Historical Resources and Tribal Cultural Resources – Potential Impacts and Mitigation – Potential Impacts to Tribal Cultural Resources* for a discussion of the potential impacts to Shasta resources and proposed mitigation. Please refer to Volume III Attachment 1 for the final Section 3.12 *Historical Resources and Tribal Cultural Resources.*

Comment IND268-14
We have documentation from both the Shasta Nation and Karuk tribe denying Coho were indigenous to both the Rogue Valley and Klamath basin.

Response to Comment IND268-14
Please refer to Master Response AQF-11.

Comment IND268-15
Removal of these dams would be in serious loss of existing water rights as proposed solutions to avoiding this problem would be in serious possibility of failure and exposed to vandalism.

Response to Comment IND268-15
Please refer to Master Responses WSWR-1, WSWR-2, WSWR-3, WSWR-5, and WSWR-6.

Comment IND268-16
Due to occasional flooding Iron Gate Dam was constructed to serve to protect all that lived on the banks of the Klamath River from catastrophic flooding events. Without this dam property values would fall and expose all with the possibility of loss of life and property.

Response to Comment IND268-16
Please refer to Master Response FLD-1. Additionally, as discussed in Volume I Section 5.4 *Social and Economic Factors Under CEQA* (page 5-3), potential effects from implementing a project that are solely economic in nature, which would include flood and fire insurance rates, would not constitute an effect (i.e., an impact) to the physical environment.

Comment IND268-17
At the present time the dams supply fire helicopters access to water supply to fight forest fires. Removal of these dams would force said fire helicopters to much longer time delays to fill their buckets and thereby expose all to longer wait times and possibility of loss of lives and property.

Response to Comment IND268-17
Please refer to Master Response HAZ-2.

Comment IND268-18
In the late 90's a proposal was made to change the definition of Federal ESA regulations regarding endangered salmon to Ecological Society of America regulations which means that instead of regulations applying only to water and substrate would be changed to allow them regulations up to a mile from the banks of a river. Through the States of Idaho, Washington, Oregon and California State Granges we defeated this change.

In the early 2000's the Granges engaged Pacific Legal Foundation and listings of Coho in Northern California and Southern Oregon were cancelled as the Coho were not indigenous to these waters and rivers.

In the mid 2000's an attempt was made by environmental groups to list Chinook Salmon in the upper Klamath and the Siskiyou County Water Users Association filed a de-listing petition which was successful and the Chinook listing was denied.

Submitted by;

Dr. Richard Gierak

Bachelors Degrees in Biology, Chemistry, Doctorate in the Healing Arts, Director of Interactive Citizens United, Director of New Frontiers Institute, Inc. Prior Participant of FERC and FPAT (Fish passage advisory team report) and HET (Hatchery evaluation team) Prior Vice President of Greenhorn Action Grange, Prior California State Grange Spokesman for the Water Committee, Prior National Whip of the Property Rights Congress of America, Representative of the Grange States of California, Oregon, Washington and Idaho regarding EFH regulations, Prior member of the Siskiyou County Water Users Assoc and former Executive member of the RNC.

Response to Comment IND268-18
Comment noted. This comment refers to prior decisions regarding environmental regulations, including a proposal to include regulation along riverbanks up to a mile from the river, the listing status of coho salmon, and a de-listing petition for Chinook salmon filed by the Siskiyou County Water Users Association, which was successful. Please refer to Master Response AQF-11 for a discussion of the historical status of coho in the Klamath Basin.

Comment IND268-19
Current and future Oregonians are, and should continue to be, beneficiaries of the monumental achievements in water infrastructure that has created Oregon's

exemplary agricultural economy. The proposed removal of the four PacifiCorp dams, including the J. C. Boyle dam in Oregon, will destroy that very infrastructure.

Therefore, I stand alongside the majority of tax-payers and citizens in firm opposition to ODEQ's approval of a water quality certification request for the J. C. Boyle Dam removal project.

The dam removal effort has too many uncertainties which bear negatively on long-term water quality, river habitat and fish spawning grounds due to the river dynamics and existing sedimentary buildup behind the dams.

These dams serve several environmentally beneficial functions by first, creating a series of reservoirs which diminish turbidity and improve water quality as water moves through the system. These reservoirs are essentially giant settling ponds for particulate matter, including erosional debris, dead algae, cobble-sized sediment, pebbles, and valley-fill alluvium. Particulate organic matter, that originates from Upper Klamath Lake, basin agricultural return flows, municipal and industrial sources in the Klamath Falls area, is largely trapped by the J. C. Boyle reservoir. The overall nutrient loads, including naturally occurring phosphorous rich material, settles behind the dam and never reaches the slower moving and shallower gradient portions of the river system. In turn, Copco 1, Copco 2 and Iron Gate Dam reservoirs also serve to keep sedimentary debris from flowing further downstream.

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Although, all four reservoirs are known to have elevated organic loads, they still serve as excellent sedimentary traps. Current estimates range from 15 million to 30 million cubic yards of sediment behind all four dams. The J. C. Boyle dam, had an estimate that was originally 1.5 million cubic yards. Today the estimate has been forced into a range that is deemed politically acceptable, at 600,000 cubic yards. This number is still a ridiculously large volume of sedimentary debris to consider flushing into the California river system. Flushing this debris would be unconscionable and would cause catastrophic harm to the overall river environment, downstream fish populations, spawning grounds and riparian habitats.

Additionally, the toxicity of these enormous volumes of muck and sedimentary composites have not been sufficiently studied. Mining operations have long surrounded the river system throughout So. Oregon and No. California. A U.S. Geological Survey review of mine data (2005), highlights that these past operations released elevated amounts of toxic substances into the watershed,

including arsenic, chromium, copper, lead, mercury, nickel, tungsten, uranium, and zinc.

Oregon has been tightening rules, initiating moratoriums and legislating outright bans on various small-volume run-of-river dredge mining operations for years. Therefore, ODEQ should have serious reservations about the complexities involved in this potential toxic stockpile and be less insistent on approving this certification. Otherwise, the citizens will recognize this current 401-certification process is a politically motivated, agenda-driven water quality charade reeking with double-standards.

The existing dams provide beneficial cleansing structures which allow the massive fresh-flow tributaries, and downstream volumes of low phosphoric, clean water from the western-slope to actually improve water quality as it travels the 250 miles to the Pacific Ocean.

ODEQ should never considering allowing this potential toxic debris into the river system.

First, it will never make it to the Pacific Ocean because deep boulder pockets, gravel and cobble bars and the subsequent multiple confluence embankments and ridges that occur along the lower elevations will trap the overwhelming tonnage of debris.

Additionally, the downstream gradient is too shallow, and the river flows will never be sufficient to mobilize the debris field. ODEQ's permit approval pretends to only be concerned about water quality in Oregon. This is indefensible because all of these toxins, muck and sedimentary debris will devastate the lower river.

The downstream impacts cannot be ignored. From River Mile 160 to the Pacific Ocean the gradient approaches a mere two percent (.1893) grade (Figure-1). The drop to sea level is only a 1600-foot change in elevation, which is only 10 feet per mile. ODEQ certainly knows the typical waste-water or home septic system would require a slope of 110 feet per mile to drain efficiently.

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While dam critics often complain that dam construction has altered the natural sediment transport processes reducing gravel bar and pocket gravel deposits and thereby reducing salmonid and lamprey spawning and rearing habitats, dam removal is not the solution.

The purposeful disbursement of Oregon's debris field into California's portion of the Klamath River system would be an immoral act.

In fact, the debris flow today, with the dams in place, is too heavy for the current channelized flows to successfully push into the Pacific. Even with the benefit of increase flows used for dissolution and flushing programs, which are regulated by the dam structures, there is insufficient flow to clear the mouth of the river (Figure-2).

The J. C. Boyle dam:

- *Provides cool water for the continued operations of Iron Gate Fish Hatchery which releases 7 million anadromous fingerlings annually*
- *Provides clean, renewable, low-cost hydroelectric power for 70,000 households*
- *Reduces peak flood flows by 25 percent*
- *Reduces algae blooms in the Lower Klamath River*
- *Reduces river temperatures in the Lower Klamath River*
- *Reduces river sedimentation and debris buildup in the Lower Klamath River*
- *Provides for lakeside camping, hiking, fishing, boating and recreational opportunities*
- *Provides river rafting and business opportunities*
- *Provides reservoirs for bio-remediation, while trapping toxins and sediment*
- *Allows for flow control and remediation techniques, such as flushing flows*

These positive attributes provide enormous public benefit and sufficient reason for ODEQ's denial of this step in the dam removal certification process.

In closing, there is another item that ODEQ must consider – Cost. Original cost estimates ranged from $1.4 billion and upwards. After 2010, when the US Congress first balked at funding the destruction of the Klamath Dams, there was an enormous effort to "find cost reductions." The results offered nothing more than cost shifting and slight-of-hand congressional Gerry-rigging of payments from various agency-level accounts. Never-the-less, the public was told of a new cost estimate of $800 million, a reduction of $400 million.

Today, the Klamath River Renewal Corp. estimates total cost at $400 - $450 million dollars, an estimated reduction of nearly $1 billion. It appears that if we wait a couple of more years the cost would be halved again!

I suggest, that a neat and tidy, $1 billion cost reduction from the original estimates with an overall price-tag of only $400 million cannot be legitimate, at least not using the same project scope and equivalent efforts. This begs the question, what items will be added to complete the dam removal project and who will fund future restoration and remediation efforts?

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No doubt, tax-payers will end up paying the full-price. They will be burdened with millions of dollars of cost-overruns, future water quality issues, higher rates for base-load electricity, devastated habitat and riparian areas, and the destruction of private property, all because of an over-whelming, unfathomable mindset intent on destroying western civilization's technological advances.

Oregonians should be the beneficiaries of the monumental investments, hard work and successful achievements made possible by our state's water infrastructure. Oregon's status as a modern agricultural and technological engine has been made possible by inexpensive baseload electricity and abundant, well-managed water resources.

Please ensure our heritage by denying approval for the 401 Water Quality Certificate for the removal of the J.C. Boyle dam.

Sincerely,
Dennis Linthicum
OR State Senate – District 28

Response to Comment IND268-19
The Oregon Water Quality Certification for the Lower Klamath Project was issued in September 2018 and is available at https://www.oregon.gov/deq/FilterDocs/ferc14803final.pdf. Comments on the Oregon Water Quality Certification should be submitted to the Oregon Department of Water Quality.

Goff, Gabreil

Comment IND223-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND223-1
Thank you for your comment. Please refer to Master Response GEN-1.

Goldsmith, Dan

Comment IND132-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND132-1
Thank you for your comment. Please refer to Master Response GEN-1.

Goodwin, Charles

Comment IND113-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND113-1
Thank you for your comment. Please refer to Master Response GEN-1.

Graff, Steven

Comment IND242-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the

project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND242-1
Thank you for your comment. Please refer to Master Response GEN-1.

Graham, Glenn

Comment IND445-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam

removal process will create temporary sediment impacts, the long-term benefits of darn removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND445-1
Thank you for your comment. Please refer to Master Response GEN-1.

Grant, Nora and Clancy

Comment IND321-1
As a resident and property owner here in Siskiyou County I implore you to please stop the removal of these dams. I feel that the real reason behind the removal is more of one of dollars in the pockets of Tribal and environmentalist than it is a betterment for the river and fish.

Response to Comment IND321-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment IND321-2
The dams play a very vital part to this county. They provide clean energy, flood control, enough water in the river for the salmon to return and spawn, water for wild fire protection, a bird and turtle refuge, and many more benefits. What happens to all of us property owners when all of this is destroyed by dam removal?? No one wants to answer our questions or concerns. Will this effect our water tables? Will all of us that have properties near the existing lakes lose our wells? Who will compensate us for our devaluation of property if our wells are gone?

Response to Comment IND321-2
For more information on issues relating to flood control, water supply, salmon migration, wildfire protection, and wildlife habitat, please refer to Master Responses FLD-1, GRW-1, WSWR-1, WSWR-3, WSWR-4, ENR-1, TER-1, and HAZ-2. With respect to the comment regarding clean energy, this comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Greenhouse Gas Emissions and Energy*). Please note that CEQA documents analyze significant effects on the physical environment; CEQA does not address potential social or economic effects from implementing a project (CEQA Guidelines, section 15131(a)). However, to inform the public and decisionmakers regarding the potential economic consequences of the proposed project, Volume I includes Section 5.4.1 *Consideration of Economic Information for Resources Potentially Affected by Dam Removal* (pages 5-4 to 5-11), which summarizes the results of prior

economic studies conducted by the U.S. Department of the Interior to characterize potential effects on property value.

Comment IND321-3

Where will the CDF and local volunteer fire departments obtain water for fighting fires? What about the current established eco-system that exists here? What about the local farmers and ranchers that depend on the lakes and rivers for crops and livestock? The wildlife, ranchers, and residents, do we not have a voice in this matter? Do the environmentalists or Tribes Care? No! They do not! As long as their pockets are lined with money they are happy. Warren Buffet and Pacific Power have nothing to lose as they will come out on top either way this goes as does KRRC.

Response to Comment IND321-3

For more information, please refer to Master Responses HAZ-2, TER-1, WSWR-1, and WSWR-2.

Comment IND321-4

Residents here at Irongate Lake Estates, and Copco Lake have fought this for 10+ years to preserve our current way of life and properties. So much of the articles in the press and in the arguments the environmentalists are using are filled with unsubstantiated falsehoods.

Response to Comment IND321-4

Please refer to Master Response GEN-2.

Comment IND321-5

Our families have even been part of the studies done on the supposed danger of the algae . Of which none have shown any side effects. People and dogs swim and play in the lake all summer long, cattle and wildlife drink out of the lake daily and NO ONE dies. In anything there is always going to be one person out of a million that has a reaction to something, whether it is an allergy related incident or just stupidity, but the majority should not have to suffer or be punished just because of one out of a million. There are pictures supposedly taken at Irongate Lake with tons of algae and dead fish. Our family has been at Irongate Lake Estates since 1999 and never once have we seen any of this. There were thousands of dollars given out to do water studies, but when we have asked for reports of results conveniently the water testing lab has gone out of business. Let alone the actual testing being done at all. Why do we not hear about the contamination of the river below all the dams by an illegal Meth Lab which produced one of the largest fish kills ever on the Klamath? Or how the tribes net thousands of salmon at the mouth of the river before the salmon even have a chance to start their journey upstream, while shooting seal lions at the same time so they don't lose any of the salmon to them, and then half of those taken end up rotting and wasted. Have been there and seen it! No one will hear of this or

many other factors as they serve no purpose to the tribe's and environmentalist spew of lies.

Response to Comment IND321-5
Please refer to Master Response GEN-2. For more information regarding algal toxicity, please also refer to Master Response WQ-7. Please refer to Volume I Section 3.4.2.1 *Phytoplankton*, Figures 3.4-2 and 3.4-3 (page 3-394) for photos of blue-green algae blooms in Iron Gate and Copco No. 1 reservoirs. Section 3.2.2 *Water Quality – Environmental Setting* and Appendix C *Water Quality Supporting Technical Information* provide a summary of the results of water quality studies in the Hydroelectric Reach (river and reservoirs), Middle and Lower Klamath River, and the Klamath River Estuary. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality* and the final Appendix C *Water Quality Supporting Technical Information*. Please also refer to Volume I Section 3.4.2 *Phytoplankton and Periphyton – Environmental Setting* (pages 3-392 to 3-421) for a summary of the results of phytoplankton and periphyton monitoring in the Klamath Basin, including blue-green algae monitoring in the Lower Klamath River Project reservoirs.

Section 3.3.2.1 *Aquatic Resources – Aquatic Species – Fish – Anadromous Fish Species* provides a discussion of factors affecting the current abundance of salmonids in the Klamath Basin, including tribal harvest. Section 3.3.5.5 *Aquatic Resources – Fish Disease and Parasites* provides a discussion of fish kills on the Klamath River. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment IND321-6
The contamination of dam removal will last for years as they try to clean up all of silt and re-new the river, towns down river will flood, in the summer and in the fall there will be only a trickle in the now flourishing river, fish will be not be able to come upstream as there will be no stream to come up, maintaining a cooler water temperature will be lost, new sources of electric power will have to be established with costs being passed on to the local residents, the current eco-system and wildlife will suffer and some like the turtles at their refuge will die. We have such a large array of wildlife, and birds including the once endangered osprey, bald and golden eagles that call this home. How can their survival and rights not be considered also. As for the salmon they have not been beyond Irongate Lake for over a century and the existing salmon will never go beyond the fish hatchery even with the dam removed, as most of them were spawned at the hatchery or below the Irongate Dam, even then that will be if and when the contaminated trickle of water will even be enough to allow them to get this far. Ask any of the families that have been in the area for generations, they will tell you about the salmon and how they have witnessed flooding of the river in the spring run offs and how in the late summer and fall that the river would barely be a trickle, but that is not being taken into account.

Response to Comment IND321-6
Please refer to Master Responses GEN-2, FLD-1, TER-1, ENR-1, WQ-1, WQ-2, WQ-3, WQ-6, WSWR-4, GEO-1, and Volume I Potential Impact 3.11-5 [*Geology, Soils, and Mineral Resources - Potential Impacts and Mitigation*] (pages 3-765 to 3-775). For a comprehensive analysis of the effects of the Proposed Project on aquatic resources, including the effects of suspended sediment and increased habitat access, please refer to Section 3.3.5 *Aquatic Resources – Potential Impacts and Mitigation*. Please refer to Volume III Attachment 1 Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project* for a summary of BiOp-related instream flow targets for the Klamath River, which includes daily average minimum flow targets. With respect to the comment regarding new sources of electric power, this topic pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Greenhouse Gas Emissions and Energy*).

Comment IND321-7
This year with all of the wildfires in Northern California and Southern Oregon these lakes were crucial in the fighting of these devastating fires. Although we were evacuated the Irongate Lake saved us and many others from total burn out. The waters from all of the lakes in this removal project were used to supply water for all of the water drops done by fire fighters. We have been speaking with the Cal-Fire employees and whether or not the big wigs in Cal-Fire agree or not is irrelevant, the employees, the ones with the boots on the ground and fighting these wildfires will tell you KRRC plans of dry hydrants and/or deep pools in the river to be used for firefighting is not a viable solution. It has been stated by a local firefighters, with concern, that in this time with the kind of fires that we have experienced and will very likely be experiencing in the future, along with the loss of life and property that we have seen, it is just beyond belief that dam removal with loss of such water resources is still on the table. The reservoirs are used every year and the loss of these resources are inconceivable, and could result in loss of life and property!

Response to Comment IND321-7
For more information on wildfire-related issues, please refer to Master Response HAZ-2.

Comment IND321-8
In addition to the environmental impact, the fire fighting resources, potential devaluation of property, and the strong possibility of a change in the groundwater tables and loss of our wells, there is the loss of a source of clean energy from the hydro-plant on Irongate Lake. Ex Governor Jerry Brown just signed into law that all energy in the state of California by 2045 must be from a clean energy source. So why would it be agreeable to take out an existing clean energy source only to turn around and have to build another?? This defies all logic and reasonable sense.

Response to Comment IND321-8
Comment noted. This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Greenhouse Gas Emissions and Energy*).

Comment IND321-9
I implore you, please help us put a stop to this terrible tragedy once and for all.

Response to Comment IND321-9
Please refer to Master Response GEN-1.

Comment IND322-1
As a resident and property owner here in Siskiyou County I implore you to please stop the removal of these dams. I feel that the real reason behind the removal is more of one of dollars than it is a betterment for the river and fish. The dams play a very vital part to this county. They provide clean energy, flood control, enough water in the river for the salmon to return and spawn, water for wild fire protection, a bird and turtle refuge, and many more benefits.

Response to Comment IND322-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment IND322-2
What happens to all of us property owners when all of this is destroyed by dam removal?? No one wants to answer our questions or concerns. Will this effect our water tables? Will all of us that have properties near the existing lakes lose our wells? Who will compensate us for our devaluation of property if our wells are gone? Where will the CDF and local volunteer fire departments obtain water for fighting fires? What about the current established eco-system that exists here? What about the local farmers and ranchers that depend on the lakes and rivers for crops and livestock? The wildlife, ranchers, and residents, do we not have a voice in this matter? Pacific Power have nothing to lose as they will come out on top either way this goes as does KRRC.

Response to Comment IND322-2
For more information on issues relating to flood control, water supply, salmon migration, wildfire protection, and wildlife habitat, please refer to Master Responses FLD-1, GRW-1, WSWR-1, WSWR-3, WSWR-4, ENR-1, TER-1, and HAZ-2. This comment also pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Greenhouse Gas Emissions and Energy*). Please note that CEQA documents analyze significant effects on the physical environment; CEQA does not address potential social or economic effects from implementing a project (CEQA Guidelines, section 15131(a)). However, to inform the public and decisionmakers regarding the potential economic consequences of the proposed project, Volume I includes Section 5.4.1 *Consideration of Economic Information*

for Resources Potentially Affected by Dam Removal (pages 5-4 to 5-11), which summarizes the results of prior economic studies conducted by the U.S. Department of the Interior (DOI) to characterize potential effects on property value.

Comment IND322-3

This year with all of the wildfires in Northern California and Southern Oregon these lakes were crucial in the fighting of these devastating fires. Although we were evacuated the Irongate Lake saved us and many others from total burn out. The waters from all of the lakes in this removal project were used to supply water for all of the water drops done by fire fighters. We have been speaking with the Cal-Fire employees and whether or not the big wigs in Cal-Fire agree or not is irrelevant, the employees, the ones with the boots on the ground and fighting these wildfires will tell you KRRC plans of dry hydrants and/or deep pools in the river to be used for firefighting is not a viable solution. It has been stated by a local firefighters, with concern, that in this time with the kind of fires that we have experienced and will very likely be experiencing in the future, along with the loss of life and property that we have seen, it is just beyond belief that dam removal with loss of such water resources is still on the table. The reservoirs are used every year and the loss of these resources are inconceivable, and could result in loss of life and property!

Response to Comment IND322-3

Please refer to Master Response HAZ-2.

Comment IND322-4

In addition to the environmental impact, the fire fighting resources, potential devaluation of property, and the strong possibility of a change in the groundwater tables and loss of our wells, there is the loss of a source of clean energy from the hydro-plant on Irongate Lake. Ex Governor Jerry Brown just signed into law that all energy in the state of California by 2045 must be from a clean energy source. So why would it be agreeable to take out an existing clean energy source only to turn around and have to build another?? This defies all logic and reasonable sense.

Response to Comment IND322-4

Comment noted. This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Greenhouse Gas Emissions and Energy*).

Comment IND322-5

As a resident of Irongate Lake Estates I find KRRC's plan for the removal and restoration totally unacceptable. It is filled mostly with speculation of how it will go and end up, with no sound science backing any of it up. And their plan for just piling up the debris of concrete, dirt, clay and whatever else in to hills, covering it up with topsoil and planting local plants on it to make it blend in to surroundings

totally absurd. If this is so appealing to them then let them build these hills of debris in their back yards!!!!

Response to Comment IND322-5
Disposal of debris from dam removal is described in Volume I Sections 2.7.1.2 *Proposed Project – Proposed Project – Dam and Powerhouse Deconstruction – Copco No. 1 Dam and Powerhouse*, 2.7.1.3 *Copco No. 2 Dam and Powerhouse*, and 2.7.1.4 *Iron Gate Dam and Powerhouse – Staging Areas and Disposal Sites* (pages 2-33 to 2-35, 2-43, and 2-49 to 2-51), and the associated disposal site locations are shown on Figures 2.7-2 and 2.7-4. Section 3.19.5 *Aesthetics – Potential Impacts and Mitigation* has been revised to clarify the locations of the proposed disposal sites for Copco No. 1, Copco No. 2, and Iron Gate dams, including a summary table of the key observation points from which views of the proposed disposal sites would be possible in the short term and long term under the Proposed Project, and the key observation points from which views of the proposed disposal sites would not be possible (Table 3.19-3 in Volume III Attachment 1 Section 3.19.5 *Aesthetics – Potential Impacts and Mitigation*). Potential Impact 3.19-6 has been revised to clarify that in the short term (i.e., during construction and before revegetation occurs), the concrete disposal sites would be visible as constructed features incongruous with a natural landscape. However, at the Copco 1 No. 1 and Copco No. 2 dam disposal site, the concrete pile, while not aesthetically pleasing, would not be visually incongruent because of the existing substantially disturbed character of that area. The Iron Gate Dam disposal site would not be visible from any of the identified existing key observation points because it is on a plateau area above the Iron Gate Dam complex; therefore, even though the concrete disposal would be incongruous with the existing landscape prior to revegetation, it would not create a significant visual impact in the short term. Potential Impact 3.19-5 has been revised to clarify that in the long term, there would not be a permanent visual impact of the concrete disposal site for Copco No. 1 and Copco No. 2 dams because this area is already visually degraded by the presence of the two dam complexes, and the disposal site would be naturally-contoured, covered with soil, and revegetated such that it would visually blend with the surrounding landscape. Similarly, in the long term, there would not be a permanent visual impact of the Iron Gate Dam disposal site because once it is contoured, covered with soil, and revegetated, the form and color of the site would generally conform with adjacent landforms, vegetation, color, and scenery. Please refer to Volume III Attachment 1 Section 3.19.5 *Aesthetics – Potential Impacts and Mitigation* for the revisions. The proposed debris disposal and management approach is not uncommon for large-scale construction projects.

Comment IND322-6
You have the opportunity to stop this tragedy now instead of waiting until it all goes terribly wrong and reaping the consequences of the error of your decision to remove these dams.

Ultimately when all is said and done and this whole scenario goes totally array we will hold YOU responsible and liable.

Response to Comment IND322-6
Please refer to Master Response GEN-1.

Comment IND323-1
This year with all of the wildfires in Northern California and Southern Oregon these lakes were crucial in the fighting of these devastating fires. Although we were evacuated the Irongate Lake saved us and many others from total burn out. The waters from all of the lakes in this removal project were used to supply water for all of the water drops done by fire fighters. We have been speaking with the Cal-Fire employees and whether or not the big wigs in Cal-Fire agree or not is irrelevant, the employees, the ones with the boots on the ground and fighting these wildfires will tell you KRRC plans of dry hydrants and/or deep pools in the river to be used for firefighting is not a viable solution. It has been stated by a local firefighters, with concern, that in this time with the kind of fires that we have experienced and will very likely be experiencing in the future, along with the loss of life and property that we have seen, it is just beyond belief that dam removal with loss of such water resources is still on the table. The reservoirs are used every year and the loss of these resources are inconceivable, and could result in loss of life and property!

Response to Comment IND323-1
Thank you for your comment. Please refer to Master Responses HAZ-2 and GEN-2.

Comment IND323-2
It is my understanding that only certain states require sediment management plans prior to a dam removal (Csike and Rhoads, 2010) and I am concerned regarding the lack of clarity about the acceptable magnitude and/or the duration of contaminated sediment release from a former reservoir after the removal of the dam.

Response to Comment IND323-2
With respect to information regarding potential contaminants in reservoir sediment deposits, please refer to Master Response WQ-6, as well as Section 3.2.2.8 *Water Quality – Environmental Setting – Inorganic and Organic Contaminants – Sediment Contaminants* and Section 3.2.5 *Water Quality – Potential Impacts and Mitigation*. The "acceptable magnitude and/or duration of contaminated sediment release" is defined in the EIR significance criteria (see Section 3.2.3 *Water Quality – Significance Criteria*). Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Regarding a "sediment management plan", the Definite Plan (see Volume II Appendix B: *Definite Plan – Appendix M*) includes a Water Quality Monitoring

Plan to assess the Proposed Project's impacts to water quality, and this plan includes turbidity and suspended sediment concentration (SSC) monitoring along with adaptive management requirements. Please note that the State Water Board has authority to review and approve any final Water Quality Monitoring Plan through its water quality certification under Clean Water Act Section 401.

Comment IND323-3
There have been recent controversies surrounding several dam removals which indicate continued concern regarding contaminated sediment issues and will continue to grow in importance in dam removal and river restoration projects.

Response to Comment IND323-3
Comment noted.

Comment IND323-4
The lack of clarity and/or duration may be grounds for litigation, which exposes the organizations that are involved in this dam removal and supposed river restoration to liability risks.

Response to Comment IND323-4
Comment noted. Please note that the Klamath River Renewal Corporation's (KRRC's) liability does not concern potential environmental impacts of the Proposed Project. For information on the issue of liability, please refer to KRRC (2019b) here: http://www.klamathrenewal.org/wp-content/uploads/2019/07/KRRC-July-29-FERC-Filing.pdf.

Comment IND323-5
I just got through reading a file that was sent to me by U.S. Senator Dianne Feinstein and was appalled by some of what I was reading.

Response to Comment IND323-5
This comment indicates that the reader was appalled by reading a file that was sent by U.S. Senator Dianne Feinstein. Comment noted.

Comment IND323-6
As a resident of Irongate Lake Estates I find KRRC's plan for the removal and restoration totally unacceptable. It is filled mostly with speculation of how it will go and end up, with no sound science backing any of it up. And their plan for just piling up the debris of concrete, dirt, clay and whatever else, that maybe toxic, in to hills, covering it up with topsoil and planting local plants on it to make it blend in to surroundings totally absurd. If this is so appealing to them then let them build these hills of debris in their back yards!!!!

Response to Comment IND323-6
Disposal of concrete and earthen material from dam removal is described in Volume I Sections 2.7.1.2 *Proposed Project – Copco No. 1 Dam and*

Powerhouse, 2.7.1.3 *Copco No. 2 Dam and Powerhouse*, and 2.7.1.4 *Iron Gate Dam and Powerhouse – Staging Areas and Disposal Sites* (pages 2-30 to 2-40, 2-40 to 2-45, and 2-45 to 2-53), and the associated disposal site locations are shown on Figures 2.7-2 and 2.7-4. Present-day contours suggest that the disposal sites were originally used as borrow sites during dam construction, thus returning material to these areas could represent a return to pre-dam conditions. The proposed on-site disposal approach for concrete and earthen material associated with the dams is not uncommon for large-scale construction projects.

Section 3.19.5 *Aesthetics – Potential Impacts and Mitigation*, including Potential Impact 3.19-5 and Potential Impact 3.19-6, has been revised to include an analysis of the potential visual impacts of the concrete and earthen material disposal sites. The revisions do not change the impact significance determinations. Please refer to Volume III Attachment 1 Section 3.19.5 *Aesthetics – Potential Impacts and Mitigation* for the revisions.

Also, please refer to Master Response HAZ-1 for a discussion of identification and disposal of hazardous materials.

Comment IND323-7
You have the opportunity to stop this tragedy now instead of waiting until it all goes terribly wrong.

Response to Comment IND323-7
Please refer to Master Response GEN-1.

Greyraven, Cynthia

Comment IND129-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people, pets, livestock, and wildlife. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND129-1
Thank you for your comment. Please refer to Master Response GEN-1.

Gross, John

Comment IND406-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of darn removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND406-1
Thank you for your comment. Please refer to Master Response GEN-1.

Growney, Karen

Comment IND388-1

I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND388-1

Thank you for your comment. Please refer to Master Response GEN-1.

Gustafson, Sharon

Comment IND256-1

I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Water is life! We need more unrestrained rivers for wildlife, recreation, and environmental health. This is a great opportunity to make that happen without impacting agriculture.

Response to Comment IND256-1
Thank you for your comment. Please refer to Master Response GEN-1.

Hagen, William

Comment IND193-1
Haven't the dam owners profited handsomely enough to fund their long-overdue removal?

I strongly support the full removal of the lower four Klamath River dams. l11e Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-tem1 benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND193-1
Thank you for your comment. Please refer to Master Response GEN-1.

Hager, Steven

Comment IND241-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND241-1
Thank you for your comment. Please refer to Master Response GEN-1.

Halvorson, Keith

Comment IND384-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of darn removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND384-1
Thank you for your comment. Please refer to Master Response GEN-1.

Hamann, R.B.

Comment IND304-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND304-1
Thank you for your comment. Please refer to Master Response GEN-1.

Hammerstad, Charles

Comment IND110-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND110-1
Thank you for your comment. Please refer to Master Response GEN-1.

Hammerstad, Chuck

Comment IND122-1
I support the removal of the 4 lower dams on the Klamath River, and the short term water quality issues will rectify naturally and result in a cleaner, colder river that will benefit both people and the fishery in the years ahead. The Klamath River for years has suffered water quality issues with unhealthy blue-green algae coming from the dams, and this has caused a public health issue and advisory in most years, as well as a fish disease called "ich". Dam removal will correct this problem, and make the river healthier and recover salmon and steelhead.

Response to Comment IND122-1
Thank you for your comment. Please refer to Master Response GEN-1.

Haselden, Julie

Comment IND392-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND392-1
Thank you for your comment. Please refer to Master Response GEN-1.

Haufler, James

Comment IND430-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND430-1
Thank you for your comment. Please refer to Master Response GEN-1.

Haupt, Kenneth

Comment IND379-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of darn removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND379-1
Thank you for your comment. Please refer to Master Response GEN-1.

Hauser, Dan

Comment IND133-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND133-1
Thank you for your comment. Please refer to Master Response GEN-1.

Henderson, Peggy

Comment IND165-1
We will lose all of our lake fish if the dams go out, which will pretty much destroy our way of life living here.

Response to Comment IND165-1
Thank you for your comment. Please refer to Potential Impact 3.20-2 for a discussion of the long-term changes to or loss of reservoir-based recreation activities and facilities due to removal of Iron Gate and Copco No. 1 reservoirs, including an analysis of the effects of the Proposed Project on recreational fishing in the reservoirs. The final Section 3.20 *Recreation* is presented in Volume III Attachment 1.

Comment IND165-2
My husband and I moved here in 2002 at the urging of Don and Corky Minion, my husband's surrogate parents. We immediately fell in love with the area, the lake, and the folks living here. We invested our time, our money, and our talents, serving as reserve deputies with the Siskiyou County Sheriff's Department for eight years.

This is our home, and where my husband passed away three years ago. Our children, grandchildren, and great-grandchildren come here every year to visit and enjoy this fishing paradise.

Response to Comment IND165-2
Please refer to Master Response GEN-2.

Comment IND165-3
Taking the dams out and reducing the Klamath River to a stream will destroy most of the fish in the Klamath River. And destroy the way of life for the people living here, many of whom have lived here most of their lives.

Response to Comment IND165-3
The EIR does not conclude that the Proposed Project would destroy most of the fish in the Klamath River. Please refer to Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* for a comprehensive analysis of the effects of the Proposed Project on aquatic resources in the Klamath River. The final Section 3.3 *Aquatic Resources* is presented in Volume III Attachment 1.

Comment IND165-4
In 1916-1920, the Copco Lake dam was built by American engineers, with the addition of turbines, providing the cleanest and cheapest electricity to tens of thousands of residents and businesses in Siskiyou County, California, and the Southern Oregon area .

Response to Comment IND165-4
Comment noted.

Comment IND165-5
I believe an in-depth feasibility study, backed up by proven scientific data, should be done before reaching any conclusions about taking out the existing dams and lakes.

Response to Comment IND165-5
There have been numerous studies that contemplated removal of the Lower Klamath Project facilities over the past 25 years. Please refer to Volume I Section 2.6.4 *Proposed Project – Project Background – Prior/Related Environmental Reviews* (pages 2-24 to 2-25) for a brief introduction to the three past environmental reviews of Klamath River dam removal, including the 2012 Klamath Hydroelectric Settlement Agreement (KHSA) Environmental Impact Statement/Environmental Impact Report (EIS/EIR), the Federal Energy Regulatory Commission's (FERC's) 2007 National Environmental Policy Act (NEPA) document, and the U.S. Bureau of Reclamation's (USBR's) 2016 Supplemental Information Report. These documents provide a great deal of information regarding the existing Klamath Hydroelectric Project (KHP), the various alternatives for the future of the hydroelectric facilities, and the potential impacts of and mitigation measures for these alternatives. After careful consideration and review of past environmental documents prepared for the Klamath Hydroelectric Project, the State Water Board determined it should develop this EIR as a separate document, rather than adopting one of the existing reviews; please refer to Section 2.6.4 *Proposed Project – Project Background – Prior/Related Environmental Reviews* (pages 2-24 to 2-25) for a list of the reasons behind that decision.

Heneveld, Trevor

Comment IND207-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND207-1
Thank you for your comment. Please refer to Master Response GEN-1.

Hickox, Robert

Comment IND291-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND291-1
Thank you for your comment. Please refer to Master Response GEN-1.

Hill, Michelle

Comment IND335-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND335-1
Thank you for your comment. Please refer to Master Response GEN-1.

Hineser, Mark

Comment IND354-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND354-1
Thank you for your comment. Please refer to Master Response GEN-1.

Hogue, Marc

Comment IND364-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the

project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of darn removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND364-1
Thank you for your comment. Please refer to Master Response GEN-1.

Hohler, David

Comment IND145-1
As a fish biologist that started working in the Klamath Basin over 30 years ago, I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam

removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND145-1
Thank you for your comment. Please refer to Master Response GEN-1.

Holloway, David

Comment IND150-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND150-1
Thank you for your comment. Please refer to Master Response GEN-1.

Howard, Jeff

Comment IND421-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND421-1
Thank you for your comment. Please refer to Master Response GEN-1.

Hrobuchak, David

Comment IND146-1
I strongly support the full and immediate removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND146-1
Thank you for your comment. Please refer to Master Response GEN-1.

Hull, Danny

Comments IND156-1, IND157-1, IND158-1, IND177-1
The California State Water Resources Control Board, 12/27/2018 Draft Environmental Impact Report (EIR) for the Lower Klamath Project License Surrender, is deficient for not providing consideration and analysis of a One Dam Removal Alternative for Iron Gate, Copco 1, Copco 2, and J.C. Boyle Dams, that explains any major detriments and major benefits incurred from--while leaving three of those dams permanently nonremoved--removing only each one of those dams.

Response to Comments IND156-1, IND157-1, IND158-1, IND177-1
Thank you for your comment. Consistent with CEQA Guidelines section 15126.6 (a), the Lower Klamath Project EIR presents a range of reasonable alternatives to the Proposed Project. As described in Volume 1 Section 4.1 *Alternatives Selection/Overview* (pages 4-1 to 4-15), 17 potential alternatives in relation to the Proposed Project's underlying purpose and objectives, six of which are examined in detail. Of these six alternatives, two involve removal of all four Lower Klamath Project dams, and four involve two or three dams remaining in place. Potential impacts and beneficial effects are identified for each of these alternatives in the EIR and each will be fully considered by the State Water Board before certifying the EIR (CEQA Guidelines section 15090). A one-dam removal scenario was not raised during public scoping for the Lower Klamath Project, and the comment does not provide a reason for the assertion that removing one of the four Lower Klamath Project dams would be a reasonable alternative to consider.

Comments IND156-2, IND157-2, IND158-2, IND177-2
Herewith now this February 25, 2019 I vote in rejection of, and against granting KRRC the water quality certification for the "Proposed Project" of removing the dams and associated facilities that together form the Lower Klamath Project (FERC Project No. 14083), that on September 23, 2016, the KRRC applied to the California State Water Resources Control Board to receive.

Response to Comments IND156-2, IND157-2, IND158-2, IND177-2
Please also refer to Master Response GEN-1.

Comment IND156-3, IND157-3, IND158-3, IND177-3
My additional comments on the California State Water Resources Control Board Draft Environmental Impact Report for the Lower Klamath Project License Surrender, are as follows:

ES-4 "Proposed Project Objectives The State Water Board has identified the following Proposed Project objectives, as required under CEQA Guidelines, section 15124, subdivision (b): In a timely manner: 1. Improve the long-term water quality conditions associated with the Lower Klamath Project in the California reaches of the Klamath River, including water quality impairments due to Microcystis aeruginosa and associated toxins, water temperature, and levels of biostimulatory nutrients. 2. Advance the long-term restoration of the natural fish populations in the Klamath Basin, with particular emphasis on restoring the salmonid fisheries used for subsistence, commerce, tribal cultural purposes, and recreation. 3. Restore volitional anadromous fish passage in the Klamath Basin to viable habitat currently made inaccessible by the Lower Klamath Project dams. 4. Ameliorate conditions underlying high disease rates among Klamath River salmonids.

The objectives further the underlying purpose of the Proposed Project, which is the timely improvement of water quality related to the Lower Klamath Project within and downstream of the current Hydroelectric Reach and the restoration of anadromous access upstream of Iron Gate Dam (the current barrier to anadromy)."

ES-17 "fish survival through fishways would be reduced as compared to through undammed stream reaches. " . . . " would not improve other water quality conditions".

ES-18 "Because the dams and reservoirs would remain, they would still continue as an impairment to migration that is not present under the Proposed Project." ES-18 "However, while this alternative would further the underlying purpose and related objectives of providing fish passage upstream of Iron Gate Dam, fish survival through fishways would be reduced as compared to through undammed stream reaches"

Rather than the immediately aforegiven oversimplistic ES-18 quote, California State Water Board might assert that "However, while this alternative would further the underlying purpose and related objectives of providing fish passage upstream of Iron Gate Dam, fish survival per fishways passage might be reduced as compared to passage through undammed stream reaches, depending on the fishways' construction and protection from poaching and predation, although fishways for the dams would be greatly shorter in length than river length from the dams to the dams' reservoir headwaters, and the dam reservoirs afford both greater protection from predation and poaching of adult migrant fish than do many undammed stream reaches, and in the case of J.C. Boyle, Copco 1 and Iron Gate dams, much Upper Klamath Lake-like algae-sheltered shoreline habitat for juvenile fish--including anadromous fish--rearing and migration.

Response to Comment IND156-3, IND157-3, IND158-3, IND177-3
The sentences quoted from Volume 1 of the EIR, pages ES-17 and ES-18, are summary statements appropriate for the Executive Summary of a large document. Please refer to Volume 1 Section 4.4 *[Alternatives] Continued Operations with Fish Passage Alternative* (pages 4-99 to 4-180) for a detailed analysis of the potential impacts of this alternative on the environment. In particular, Volume 1 Section 4.4.3.7 *Alternatives – Continued Operations with Fish Passage Alternative – Aquatic Resources – Fish Passage* (pages 4-131 to 4-162) presents a discussion of potential impacts associated with fish passage at the four Lower Klamath Project dams.

Comment IND156-4, IND157-4, IND158-4, IND177-4
ES-19 ". . . elimination of whitewater recreation flows . . .", ". . . fish survival through fishways would be reduced as compared to passage through un-dammed stream reaches . . ."

Whitewater recreation flows could continue from winter and spring seasons-stored Klamath River water, and also could be provided per temporary curtailment of hydroelectric power generation accompanied with increased J.C. Boyle Dam water storage. J.C. Boyle Dam's water release doesn't have to be restricted to constant hydroelectric power production and fish habitat water flow.

Response to Comment IND156-4, IND157-4, IND158-4, IND177-4
The sentence quoted from EIR page ES-19 is a summary statement appropriate for the Executive Summary of a large document. Please refer to Volume 1 Section 4.4.1 *Alternatives – Continued Operations with Fish Passage Alternative – Introduction* (pages 4-99 to 4-101) for a discussion of the hydrology assumptions related to recreation flows for this dams-in alternative. Volume 1 Section 4.4.20 Alternatives – *Continued Operations with Fish Passage Alternative – Recreation* (pages 4-176 to 4-178) presents a discussion of potential impacts of this dams-in alternative on recreational activities on the Klamath River, including whitewater boating.

Comment IND156-5, IND157-5, IND158-5, IND177-5
Assuming no fish habitat benefit of the Klamath River hydroelectric dam reservoirs, and no fish migration benefit of properly constructed and properly protected Klamath River hydroelectric dam fishways, is again oversimplistic (see ES-18 comment above).

Response to Comment IND156-5, IND157-5, IND158-5, IND177-5
The sentence quoted from Volume I *Executive Summary* page ES-18 is a summary statement appropriate for the Executive Summary of a large document. Section 4.4 *Alternatives – Continued Operations with Fish Passage Alternative* considers the Lower Klamath Project reservoirs as a potential source of rearing habitat, albeit one that would be limited by exisitng water quality conditions. For example, as described Section 4.2.3.2 *Alternatives – No Project Alternative – Aquatic Resources – Aquatic Resource Potential Impacts, Impacts, and Mitigation* Potential Impact 4.2.3-7 (page 4-138) for fall-run Chinook salmon, fish migrating through the Lower Klamath Project reservoirs would be exposed on a seasonal basis to some degree of stressful water quality conditions, including summer and fall high water temperatures in reservoir surface layers, low dissolved oxygen in reservoir middle and bottom layers, changes in dissolved oxygen, pH, and ammonia associated with algal blooms, and exposure to microcystin from *Microcystis aeruginosa* blooms (Dunsmoor and Huntington 2006, FERC 2007). These conditions can become stressful to fish, contributing to lower resistance to disease during June through September. Based on the reservoir dynamics and the predator population that currently occurs within the reservoirs, predation of outmigrating salmonids upstream of Iron Gate Dam likely would be low (NMFS 2006a). In restoration efforts elsewhere in the Pacific Northwest, anadromous juveniles have successfully passed through reservoirs under similarly difficult circumstances (NMFS 2006a).

The EIR does not conclude “no fish migration benefit” from provision of fish passage, as described in Volume I Section 4.4.3.7 *Alternatives – Continued Operations with Fish Passage Alternative – Aquatic Resources – Fish Passage* (page 4-137) analyzes the effects of fishways on aquatic resources and finds that while fish migrating through fishways may experience delay, injury, and mortality beyond what would occur from natural migration in the absence of dams and reservoirs (FERC 2007) (page 4-132), fishways would provide anadromous fish access to historical habitat and the benefits commensurate with increased habitat access.

Comment IND156-6, IND157-6, IND158-6, IND177-6
ES-24 "However, the Proposed Project is a restoration project aimed at improving the aquatic ecosystem in the Klamath River over the long term."

The "Proposed Project"'s premise of "restoration" is an oversimplification, and likely a subterfuge, and it should rather be termed a "partial restoration", because the Klamath River is a well established multiple use--including agriculture

irrigation, hydroelectric power, reservoir recreation, flood control, gold mining, remediated waste water transporting, waterfowl hunting, fire suppression, warm water nonnative game fish fishing, wildlife habitat, commercial fish harvesting, and log rafting--industrial river, and the "Proposed Project"s' "restoration" of the Klamath River towards a former wild and scenic status, excessively denies humanity of natural ecosystem-supportive Klamath River vital human life support, and is ambiguous due to current long term anthropogenically caused increasing global warming climate change, and increasing vital agricultural irrigation need (e.g., lowered Upper Klamath Basin water table), and global warmingreduced average annual Klamath River watershed snowpack storage, and increasing climate-protecting clean renewable energy need, and permanent loss of 70,000 homes worth of clean renewable hydroelectric power production. Indeed, Pacific Corp's "surrender of license" to KRRC for the purpose of the Proposed Project's "Klamath River restoration" proposition, is a corrupt ploy effort to: Avoid future litigation about futurely installed dam fishways' fish passage, substitute pisciculture and commercial fish harvesting for agriculture, substitute fossil fuel-powered energy production for clean renewable 24 hours 7 days a week hydroelectric power, unnecessarily destroy both three very good hydroelectric dams and one nearly excellent hydroelectric dam.

Response to Comment IND156-6, IND157-6, IND158-6, IND177-6
Comment noted. The sentence quoted from Volume I *Executive Summary* page ES-24 is a summary statement appropriate for the Executive Summary of a large document. With respect to the comment's assertion regarding the premise of restoration, please refer to Volume I Section 2.6.1 *Proposed Project – Project Background – Water Conflicts in the Klamath River Basin* (pages 2-20 to 2-22), which presents timeline highlights of major water-related milestones and issues in the Klamath Basin over approximately the last few decades; the various water quality and resource impacts shown in the timeline provide context for the underlying purpose and objectives of the Proposed Project, as stated in Volume I Section 2.1 *Proposed Project – Project Objectives* (page 2-1). The EIR considers the multiple beneficial uses associated with the Klamath River throughout the analyses – please refer to Master Responses WSWR-1, WSWR-3, REC-1, FLD-1, HAZ-2, TER-1, and GEN-2. The comments regarding renewable energy and hydroelectric power generation pertain to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Greenhouse Gas Emissions and Energy*). With respect to the comment regarding the wild and scenic status of the river, the EIR acknowledges that the Klamath River beginning 3,600 feet downstream of Iron Gate Dam and continuing to the Klamath Estuary (i.e., Middle and Lower Klamath River) is designated a wild and scenic river segment by both the State of California and the federal government. Thus, this status is considered as part of the CEQA baseline and is discussed in resource area environmental setting and potential impact analysis discussions including Section 3.2.3 *Water Quality – Significance Criteria*, Section 3.3.2.2 *Aquatic Resources – Environmental Setting – Physical Habitat Descriptions – Upper Klamath River – Hydroelectric Reach,*

Section 3.14.5 *Land Use and Planning – Potential Impacts and Mitigation* Potential Impact 3.14-2, Section 3.19.2 *Aesthetics – Environmental Setting*, Section 3.19.3 *Aesthetics – Significance Criteria*, Section 3.20.2.1 *Recreation – Environmental Setting – Regional Recreation*, Section 3.20.2.4 *Recreation – Environmental Setting – Wild and Scenic River Conditions*, Section 3.20.3 *Recreation – Significance Criteria*, Section 3.20.4.5 *Recreation –Impact Analysis Approach – Wild and Scenic Rivers*, and Section 3.20.5 *Recreation – Potential Impacts and Mitigation* Potential Impact 3.20-6 and Potential Impact 3.20-7.

Please refer to Volume 1 for Section 3.14 *Land Use and Planning* (specifically page 3-885) and Volume III Attachment 1 for the final Section 3.2 *Water Quality*, Section 3.3 *Aquatic Resources*, Section 3.19 *Aesthetics*, and Section 3.20 *Recreation*.

Comment IND156-7, IND157-7, IND158-7, IND177-7

ES-24 "It is clear that the Klamath River has significantly degraded water quality and aquatic resources, and that these ongoing impacts stem from multiple factors including operation of the hydroelectric facilities."

It is not so "clear" that Klamath River has "significantly degraded water quality and aquatic resources . . . that . . . stem from multiple factors including operation of the hydroelectric facilities", rather than ". . . that . . . stem . . . from multiple factors, including in the case of the hydroelectric facilities: (1) Primarily a lack of selective thermal mixing and withdrawal facilities, to release late summer and early fall Copco 1 Dam and Iron Gate Dam reservoirs' stratified waters, downriver in Klamath River of; (2) negligibly from the J.C. Boyle Dam facilities; (3) no water quality degradation from Copco 2 Dam facilities, and substantial aquatic resources degradation, that can easily be completely alleviated per fishways installation in Copco 2 Dam facilities.

In distinguishing the California Klamath River hydroelectric dam reservoirs' water quality contribution to the Klamath River, Upper Klamath Lake hypereutrophic water quality appears significantly to have much the same thermal chemistry as the California Klamath River hydroelectric dams' reservoirs' water quality, when Upper Klamath Lake's water quality is at equivalent temperatures to the California Klamath River hydroelectric dams' reservoirs' water quality temperatures. Climate change, diminished annual natural watershed water storage, and industrially modified (including irrigation, treated wastewater, urban and agricultural runoff) water flow are partly compensated for per the Klamath River dam reservoirs, as the reservoirs allow humanity to maintain water flow from Iron Gate Reservoir for 190 miles to the sea, and--per selective water release from thermally stratified Iron Gate reservoir--to modify water temperature in the Klamath River from Iron Gate Reservoir for several miles downriver of Iron Gate Reservoir. Ammonia and CO2 that are produced from decomposition in the reservoirs, are also produced from the undammed river reaches, however the greater turbulence of the undammed river reaches mixes the ammonia and CO2

faster with the atmosphere than does J.C. Boyle, Copco 1--though not Copco 2--, and Iron Gate dams' reservoirs.

Response to Comment IND156-7, IND157-7, IND158-7, IND177-7
The sentence quoted from the EIR page ES-24 is a summary statement appropriate for the Executive Summary of a large document.

J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate dams and the associated reservoirs and hydropower generation facilities influence water quality in more ways than described by the comment. Section 3.2.2 *Water Quality - Environmental Setting* and Appendix C *Water Quality Supporting Technical Information* provide a summary of the water quality conditions in the Lower Klamath Project EIR water quality Area of Analysis. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality* and the final Appendix C *Water Quality Supporting Technical Information*. Section 3.3.2 *Aquatic Resources - Environmental Setting* provides a summary of the aquatic resources under existing conditions in the Lower Klamath Project EIR aquatic resources Area of Analysis. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Please refer to Master Response WQ-1 for a discussion of the role of the Lower Klamath Project dams/reservoirs with respect to overall water quality in the Klamath River. As described in Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*, the amount of flow in the Klamath River is determined by the operation of the Klamath Irrigation Project by the U.S. Bureau of Reclamation (USBR) and the applicable biological opinion(s) (BiOp) to meet the needs of listed species and maintain full irrigation deliveries in accordance with existing contracts, contingent upon available water supplies. The Proposed Project does not include any changes to the amount of flow released by the Klamath Irrigation Project and the applicable biological opinion(s). According to the 2019 National Marine Fisheries Service (NMFS) biological opinion (2019 NMFS BiOp), the compliance point for the minimum Klamath River flow targets would shift upstream from Iron Gate Dam to Keno Dam if dam removal occurs and USBR and NMFS would coordinate to determine the appropriate releases at Keno Dam to provide flows downstream of Iron Gate Dam consistent with NMFS' expectations under the existing 2019 NMFS BiOp (NMFS 2019). As such, the minimum flows during summer and fall would be similar under existing conditions and the Proposed Project. Please refer to Volume III Attachment 1 for the final Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*.

Please refer to Master Response WQ-2 for a discussion of the potential for releases from the Lower Klamath Dams to reduce the Klamath River water temperature during summer and fall. Additionally, recent testing by PacifiCorp of an intake barrier curtain in Iron Gate Reservoir did not demonstrate that preferential withdrawal of deeper, cooler reservoir would reliably cool summer

and fall water releases from Iron Gate Dam, or consistently achieve the water temperature allocations in the Klamath total maximum daily loads (TMDLs) while achieving dissolved oxygen water temperature objectives in the Klamath River. Potential water temperature improvements from operation of the curtain (i.e., 1 to 2°C [1.8 to 3.6°F]) would still not achieve water temperature objectives and would not be able to consistently occur all the time because the dissolved oxygen concentration in deeper, cooler reservoir waters would potentially be too low to achieve dissolved oxygen water quality objectives even with additional mechanical aeration (i.e., turbine venting) at Iron Gate Dam. During 2017, the curtain had to be completely rolled up (i.e., no longer drawing from deeper, cooler reservoir waters) to achieve dissolved oxygen concentrations for aquatic life (PacifiCorp 2018a).

Additionally, please refer to Volume I Section 4.5.2 *Two Dam Removal Alternative – Water Quality* (pages 4-186 to 4-204) for a discussion of how the presence of J.C. Boyle and Copco No. 2 dams would influence Klamath River water quality even without Copco No. 1 and Iron Gate dams.

Appendix C, Section C.3 *Nutrients* provides a discussion of the dissolved nutrient conditions, including ammonia and ammonium concentrations, in the Hydroelectric Reach, the Middle and Lower Klamath Project, and the Klamath River Estuary. Ammonia and ammonium are naturally formed in the river environment, but the turbulent, oxygen-rich Klamath River would more rapidly convert these into other less toxic and bioavailable forms of nitrogen than would occur in the Lower Klamath Project reservoirs. Additionally, turbulent, oxygen-rich conditions in the Klamath River would limit anoxic conditions along the streambed that would convert organic nitrogen to ammonia/ammonium. Measurements of ammonia/ammonium in the Lower Klamath Project reservoirs, especially at lower reservoir depths, indicate the anoxic conditions that form during seasonal thermal stratification are likely causing conversion of organic nitrogen in reservoir deposits to ammonia. Please refer to Volume III Attachment 1 for the final Appendix C *Water Quality Supporting Technical Information*.

Comment IND156-8, IND157-8, IND158-8, IND177-8

ES-24 "In looking at the range of benefits and impacts the State Water Board has identified the Proposed Project as the environmentally superior alternative."

I disagree. To me the "Proposed Project" is a "destroy the Klamath River hydroelectric dams and leave the river to nature" (quote of myself) alternative, that definitely is not the "environmentally superior alternative" for improvement of the multiuse Klamath River. Leaving Klamath River to dry out our farms and our urban wells, because there is no artificial water storage (Link River Dam is a diversion dam that raised Upper Klamath Lake water level very little, Keno Dam is an irrigation dam) for the globally-warmed climate changed Klamath river, and not providing additional--or at least constantly providing--fish hatcheries to supplement salmonid harvest from the river, and disallowing multiple use of the

dams whereof 15 miles of the Klamath River is able, per four reservoirs, to provide both warm and cool water aquatic habitat that is proven able to support both warm and cool water aquatic life--including abundant warm and cold water game fish--year round, and permanently losing 70,000 homes' worth of clean renewable hydroelectric power production, in exchange for a long term seasonally--per reduced watershed snowpack--diminished flow, globally warmed climate-changed river, that for the last 176.3-66 miles of its length to the sea, has both much the same chemical composition, and the same or greater seasonally warm water quality characteristics, that it has had for the immediately previous 15-20 years, is not the "environmentally superior alternative" that humanity needs to produce for the Klamath River's best environmental coexistence with humanity. The Klamath River is, and has long been, a multi-use industrial river and not a wild and scenic river.

Response to Comment IND156-8, IND157-8, IND158-8, IND177-8
As stated in Volume I *Executive Summary* (page ES-24), the State Water Board has looked at the range of benefits and impacts under the Proposed Project and six alternatives and has identified the Proposed Project as the environmentally superior alternative based solely on a comparison to the existing condition (summarized in Table ES-1). While the alternative with the least number of unmitigable adverse environmental impacts would be the Continued Operations with Fish Passage Alternative, the Proposed Project is a restoration project aimed at improving the aquatic ecosystem in the Klamath River over the long term and as such would result in significantly more identified benefits for environmental resources than the Continued Operations with Fish Passage Alternative, including all of the benefits listed above under Effects Found to be Beneficial. Further, the majority of the unmitigable adverse impacts identified under the Proposed Project would occur in the short term, during reservoir drawdown and construction activities associated with hydroelectric facilities removal. With respect to the comment's concerns regarding water supply, hatcheries, water temperature and aquatic species, please refer to Master Responses WSWR-1, WSWR-3, AQF-2, WQ-2. The comments regarding renewable energy and hydroelectric power generation pertain to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Greenhouse Gas Emissions and Energy*). With respect to the comment regarding the wild and scenic status of the river, the EIR acknowledges that the Klamath River beginning 3,600 feet downstream of Iron Gate Dam and continuing to the Klamath Estuary (i.e., Middle and Lower Klamath River) is designated a wild and scenic river segment by both the State of California and the federal government. Thus, this status is considered as part of the CEQA baseline and is discussed in resource area environmental setting and potential impact analysis discussions including: Section 3.2.3 *Water Quality – Significance Criteria;* Section 3.3.2.2 *Aquatic Resources – Environmental Setting – Physical Habitat Descriptions – Upper Klamath River – Hydroelectric Reach;* Section 3.14.5 *Land Use and Planning – Potential Impacts and Mitigation* Potential Impact 3.14-2; Section 3.19.2 *Aesthetics – Environmental Setting;*

Section 3.19.3 *Aesthetics – Significance Criteria;* Section 3.20.2.1 *Recreation – Environmental Setting – Regional Recreation;* Section 3.20.2.4 *Recreation – Environmental Setting – Wild and Scenic River Conditions;* Section 3.20.3 *Recreation – Significance Criteria;* Section 3.20.4.5 *Recreation –Impact Analysis Approach – Wild and Scenic Rivers;* and Section 3.20.5 *Recreation – Potential Impacts and Mitigation* Potential Impact 3.20-6 and Potential Impact 3.20-7. Please refer to Volume I for Section 3.14 *Land Use and Planning* (specifically, page 3-885) and Volume III Attachment 1 for the final Section 3.2 *Water Quality*, Section 3.3 *Aquatic Resources*, Section 3.19 *Aesthetics*, and Section 3.20 *Recreation.* Please also refer to Master Response GEN-1.

Comment IND156-9, IND157-9, IND158-9, IND177-9

Rather than the "Proposed Project", the "Continued Operations with Fish Passage Alternative" to retain the Klamath River hydroelectric dams, and to improve the dams where necessary with fishways, that are adequate for native and nonnative upper Klamath River fishes' ("upper" is used here to exclude sturgeon) year-round fish travel throughout the Klamath River, provides the Klamath River's best environmental coexistence with humanity. Also, Copco 2 Dam--with its oftentimes 46 minute reservoir pool replenishment time--provides no adverse environmental impact on the Klamath River, that--much similar to Link River Dam's effect on Link River--a fish ladder (complete with fish counting station), a fish screen, and a seasonally adjusted fish ladder and dam water release flow, can't adequately mitigate. (per a 1,150 cubic feet/second moderate river-flow rate, Copco 2 Dam's reservoir of 73 acre-feet water storage changes its water every 46 minutes).

Response to Comment IND156-9, IND157-9, IND158-9, IND177-9

Section 4.4 *Alternatives – Continued Operations with Fish Passage Alternative* (pages 4-99 to 4-180) provides a comprehensive assessment of the alternative that includes provision of fish passage with fishways. Additionally, as discussed in Section 4.1 *Alternatives – Alternatives Selection/Overview* (pages 4-1 to 4-14), the State Water Board analyzed the *Two Dam Removal Alternative*, in which the Copco No. 1 and Iron Gate dam complexes in California would be fully removed, while the J.C. Boyle dam complex in Oregon and Copco No. 2 dam complex in California would remain in place. As stated in Section 4.1 *Alternatives – Alternatives Selection/Overview* (page 4-5), this alternative was analyzed because it eliminates the reservoirs with the largest contributions to water quality impairment and with the tallest dams for fish ladder construction, while allowing for continued power generation (please refer to Section 4.5 *Alternatives – Two Dam Removal Alternative* [pages 4-181 to 4-246] for additional information).

Comment IND156-10, IND157-10, IND158-10, IND177-10

The question about restoring the Klamath River, is not so much a question of a fish out of water, as it is a question of people out of water, and people out of a cool climate, and people out of fish, and people out of fossil fuel-powered electricity generation, and people out of clean renewable electricity production,

and people out of agriculturally-produced food. Again, "destroy the Klamath River hydroelectric dams and leave the river to nature" is not the "environmentally superior alternative". Not for humanity's social and nature-dependant environment. Time and again the natural environment is deficient to provide for humanity's best long term survival (ex's: some infectious diseases, most tsunamis, dearth of natural bridges, dearth of natural boats, some landfall hurricanes, most tornadoes, some drought-strickened gravel-spawned fish eggs, etc.).

Response to Comment IND156-10, IND157-10, IND158-10, IND177-10
Please refer to Master Response GEN-1.

Comment IND156-11, IND157-11, IND158-11, IND177-11
From a legitimate public environment multiuse paradigm of the Klamath River, the Klamath River Hydroelectric Dams have provided 313 years of Klamath River clean renewable hydroelectric power production earth surface biocycle atmospheric emissions, for what could have been 313 years of 100% fossil fuel-powered electricity production atmospheric emissions.

Response to Comment IND156-11, IND157-11, IND158-11, IND177-11
This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Greenhouse Gas Emissions and Energy*).

Comment IND156-12, IND157-12, IND158-12, IND177-12
ES-4 "The objectives further the underlying purpose of the Proposed Project, which is the timely improvement of water quality related to the Lower Klamath Project within and downstream of the current Hydroelectric Reach and the restoration of anadromous access upstream of Iron Gate Dam (the current barrier to anadromy)."
ES-24 "However, the Proposed Project is a restoration project aimed at improving the aquatic ecosystem in the Klamath River over the long term."

First and foremost the Klamath River does not belong to the fish, the Klamath River belongs to humanity for humanity's best long term survival. Currently and for the most likely forseeable future, fish live year-round throughout the entire Klamath River, because the Klamath River's water is adequately good for the fish. Other than improvement of the Klamath hydroelectric dams with fish passageways and/or fish screens, where necessary for adequate upper Klamath River fish passage throughout the Klamath River, and additional fish hatcheries to help salmonids compensate against increasing global warming, ongoing climate change, and commercial salmon harvesting, there is no necessary restoration of the Klamath River.

Response to Comment IND156-12, IND157-12, IND158-12, IND177-12
The sentences quote only partial excerpts from the objectives stated in Section *Executive Summary* (page ES-4). Please see Volume I Section *Executive Summary* (page ES-4) and Section 2.2 *Proposed Project – Project Location* (page 2-1) for a complete statement regarding proposed project objectives. Comments on the Definite Plan should be submitted to the Klamath River Renewal Corporation (KRRC). Water quality conditions in the Klamath River Basin under existing conditions are described in Volume III Attachment 1 Section 3.2.2 *Water Quality – Environmental Setting.* Additionally, please refer to Master Response WQ-1 for a discussion of the role of the Lower Klamath facilities with respect to overall water quality.

Comment IND156-13, IND157-13, IND158-13, IND177-13
Blaming Iron Gate Dam and/or Copco 1 Dam for the Klamath River's last 176.3-66 miles of water chemistry and water temperature, is overlooking the substantial chemical input from the Shasta, Scott, and Salmon rivers into the Klamath River, and the turbulence and surface area-caused rapid equilibration of Klamath River with its environment in the first 25 river miles immediately downstream from Iron Gate Dam. From the time Klamath River leaves Keno, Oregon, until the Klamath River passes Iron Gate Dam, Klamath Rivers' chemistry is mostly determined of its natural river bed composition, river bank runoff, rapid elevation change, atmospheric chemistry (including thermal, material composition, and precipitates), instream water springs, tributary creeks, biological activity, and 15 miles of dam reservoirs.

Response to Comment IND156-13, IND157-13, IND158-13, IND177-13
Section 3.2.2 *Water Quality – Environmental Setting* and Appendix C *Water Quality Supporting Technical Information* provide a summary of the measured water quality conditions in the Lower Klamath Project EIR water quality Area of Analysis. The analysis of the potential impacts in the EIR is based on water quality measurements from the Klamath River and water quality numeric models developed to evaluate Klamath River conditions under the Proposed Project and various alternatives. Water quality measurements take into account the influence of the Shasta, Scott, Salmon, and Trinity Rivers along with conditions in the Klamath River. Additionally, the water quality numeric models were calibrated using Klamath River water quality measurements and water quality data from Klamath River tributaries, including the Shasta, Scott, Salmon, and Trinity Rivers. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality* and the final Appendix C *Water Quality Supporting Technical Information*.

Comment IND156-14, IND157-14, IND158-14, IND177-14
[4-108] "Temperature effects of the dams do not extend downstream of the Salmon River confluence (see Section 3.2.2.2 Water Temperature). Therefore, there would be no change in the impact of the Continuing Operations with Fish Passage Alternative in the Middle and Lower Klamath River reaches downstream

from the confluence with the Salmon River, including the Klamath River Estuary and the Pacific Ocean nearshore environment."
[3-25] "Downstream from the Salmon River (RM 66), summer water temperatures begin to decrease slightly with distance as coastal weather influences (i.e., fog and lower air temperatures) decrease longitudinal warming (Scheiff and Zedonis 2011) and cool water tributary inputs increase the overall flow volume in the Klamath River (Asarian and Kann 2013). In general, however, water temperatures in this reach still regularly exceed salmonid thermal preferences (less than 68F) during summer months."

I seriously doubt that Copco 1, Copco 2, and Iron Gate dams' reservoirs' water temperatures effect the Klamath River's water temperature greater than 25 miles downstream from Iron Gate Dam.

Response to Comment IND156-14, IND157-14, IND158-14, IND177-14
Please refer to response to comment ORG46-127 for a technical discussion of the multiple model results that indicate Iron Gate Dam releases potentially influence Klamath River water temperature to the confluence with the Salmon River (river mile (RM) 66.3). Overall, water temperature modeling indicates there is a small difference (i.e., approximately 1°C or less) between water temperature in the Klamath River under existing conditions and dam removal conditions that ***may*** extend to the confluence of the Salmon River during portions of some years (typically spring and fall months) (PacifiCorp 2004, 2005, 2008, 2014; Risley et al. 2012). The confluence with the Salmon River is the furthest downstream location Iron Gate Dam releases may influence Klamath River water temperature, but Iron Gate Dam releases do not always influence water temperature all the way to the confluence of the Salmon River. Modeling indicates Iron Gate Dam releases typically stop influencing water temperature farther upstream in the Klamath River during winter (i.e., December through February) and late spring to early fall (i.e., May through September) months. As such, Potential Impact 3.2-1 correctly states water temperature would not be directly affected in the Middle Klamath River downstream from the confluence with the Salmon River. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*, including Potential Impact 3.2-1.

Comment IND156-15, IND157-15, IND158-15, IND177-15
[4-108] "under the Continued Operations with Fish Passage Alternative, late summer/fall water temperature conditions would not move towards a condition that supports designated beneficial uses, including cold freshwater habitat (COLD), rare, threatened, or endangered species (RARE), and migration of aquatic organisms (MIGR) (North Coast Regional Board 2010) in the Middle Klamath River to approximately the confluence of the Salmon River"
ES-4 "Proposed Project Objectives The State Water Board has identified the following Proposed Project objectives, as required under CEQA Guidelines, section 15124, subdivision (b):

In a timely manner:" . . . "2. Advance the long-term restoration of the natural fish populations in the Klamath Basin, with particular emphasis on restoring the salmonid fisheries used for subsistence, commerce, tribal cultural purposes, and recreation. 3. Restore volitional anadromous fish passage in the Klamath Basin to viable habitat currently made inaccessible by the Lower Klamath Project dams."

The statement "2. Advance the long-term restoration of the natural fish populations . . . with particular emphasis on restoring the salmonid fisheries . . . ." should be "Advance the long-term augmentation and partial restoration of the natural fish populations . . . with particular emphasis on augmenting and partially restoring the salmonid fisheries . . . ."

Per current and forseeably likely long term Klamath River water conditions, currently and for a medium-term forseeable future, all that Klamath River salmonids need to survive and thrive in the Klamath River, is adequate fish passageways and fish screens in all of the Klamath River hydroelectric dams, and very likely, additional fish hatchery artificial propagation to compensate for fish population increase-produced fish predation and fish harvest. Recall that juvenile fish are forage fish for larger fish and other predators, and that some Klamath River salmonids rear in the mainstem Klamath River and the Klamath River estuary for a year or longer.

Proponents for Klamath River salmon like to note salmon die-offs near the Klamath River estuary, and within 66 miles of the Pacific Ocean, and at Iron Gate dam, that are due to water temperature and/or disease. Certainly Iron Gate dam-released water, is able to equilibrate with ambient environmental temperatures within both a few miles downriver of Iron Gate dam, and many miles upriver of the river's 66 river mile distance to the Pacific Ocean; and certainly salmon would swim up Klamath River past the Klamath River dams when all of those dams have adequate fish passageways, as does J.C. Boyle Dam at this time, rather than as salmon have every year since Iron Gate Dam was built in 1962, migrated from the Pacific Ocean to Iron Gate Dam, and then either remained at Iron Gate dam to die of natural and/or water temperature-related cause in consequence of no fish ladder at Iron Gate dam, or returned downriver to find better water temperature, and then not so finding die of natural and/or water temperature related cause. Certainly also, water releases from the Trinity River Trinity and Lewiston Reservoirs, and from the J.C. Boyle, Copco 1, and Iron Gate reservoirs, have helped optimize the Klamath River's wildlife habitat. ("Discharge from Lewiston Dam can play an important role in regulating water temperatures downstream in the mainstem Trinity and lower Klamath rivers.") [The Influence of Lewiston Dam Releases on Water Temperatures of the Trinity River and Lower Klamath River, CA, April to October, 2014, Magneson and Chamberlain]

I find that global warming-caused climate change allowing, Chinook salmon shall continue to migrate to Iron Gate Dam's location, providing the Iron Gate Dam's

water releases are properly adjusted and timed to provide upstream migrating adult chinook salmon with sufficiently cool Klamath River water temperature. Of recent years--e.g. 2014--apparently the Klamath River near-estuary Ich-caused large salmon population deaths, and the year 2002 Klamath River near-estuary bacteria-caused large salmon population deaths, are particularly indicative of warm-water related salmon fatality, that is not due to the Klamath River hydroelectric dams, in consequence of those deaths having occurred shortly after the salmon entered the Klamath River, 150-190 miles distant to Iron Gate Dam. (Ref.: Klamath River Basin Hydrologic Conditions Prior to the September 2002 Die-Off of Salmon and Steelhead Water-Resources Investigations, USGS Report 03–4099,
https://na01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fpubs.usgs.gov%2Fwri%2F2003%2F4099%2Fwri034099.pdf&data=02%7C01%7Cwr401program%40waterboards.ca.gov%7C3f089e18d6904a4b913f08d69bc59a42%7Cfe186a257d4941e6994105d2281d36c1%7C0%7C1%7C636867670366403142&sdata=5FuqJ5XpYpfakUaZHzUOzXSEKKE4MnivbdspkQXt7NY%3D&reserved=0; "[4-108] "Temperature effects of the dams do not extend downstream of the Salmon River confluence (see Section 3.2.2.2 Water Temperature")

The Klamath River's Salmonids can survive 71 degree water temperature for several days, and so as individual fish should be able to migrate safely in the Klamath River between the Salmon River confluence and the Copco 1 headwaters within a few days of each year during the immediately forthcoming 50 years.

Response to Comment IND156-15, IND157-15, IND158-15, IND177-15
Comment noted. The sentences quote only partial excerpts from the objectives stated in Section *Executive Summary* (page ES-4). Please see *Executive Summary* (page ES-4) and Volume I Section 2.2 *Proposed Project – Project Location (*page 2-1) for a complete statement regarding proposed project objectives. Comments on the Definite Plan should be submitted to the Klamath River Renewal Corporation (KRRC).

The EIR is based on the best available and most current scientific and factual data. There is no evidence that the Klamath River Hydroelectric Project improves conditions for anadromous salmonids downstream of Iron Gate Dam, or reduces the risk of fish disease. As described in Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Disease and Parasites*, FERC (2007) concluded that the Klamath Hydroelectric Project (KHP) has likely contributed to conditions that foster disease and lead to salmon losses in the Middle and Lower Klamath River. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Water quality conditions in the Klamath River Basin under existing conditions are described in Section 3.2.2 *Water Quality – Environmental Setting.* Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*. Additionally, please refer to Section 3.3.2.2 *Aquatic Resources – Environmental Setting – Physical Habitat Descriptions* for a discussion of periodic high water temperatures during summer, poor water quality (low dissolved oxygen and high pH), and disease outbreaks during spring, which impair the ability of the mainstem Klamath River to support the rearing and migration of anadromous species. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Please also refer to Master Response AQF-6, and WQ-1.

Comment IND156-16, IND157-16, IND158-16, IND177-16

Retaining Copco 1 and Iron Gate dams' water storage during the immediately forthcoming 50 years, even when that water storage is greatly depleted for fish habitat, would greatly benefit Klamath River valley agriculture and power generation, and could per careful water release/water storage regimen, beneficially assist Klamath River water environment from Iron Gate Dam to the Klamath River Estuary.

Response to Comment IND156-16, IND157-16, IND158-16, IND177-16

Please refer to Master Responses WSWR-1 and WSWR-3. The comment regarding hydroelectric power generation pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Greenhouse Gas Emissions and Energy*).

Comment IND156-17, IND157-17, IND158-17, IND177-17

By way of a comparison with California State Water Board Klamath River salmon migration temperatures findings, here is a quote about Columbia River Bonneville Dam salmon migration temperatures: "Adult fall Chinook salmon and steelhead have evolved to migrate in the Columbia River during relatively warm water conditions, but temperatures have warmed in recent history because of the effects from development and management of the Federal Columbia River Power System and from regional climate change. Fish that are migrating in 21 to 25°C (70 to 77°F) water are within the zone of tolerance and at the upper end of this range, likely under significant thermal stress." [Temperature and handling of adult salmon and steelhead at Bonneville Dam 24 January 2010 Christopher A. Peery, Fish Biologist Idaho Fisheries Resources Office U.S. Fish and Wildlife Service, DOI Ahsaka, Idaho]

ES-4 "Proposed Project Objectives The State Water Board has identified the following Proposed Project objectives, as required under CEQA Guidelines, section 15124, subdivision (b): In a timely manner:" . . . "4. Ameliorate conditions underlying high disease rates among Klamath River salmonids."

The Klamath River hydroelectric dams reduce habitat for the salmon diseases Ceratomyxa shasta and Parvicapsula minibicornis that both inhabit the same polychaete host, Manayunkia speciosa, because Manayunkia speciosa prefers shallow running water over an exposed pebble and small stone riverbed, rather than a dam reservoir silted bottom; thus removing the Klamath hydoelectric dams' reservoirs, will increase Klamath River presence of the Klamath River salmon-killing salmonid parasites, Ceratomyxa shasta and Parvicapsula minibicornis, per restoring free-flowing river environment that favorably supports the parasites' common polychaete worm host, Manayunkia speciosa (e.g., see Journal of Parasitology 93(1):78-88. 2007).

Response to Comment IND156-17, IND157-17, IND158-17, IND177-17
As described in Section 3.3.4.4 *Aquatic Resources – Impact Analysis Approach – Water Temperature* thermal tolerances of focal salmonid species were defined for critical life-history stages and were selected based on USEPA (2003) guidelines for salmonids. The analysis in the EIR is consistent with the reference cited by the commenter, finding stressful conditions for migrating Chinook salmon at temperatures greater than 21ºC. Please refer to Volume III Attachment 1 of the final Section 3.3 *Aquatic Resources*. Please refer to Master Response AQF-5 for a discussion of fish disease upstream from Iron Gate dam.

Comment IND156-18, IND157-18, IND158-18, IND177-18
ES-4 "Proposed Project Objectives The State Water Board has identified the following Proposed Project objectives, as required under CEQA Guidelines, section 15124, subdivision (b): In a timely manner: 1. Improve the long-term water quality conditions associated with the Lower Klamath Project in the California reaches of the Klamath River, including water quality impairments due to Microcystis aeruginosa and associated toxins, water temperature, and levels of biostimulatory nutrients."

Klamath River from Keno Dam to Iron Gate Dam, shall continue to receive the majority of its water from hypereutrophic phosphorous and nitrogen rich Upper Klamath Lake water, that also contains enough Microcystis aeruginosa to amply, adversely to some uses (such as swimming, dog swimming, and consumption of year round reservoir-resident fish) effect Klamath River water there, and that will continue to greatly support substantial benthic periphyton growth all the way to near the Klamath River estuary. Copco 1 Dam and Iron Gate Dam reservoirs are deep enough so that they each seasonally thermally stratify, and J. C. Boyle Dam reservoir's near dam 40 foot depth often has cooler water than the reservoir's surface water, so that all three reservoirs allows both cool water and warm water ecosystems to coexist within them, and so that fish are able to occupy and migrate in different thermal layers within each of those reservoirs. The Klamath River Hydroelectric Dam reservoirs also provide some constant settling [4-28] of biostimulatory nutrients--including nitrates and phosphates--that the reservoirs receive from Upper Klamath Lake water.

Response to Comment IND156-18, IND157-18, IND158-18, IND177-18
Comment noted. Please refer to Master Responses WQ-1, WQ-2, and PAP-1.

Comment IND156-19, IND157-19, IND158-19, IND177-19
[page 3-81] " However, within the general uncertainty of climate change projections, results from the two models correspond reasonably well and indicate that water temperatures in the Upper Klamath Basin are expected to increase on the order of 2°F to 5°F between 2012 and 2061. RBM10 results also indicate that, even with warming of water temperatures under climate change, the primary long-term effect of dam removal downstream of Iron Gate Dam is still anticipated to be the return of approximately 126 miles of the Middle Klamath River, from Iron Gate Dam (RM 193.1) to the Salmon River (RM 66), to a more natural thermal regime (Perry et al. 2011). Model results indicate that the annual temperature cycle downstream from Iron Gate Dam would shift forward in time by approximately 18 days under the Proposed Project, with warmer temperatures in spring and early summer and cooler temperatures in late summer and fall immediately downstream from the dam."

Allowing for the EIR's declared 50 year [pages 3-80, 4-107] climate change-caused Klamath River water thermal increase projection, I approve of implementing the "Continued Operations with Fish Passage Alternative", and utilizing the PacifCorp-collected, and of some Pacificorp ratepayers paid, Klamath River hydroelectric dams deconstruction ("J C Boyle Dam Removal Copco & Iron Gate Dams Removal") fund, to provide Upper Klamath River fish-adequate fishways in all of the Klamath River hydroelectric dams.

Response to Comment IND156-19, IND157-19, IND158-19, IND177-19
Comment noted. Please refer to Master Responses GEN-1. Please note that the water temperature modeling results quoted in the comment and excerpted from Potential Impact 3.2-1 are discussing the water temperature under the Proposed Project and they are not about water temperature conditions under the Continued Operations with Fish Passage Alternative. Please refer to Volume I Section 4.4.2.1 *Alternatives –Continued Operations with Fish Passage Alternative – Water Temperature* (pages 4-102 to 4-108) for a discussion of the Klamath River water temperature under the Continued Operations with Fish Passage Alternative. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*, including Potential Impact 3.2-1.

Comment IND156-20, IND157-20, IND158-20, IND177-20
With our current administration's emphasis on United States of America infrastructure improvement whereof we may "make America great again", I herewith now vote that the United States of America Department of the Interior should purchase and manage the Klamath River hydroelectric dams and the Link River hydroelectric facilities, so that the dams and hydroelectric facilities are responsibly managed as public property per the United States of America's national citizenship, and that the United States of America Department of the

Interior should, where necessary with fish ladders and/or fish screens that are adequate for all upper Klamath River fish, improve the Klamath River hydroelectric dams and Link River hydroelectric facilities, so that the Klamath River dams and Link River hydroelectric facilities continue to provide much multiuse--including hydroelectric power production--of the Klamath River and Link River respectively.

Response to Comment IND156-20, IND157-20, IND158-20, IND177-20
This comment focuses on the federal government purchasing and managing the Klamath River hydroelectric dams and Link River hydroelectric facilities. Comment noted.

Comment IND156-21, IND157-21, IND158-21, IND177-21
Per requiring some Pacificorp ratepayers to fund deconstruction of the Klamath River hydroelectric dams and the Link River western settlement historic-hydroelectric facilities, without Pacificorp allowing those ratepayers to opt out of funding that deconstruction, Pacificorp coerced many Pacificorp ratepayers to provide decontruction-designated funding, for deconstruction that those ratepayers did not and do not approve of. Humanity doesn't need Pacificorp requiring that the Klamath River hydroelectric dams be destroyed, and humanity doesn't need Pacificorp donating or surrendering the Klamath River hydroelectric dams to KRRC (Klamath River Renewal Corporation) for deconstruction of those dams.

Money that from PacifiCorp ratepayers who, and California taxpayers who, prefer to have opted out of paying for Klamath River hydroelectric dam deconstruction, has been scheduled and/or collected for the subversive to American security—-including power security, agricultural security, fish habitat security, Klamath Basin municipal water works security, and national defense security-purpose of destroying the Klamath River hydroelectric dams, should be re-purposed to fund installation of Upper Klamath River anadromous fish migration-adequate fish passageway--including fish screens--facilities, in each Klamath River basin Klamath River hydroelectric project, where those fish passageway facilities both do not exist adequately, and are necessary for adequate Klamath River fish passage past the hydroelectric project(s).

Response to Comment IND156-21, IND157-21, IND158-21, IND177-21
Please refer to Master Response ENR-1.

Comment IND156-22, IND157-22, IND158-22, IND177-22
[Page 3-728] "Since it is planned in the 2017 IRP for PacifiCorp to add new sources of renewable power or purchase RECs to comply with the California RPS, and removal of the reservoirs would result in a reduction in methane production, it is not anticipated that the replacement of the hydroelectric energy from the Lower Klamath Project dam complexes would result in an increase in GHG emissions from non-renewable power sources. As such, GHG impacts

from replacement of the hydroelectric energy from the Lower Klamath Project dam complexes is determined to be less than significant. Significance No significant impact."

California State Water Board's above statement manifests false carbon and greenhouse gas (GHG) economy. Here's why: The Lower Klamath Project dams' reservoirs' do not produce anthropogenic GHG, they produce biologic "biochemistry as usual" earth surface biocycle carbon compounds, that are either recycled through the biosphere, or initially allocated primarily into the earth's surface--including earth surface waters and upper earth crust terrain--and the earth's atmosphere, per weathering--including geologic forces--and inanimate chemical reactions. Furthermore, the "Proposed Project" deconstruction of the Lower Klamath Project dams, results in less PacifiCorp clean renewable energy production infrastructure to add new PacifiCorp clean renewable energy production infrastructure to; the "Proposed Project" deconstruction of the Lower Klamath Project dams requires much anthropogenic fossil fuel combustion into earth's atmosphere; and construction of new PacifiCorp clean renewable energy production infrastructure most likely requires substantial anthropogenic fossil fuel combustion in consequence of a current and immediately forthcoming dearth of clean renewable energy power and electrically powered heavy duty construction equipment to construct new PacifiCorp clean renewable energy production infrastructure of. Also Pacificorp's proposed purchase of renewable energy certificates (RECs) does not guarantee replacement of deconstructed Lower Klamath Project dams with new--not currently or futurely existent--clean renewable power production facilities, and certainly doesn't guarantee replacement water storage for the 11+ miles of Klamath River water storage that would be lost with deconstruction of Copco 1, Copco 2, and Iron Gate dams' reservoirs.

Response to Comment IND156-22, IND157-22, IND158-22, IND177-22
The comment regarding hydroelectric power generation pertain to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Greenhouse Gas Emissions and Energy*).

Comment IND156-23, IND157-23, IND158-23, IND177-23
[4-107] "In the long term, climate change is expected to cause general increases in water temperatures. The historical data record indicates that mainstem water temperatures have increased, on average, approximately 0.05ºC (0.09ºF) per year between 1962 and 2001 (Bartholow 2005) such that climate change may already be affecting Klamath River water temperatures. Projecting the Bartholow (2005) estimate of an average annual temperature increase 50 years into the future, water temperatures would increase approximately 2–3°C (3.6–5.4°F). . . . Considering together the available sources for climate change predictions, annual average water temperatures in the Middle and Lower Klamath River are expected to increase within the period of analysis on the order of 1–3 °C (1.8–5.4 °F)."

Projecting similar long term climate change-caused general water temperature increases on Upper Klamath Lake, a 50 year increase of 1–3 °C (1.8–5.4 °F) in naturally dammed--of a 4,137.8 feet natural dam elevation heigth--8 feet average depth Upper Klamath Lake, seems readily plausible to occur, however I don't recommend draining the lake so as to dredge a cool water channel through the lake for fish habitat. Similarly I do not believe that because of ongoing global warming-caused climate change, humanity must loose 11+ miles of Klamath River reservoir water storage. With installation of depth-graduated fish ladders and fish screens, that allow fish passage per different reservoir depth levels; and installation of depth selective water withdrawal pipes, that allow reservoir water withdrawal and mixed reservoir water level water release past both Copco 1 and Iron Gate dams' reservoirs; water quality from immediately below Iron Gate Dam to the Salmon River confluence with Klamath River, may be substantially augmented, improved, and controlled per a Copco 1 and Iron Gate dams' reservoirs' management, that always seasonally prioritizes and ascribes no greater than thirdly importance to hydroelectric power production of the reservoirs, and secondary importance to the reservoirs' provision of both the reservoirs' fish habitat, and the Klamath Rivers' fish habitat from Iron Gate Dam to the Salmon River confluence with the Klamath River, while limiting the Klamath River's agriculture irrigation primary importance to a primary importance that always allows Klamath River fish habitat-adequate Keno Dam flow into the Klamath River.

Response to Comment IND156-23, IND157-23, IND158-23, IND177-23
Please refer to Master Response WQ-1 for a discussion of the role of the Lower Klamath Project dams/reservoirs with respect to overall water quality in the Klamath River. As described in Section 3.1.6 *Introduction – Summary of Available Hydrology Information for the Proposed Project*, the amount of flow in the Klamath River is determined by the operation of the Klamath Irrigation Project by the U.S. Bureau of Reclamation (USBR) and the applicable biological opinion(s) to meet the needs of listed species and maintain full irrigation deliveries in accordance with existing contracts, contingent upon available water supplies. The Proposed Project does not include any changes to the amount of flow released by the Klamath Irrigation Project and the applicable biological opinion(s). According to the 2019 National Marine Fisheries Service biological opinion (2019 NMFS BiOp), the compliance point for the minimum Klamath River flow targets would shift upstream from Iron Gate Dam to Keno Dam if dam removal occurs and USBR and NMFS would coordinate to determine the appropriate releases at Keno Dam to provide flows downstream of Iron Gate Dam consistent with NMFS' expectations under the existing 2019 NMFS BiOp (NMFS 2019). As such, the minimum flows during summer and fall would be similar under existing conditions and the Proposed Project. Please refer to Volume III Attachment 1 for the final Section 3.1.6 *Introduction – Summary of Available Hydrology Information for the Proposed Project*.

Please refer to Master Response WQ-2 for a discussion of the potential for releases from the Lower Klamath Dams to reduce the Klamath River water temperature during summer and fall. Additionally, recent testing by PacifiCorp of an intake barrier curtain in Iron Gate Reservoir did not demonstrate that preferential withdrawal of deeper, cooler reservoir would reliably cool summer and fall water releases from Iron Gate Dam, or consistently achieve the water temperature allocations in the Klamath total maximum daily loads (TMDLs) while achieving dissolved oxygen water temperature objectives in the Klamath River. Potential water temperature improvements from operation of the curtain (i.e., 1 to 2°C [1.8 to 3.6°F]) would still not achieve water temperature objectives and would not be able to consistently occur all the time because the dissolved oxygen concentration in deeper, cooler reservoir waters would potentially be too low to achieve dissolved oxygen water quality objectives even with additional mechanical aeration (i.e., turbine venting) at Iron Gate Dam. During 2017, the curtain had to be completely rolled up (i.e., no longer drawing from deeper, cooler reservoir waters) to achieve dissolved oxygen concentrations for aquatic life (PacifiCorp 2018a).

Additionally, please refer to Volume I Section 4.4 *Continued Operations with Fish Passage Alternative.*

Comment IND156-24, IND157-24, IND158-24, IND177-24

For most of the Klamath River Hydroelectric Project's occurrence, the project has been operated primarily to provide continuous hydroelectric power production. So as to better accomplish fair multiuse--including agriculture irrigation, fish habitat, and hydroelectric power production--of the Klamath River resource, and in consequence of climate change-caused watershed snowpack storage reduction, hydroelectric dams' blockage of fish migrations, and increased demand and supply for clean, renewable energy production, the Klamath River Hydroelectric Dam facilities and the Link River hydroelectric facilities should be owned and operated of the United States of America Department of the Interior. Since Pacificorp has opted to deconstruct the Klamath Hydroelectric dams, the U.S.A. Department of the Interior should be able to inexpensively purchase the dams. And since Pacificorp ratepayers have accrued a Klamath Hydroelectric dams deconstruction fund that could be applied towards installing fishways in the Klamath Hydroelectric dams, the U.S.A. Department of the Interior should be able to both purchase the dams and financially assist in equipping the dams with Upper Klamath River fish-adequate fishways.

Response to Comment IND156-24, IND157-24, IND158-24, IND177-24

Please refer to Volume I Section 4.4 *Continued Operations with Fish Passage Alternative.*

Comment IND156-25, IND157-25, IND158-25, IND177-25

[3-204] "Dams (e.g., Link River Dam, Iron Gate Dam, Lewiston Dam, etc.) have eliminated access to much of the historical spring-run spawning and rearing

habitat and are partly responsible for the extirpation of at least seven spring-run populations from the Klamath-Trinity River system (Myers et al. 1998)."

Since after Copco 1 was built in 1912-18, Link River Dam was built in 1918-21 with a fish ladder, and with a low elevation water drop chute stilling basin that is yet preferred per many Link River fish for passing Link River Dam, even though the west end of Link River Dam has of recent years been equipped with the second lowest fish ladder now in the U.S.A, I don't find how Link River Dam has eliminated access to much of the historical spring-run spawning and rearing habitat and is partly responsible for the extirpation of at least seven spring-run populations from the Klamath-Trinity River system.

Response to Comment IND156-25, IND157-25, IND158-25, IND177-25
Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species – Spring-run Chinook Salmon* has been clarified as requested. Please refer to Volume III Attachment 1 Section 3.3.2.1 *Aquatic Resources – Environmental Setting Aquatic Species – Spring-run Chinook Salmon* for the revisions.

Comment IND156-26, IND157-26, IND158-26, IND177-26
[3-204] "Spring-run Chinook salmon upstream migration is observed during two-time periods—spring (April through June) and summer (July through August) (Strange 2008) (Table 3.3-4). Snyder (1931) also describes a run of Chinook salmon occurring in the Klamath River during July and August under historical water quality and temperature conditions."

Per the "Continued Operations with Fish Passage Alternative", a reintroduction of the Klamath River spring salmonids migrations to and from the Upper Klamath River basin and Upper Klamath Lake drainage, should result in a robust and abundant annually recurrent Upper Klamath River anadromous salmonid population! The "Continued Operations with Fish Passage Alternative", allows humanity to financially affordably try utilizing fish passage-adequate artificial fishways, fish hatcheries (e.g. Iron Gate hatchery and possibly Fall Creek hatchery), and water storage-enhanced fish habitat (e.g. Iron Gate and Copco 1 dams), to allow, maintain, support, and provide a recurrent annually abundant Klamath River anadromous salmonid population with. If eight years after the Klamath River hydroelectric dams are equipped with adequate Upper Klamath River anadromous fish-passage fishways, Copco 1 Dam and/or Iron Gate Dam anadromous fish assistance and support is found excessively deficient, remedial measures that may then include removing Copco 1 Dam and/or Iron Gate Dam, will be much more qualifiable and quantifiable, than humanity's current Iron Gate Dam to Keno Dam, Klamath River healthy--and harvested(!)--red band trout population-based, Upper Klamath River salmonid-sustainability estimates.

Response to Comment IND156-26, IND157-26, IND158-26, IND177-26
Comments on the Definite Plan should be submitted to the Klamath River Renewal Corporation (KRRC). Section 4.4.3.7 *Alternatives – Continued*

Operations with Fish Passage Alternative – Aquatics Resources – Fish Passage presents an assessment of a continued operations with fish passage alternative to the Proposed Project. This alternative is compared to the Proposed Project in Section *Executive Summary – Alternatives to the Proposed Project – Continued Operations with Fish Passage* (ES-17 to ES-18).

Additionally, Section 3.3.5.9 *Aquatic Resource Impacts*, Potential Impact 3.3-14 discusses potential impacts to redband trout populations as a result of the proposed project. Please refer to Volume III attachment 1 for the final Section 3.3.5.9.

Comment IND156-27, IND157-27, IND158-27, IND177-27

[3-29] "While J.C. Boyle Reservoir does not thermally stratify, there are still large summertime variations in dissolved oxygen with depth observed in J.C. Boyle Reservoir that result in bottom waters in the reservoir having lower dissolved oxygen concentrations than surface waters (Raymond 2009a, 2010a; see Appendix C, Figure C-29 for more detail). This variation can affect dissolved oxygen concentrations further downstream in the California portion of the Hydroelectric Reach." [3-230] "The 21-mile long riverine reach between J.C. Boyle and Copco No. 1 reservoirs is divided into two reaches: the 4.6-mile long J.C. Boyle Bypass Reach, which receives bypass flows from J.C. Boyle Dam, and the 17-mile long Peaking Reach, which receives variable flow from hydroelectric operations (see also Section 2.3.1 J.C. Boyle Dam and Associated Facilities). The downstream 6.2 miles in California is designated by CDFW as a Wild Trout Area with the whole reach managed by CDFW for wild trout, including angling restrictions and reduced stocking, and habitat enhancements targeted for native trout (CDFG 2005). The reach from the J.C. Boyle Powerhouse to the Oregon-California state line is designated as a National Wild and Scenic River."

J.C. Boyle Reservoir is small, receives Spencer Creek inflow at J.C. Boyle Reservoir's headwaters, sometimes is not greatly oxygenated from the Klamath River's Keno Dam to J.C. Boyle Dam Reservoir riffle-running flow, has a total volume retention/replenishment time of only 1.53 days, is about 52% in a wide shallow valley and 48% in a shaded narrow canyon, is 40 feet deep in the canyon near J.C. Boyle Dam, and is at 3800 feet elevation that is 14.8 miles and near 950 feet in elevation distant to the California portion of the (J.C. Boyle) Hydroelectric Reach. That 950 feet of elevation difference provides much ample river turbulence opportunity, including many violent rapids, for Klamath River's dissolved oxygen to completely equilibrate with ambient Klamath River canyon environment--including hot springs--conditions, regardless of J.C. Boyle Reservoirs' dissolved oxygen level. (per a 1,150 cubic feet/second moderate river-flow rate, J.C. Boyle Dam's reservoir of 3,495 acre-feet water storage, completely changes water every 1.53 days)

Response to Comment IND156-27, IND157-27, IND158-27, IND177-27
While the comment is correct that fast-moving, turbulent flows in the J.C. Boyle Peaking Reach of the Klamath River provide aeration of river water, especially within the rapids in this reach, modeling of dissolved oxygen concentrations in the J.C. Boyle Peaking Reach indicate that hydropower peaking flows can release lower dissolved oxygen water that potentially affects dissolved oxygen concentrations further downstream in the California portion of the J.C. Boyle Peaking Reach.

Modeling of dissolved oxygen concentrations shows dissolved oxygen concentrations upstream and downstream of J.C. Boyle Powerhouse are similar during non-peaking periods, but dissolved oxygen concentrations decrease downstream of J.C. Boyle Powerhouse during hydropower peaking operations (see Figure 4.8-42 below; PacifiCorp 2004a-1). Once peaking operations stop, the dissolved oxygen concentrations downstream of J.C. Boyle Powerhouse become the same as dissolved oxygen concentrations upstream of J.C. Boyle Powerhouse again. The pattern of lower dissolved oxygen concentrations during peaking operations and higher dissolved oxygen concentrations during non-peaking periods seen in the modeled dissolved oxygen concentrations downstream of the J.C. Boyle Powerhouse under existing conditions is also seen in dissolved oxygen concentration data at the J.C. Boyle Powerhouse measured in 2019 (see Figure IND156-27-1 below), indicating the dissolved oxygen modeling is correctly characterizing dissolved oxygen dynamics downstream of the J.C. Boyle Powerhouse.

A comparison of the modeled dissolved oxygen concentrations “above Copco” (i.e., downstream of the Oregon-California state line) under existing conditions and under without-Project (i.e., with dam removal) conditions shows the low dissolved oxygen concentrations associated with hydropower peaking operations produce a lower dissolved oxygen concentration period during several hours of the day than would occur under dam removal conditions (see Figure 4.8-42 below; PacifiCorp 2004a-1). Total maximum daily load (TMDL) dissolved oxygen modeling results at the Oregon-California state line shown in Figure 3.2-19 also have periods of lower dissolved oxygen concentrations in the summer under existing conditions (i.e., “TMDL dams-in” [T4BSRN] scenario) than under the Proposed Project (i.e., “TMDL dams-out, Oregon” [TOD2RN] scenario), further supporting the potential for hydropower peaking operations to influence dissolved oxygen concentrations in the California portion of the J.C. Boyle Peaking Reach. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

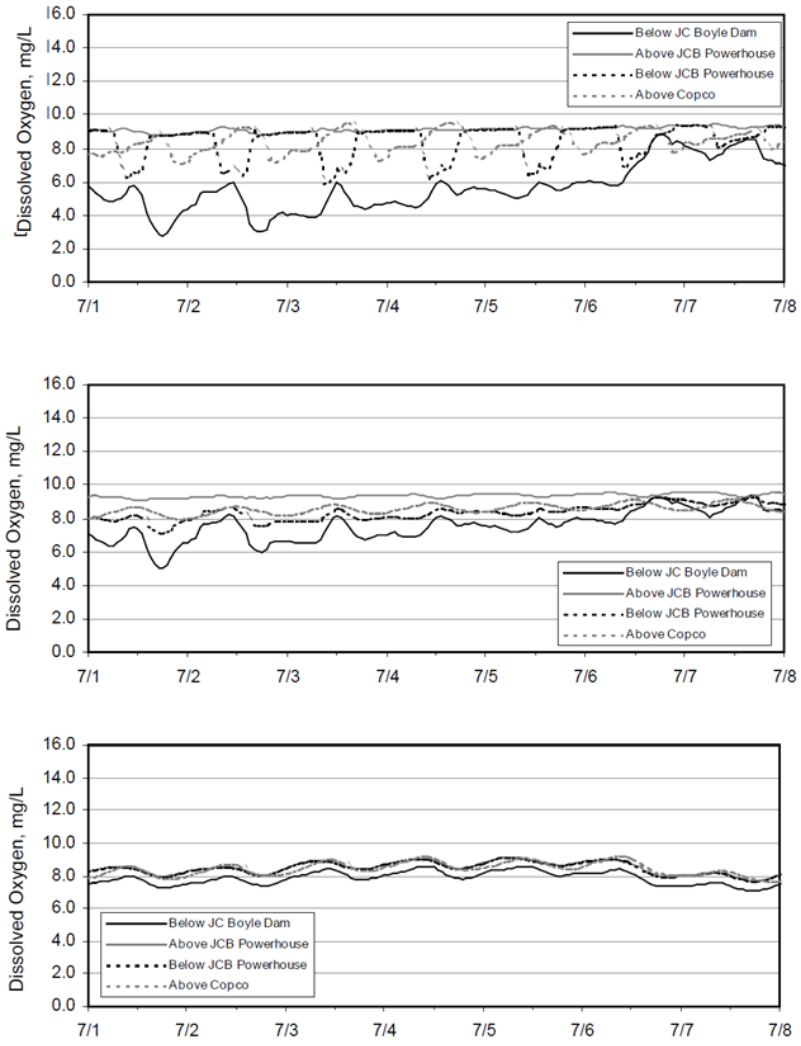

Figure 4.8-42 from PacifiCorp (2004a-1). J.C. Boyle Bypass and Peaking Reach Dissolved Oxygen, 2000: EC [Existing Conditions] (Top), SF [Steady Flow] (Middle), WOP [Without-Project] (Bottom). Note: The Without-Project (WOP) Conditions Modeled in PacifiCorp (2004a-1) Included the Removal of Keno Dam in Addition to Removal of J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate Dams.

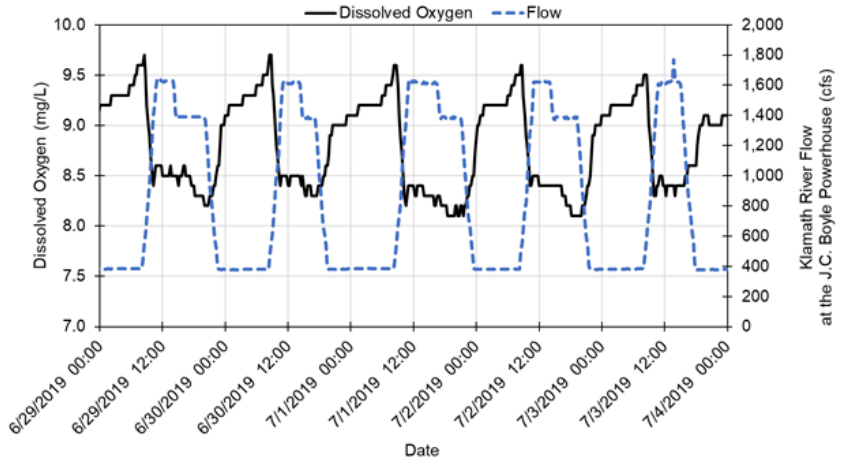

Figure IND156-27-1. Dissolved Oxygen and Klamath River Flow Measured at the U.S. Geological Survey (USGS) 11510700 Gage Downstream of J.C. Boyle Powerhouse. Source: USGS 2019.

Data directly documenting the influence of low dissolved oxygen concentrations in J.C. Boyle Reservoir on dissolved oxygen concentrations at the Oregon-California state line are unavailable, but United States Geological Survey (USGS) dissolved oxygen data measured downstream of the J.C. Boyle Powerhouse indicate hydropower peaking flows diverted from J.C. Boyle Reservoir are decreasing dissolved oxygen concentrations in the J.C. Boyle Peaking Reach downstream of the powerhouse and modeling results consistently indicate that hydropower peaking operations potentially impact dissolved oxygen concentrations in the California portion of the Hydroelectric Reach. Thus, it is reasonable to conclude that variations in dissolved oxygen concentrations in J.C. Boyle Reservoir can affect dissolved oxygen concentrations further downstream in the California portion of the Hydroelectric Reach.

Comment IND156-28, IND157-28, IND158-28, IND177-28

Currently I am without additional time to comment on the California State Water Resources Control Board's draft Environmental Impact Report (EIR) for surrender of the Lower Klamath Project license. Hopefully California State Water Resources Control Board, realizes that the hypereutrophic Klamath River's water quality, without a major cataclysmic event such as a large and long term volcanic eruption, will within the immediately forthcoming several centuries, most likely never--with or without dams--naturally be high elevation unpolluted and naturally nonenriched alpine environment pristine.

Response to Comment IND156-28, IND157-28, IND158-28, IND177-28

As explained in Volume I Section 2.1 *Proposed Project –Project Objectives* (page 2-1), rather than focusing on a pristine and/or alpine environment as stated in the comment, the water quality objective of the Proposed Project is to improve the long-term water quality conditions associated with the Lower Klamath Project in

the California reaches of the Klamath River, including water quality impairments due to *Microcystis aeruginosa* and associated toxins, water temperature, and levels of biostimulatory nutrients.

As summarized in Volume I *Executive Summary – Summary of Propose Project Effects, Potential Impacts, and Potential Cumulative Impacts – Effects Found to be Beneficial* (page ES-9), the Proposed Project is expected to have a beneficial effect on long-term water quality conditions associated with the Lower Klamath Project in the California reaches of the Klamath River by improving water temperature, dissolved oxygen, and pH, and reducing the incidence of algal toxins and noxious phytoplankton blooms.

Humphreys, Chad

Comment IND108-1

I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND108-1

Thank you for your comment. Please refer to Master Response GEN-1.

Humphreys, Tim

Comment IND220-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND220-1
Thank you for your comment. Please refer to Master Response GEN-1.

Ihara, Nancy

Comment IND320-1
I attended the hearing at the D St Community Center in Arcata. The testimony in favor of dam removal was overwhelming. We must do what we can to encourage healthier migration of salmon.

i appreciate the supportive position of the Water Board in this matter.

Response to Comment IND320-1
Thank you for your comment. Please refer to Master Response GEN-1.

Imatani, Kenneth

Comment IND378-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of darn removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND378-1
Thank you for your comment. Please refer to Master Response GEN-1.

Israel, Joshua

Comment IND397-1
I support removal of the Klamath River Dams (JC Boyle, COPCO I and 2, and Iron Gate Dams). Klamath used to be the third biggest Salmon Fishery in the West Coast and this needs to be restored.

Response to Comment IND397-1
Thank you for your comment. Please refer to Master Response GEN-1.

Jansen, Marty

Comment IND351-1

I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND351-1

Thank you for your comment. Please refer to Master Response GEN-1.

Jepson, Oliver

Comment IND319-1

I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND319-1
Thank you for your comment. Please refer to Master Response GEN-1.

Johnson, Dan

Comment IND134-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND134-1
Thank you for your comment. Please refer to Master Response GEN-1.

Johnson, Daniel

Comments IND138-1 and IND139-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comments IND138-1 and IND139-1
Thank you for your comment. Please refer to Master Response GEN-1.

Johnson, David

Comment IND147-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the

project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND147-1
Thank you for your comment. Please refer to Master Response GEN-1.

Johnson, Drake

Comment IND194-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam

removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND194-1
Thank you for your comment. Please refer to Master Response GEN-1.

Johnson, Kenneth

Comment IND377-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of darn removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND377-1
Thank you for your comment. Please refer to Master Response GEN-1.

Johnson, R.B.

Comment IND301-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND301-1
Thank you for your comment. Please refer to Master Response GEN-1.

Johns, Don

Comment IND182-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND182-1
Thank you for your comment. Please refer to Master Response GEN-1.

Joost, William, Jr.

Comment IND192-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND192-1
Thank you for your comment. Please refer to Master Response GEN-1.

Kaar, Susan

Comment IND234-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND234-1
Thank you for your comment. Please refer to Master Response GEN-1.

Kalinowski, John

Comment IND405-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the

project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-tem1 benefits of darn removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND405-1
Thank you for your comment. Please refer to Master Response GEN-1.

Keegan, Kyle

Comment IND373-1
I am a resident of Humboldt County and an ecological restorationist for the past two decades.

I have personally witnessed the decline of the Klamath River, the health of its waters and its salmon runs. I want to give my full support for the removal of the dams in order to attempt to reverse the decline or salmon runs and to restore natural flow regimes and water quality/quantity to the Klamath river ecosystem. I understand that there may be short term impacts to water quality after removing the dams.

I also feel that strong returns of salmon will be in the best interest or local Indian tribes who depend on the runs for subsistence and cultural needs.

Please continue to work towards making the Klamath Dam removal a reality.

Response to Comment IND373-1
Thank you for your comment. Please refer to Master Response GEN-1.

Kennedy, Mark

Comment IND353-1
Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

Response to Comment IND353-1
Thank you for your comment. Please refer to Master Response GEN-1.

Kent, Bart and Mary Cunningham

Comment IND154-1
As an Intervenor in the project to remove the dams on the Klamath River I am writing to submit my comments on the SWRCB Draft EIR.

Response to Comment IND154-1
Thank you for your comment.

Comment IND154-2
I found the Draft EIR to be deficient and lacking in addressing the effects of dam removal. The report is largely based on obsolete data and biased studies. Many of the referenced studies are older than 20 years.

Response to Comment IND154-2
The Lower Klamath Project EIR incorporates all available existing information. This includes older studies that are still relevant to the Proposed Project and the EIR alternatives as well as more recent, available data. In instances where the analyses rely on studies that would be conducted in 2019 (e.g., wetland delineation surveys, local groundwater well studies, reservoir rim slope stability studies), presence of those resources is assumed and mitigation is proposed to reduce impacts to less than significant.

Please also refer to Master Response WQ-4 for a discussion of how more recent water quality data are considered in the EIR analyses.

Comment IND154-3
Very few current studies have been done. There has also been no adequate exploration of alternative solutions to dam removal.

Response to Comment IND154-3
The Lower Klamath Project EIR presents a range of reasonable alternatives to the Proposed Project. Volume I Section 4.1 *[Alternatives Selection/Overview]* (pages 4-1 to 4-14) discusses 17 potential alternatives in relation to the Proposed Project's underlying purpose and objectives, six of which are examined in detail. Of these six alternatives, two involve removal of all four Lower Klamath Project

dams, and four involve two or three dams remaining in place. Potential impacts and beneficial effects are identified for each of these alternatives in the EIR and each will be fully considered by the State Water Board before certifying the EIR (CEQA Guidelines section 15090).

Please note that alternatives that were eliminated from consideration are discussed in the following subsections of Volume I *Alternatives – Alternatives Selection/Overview – Alternatives Selection:*

- Section 4.1.1.2 *Elimination of Potential Alternatives for Failure to Meet Underlying Project Purpose* (pages 4-6 through 4-11);
- Section 4.1.1.3 *Removal or Consolidation of Substantially Similar alternatives* (pages 4-11 through 4-13);
- Section 4.1.1.4 *Elimination of Potential Alternatives that Would Not Avoid or Substantially Lessen Significant Environmental Effects of the Proposed Project* (pages 4-13 through 4-14);
- Section 4.1.1.5 *Alternatives With Other Feasibility Concerns* (page 4-14).

Comment IND154-4

Your report states that loss of property value is not analyzed in this project because it does not constitute an effect. However this is having a drastic effect on homeowners around the lake.

Response to Comment IND154-4

Please note that under CEQA, potential effects from implementing a project that are solely social or economic in nature, such as reductions in property values, loss of property tax revenues, and increases in energy costs, do not constitute an effect (i.e., an impact) to the physical environment.

Comment IND154-5

Your report also addresses slope instability but does I not address the fact that many homes may be subject to slippage. The effects of slope slippage on existing homes is a direct impact of dam removal and should be addressed.

Response to Comment IND154-5

Regarding the potential for landslides (slippage) due to reservoir drawdown, please refer to Potential Impact 3.11-3 (pages 3-761 to 3-765) in Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* and to Master Response GEO-2. There is some potential for instability of diatomaceous deposits along the rim and within Copco No. 1 Reservoir, where there are twelve parcels with existing habitable structures that could be affected. Mitigation Measure GEO-1 applies to these structures.

Khartchenko, Alexander

Comment IND68-1
1. Protection of our lives against fires (because of our Lakes the tragic situation similar to what happened in Paradise would never take p lace here).

Response to Comment IND68-1
Thank you for your comment. Please refer to Master Response HAZ-2.

Comment IND68-2
2. The cheapest and the cleanest source of power energy: clean water goes through turbines, produces electricity, and then the same clean water goes further.

Response to Comment IND68-2
Please refer to Master Response ENR-1 for a discussion of the potential for rate increases from the removal of the Lower Klamath Project Facilities. With respect to the potential for an increase in greenhouse gas (GHG) emissions from the removal of the Lower Klamath Project facilities, this topic pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Greenhouse Gas Emissions and Energy*).

Comment IND68-3
3. The best recreation area exists here now because of out Dams and Lakes: water skiing, rowing, great fishing, hiking - (especially around Copco Lake - the most fun!.), etc.

Response to Comment IND68-3
Please refer to Section 3.20.5 *Recreation – Potential Impacts and Mitigation* Potential Impact 3.20-2 for a discussion of long-term changes to or loss of reservoir-based recreation activities and facilities due to removal of Iron Gate and Copco No. 1 reservoirs. The final Section 3.20 *Recreation* is presented in Volume III Attachment 1.

Comment IND68-4
4. Preserving the gorgeous flora and fauna which was created due to the Dams - the current ecology is more than 100 years old: several nests of Bald Eagles, rare small turtles, short nose sucker, etc.

Response to Comment IND68-4
Please refer to Master Response TER-1.

Comment IND68-5
5. The value of Lakes for local agriculture is a crucial. There is no doubt about it. Also Lakes provide the best fresh water for our wells - we live near the Lake and we know it.

Response to Comment IND68-5
Please refer to Master Responses WSWR-1 and WSWR-3 for information regarding the water supply and agriculture in the Klamath Basin. Please also refer to Master Response GRW-1 for a discussion of the effects of the Proposed Project on groundwater wells in the vicinity of the reservoirs.

Comment IND68-6
The liberals and those who pretend to be environmentalists base their ideas of demolishing Dams not on true data and therefore the whole their approach is a false and hence dangerous.

Response to Comment IND68-6
Please refer to Master Response GEN-2.

Comment IND68-7
Many hundred years ago according to archeologists Copco Lake existed, and the earthquake a few hundred years ago broke the natural dam. In 1916 the Dam was re-created by genius American engineers with addition of turbines providing the cleanest and cheapest electricity to tens of thousands of residents and businesses in California Siskiyou county and Southern Oregon area.

Response to Comment IND68-7
This comment does not relate to the adequacy of the EIR under CEQA (see Master Response GEN-2).

Comment IND68-8
The dream of liberals (none of the them live near the Lakes or even in Siskiyou county) that demolition of Dams will bring salmon to the Klamath River in our neighborhood is not grounded on facts as well. According to the notes of people who lived here before dams were built (1850 to 1910), salmon was never noticed here, more over in old times during the hot summers the River was almost dry; they called it Walk Through river or Stinky river. The saying" The History is a Science about Future " becomes true, if Dams will disappear we return back to the Stinky River.

Response to Comment IND68-8
Please refer to Master Response AQF-4.

Comment IND68-9
Another wrong words of those who support demolishing of Dams is so called algae health issues. According to my personal experience algae has nothing to do with the health: I swim in the Lake and River every summer and never had any health problems, on the contrary, I feel very refreshed, full of energy and healthy after that. And certainly as recent research proves, Algae has nothing to do with our Dams: Algae existed millions years ago and will continue to be for millions years more.

Response to Comment IND68-9
Please refer to Master Response WQ-7.

Comment IND68-10
By the way, many many hundred years ago according to the findings of archeologists Copco Lake existed, and most likely the earthquake a few hundred years ago broke the natural dam. In 1916- 1920 the Dam was re-created by genius American engineers with addition of turbines providing the cleanest and cheapest electricity to tens of thousands of residents and businesses in California Siskiyou county and Southern Oregon area.

Response to Comment IND68-10
This comment does not relate to the adequacy of the EIR under CEQA (see Master Response GEN-2).

Comment IND68-11
DAMS MUST BE SAVED.

Response to Comment IND68-11
Please refer to Master Response GEN-1.

Kiefer, Marc

Comment IND363-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of darn removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND363-1
Thank you for your comment. Please refer to Master Response GEN-1.

Klein, Dorothy and Rodney

Comment IND175-1
We are Absolutly Against removal of the dams. Why take away a NATURAL Source of energy? What will have to be used to replace it? MONEY. Money from all the humans in the area. These are not The only places to save fish. HUMANS are more important than fish. Those of us on Fixed incomes dread The raise in out utility bills.

Please use your influence to Stop The dam removals.

Response to Comment IND175-1
Thank you for your comment. Please refer to Master Responses GEN-1, GEN-2, and ENR-1. With respect to the comment about energy, this topic pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (Greenhouse Gas Emissions and Energy).

Koch, David

Comment IND148-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam

removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND148-1
Thank you for your comment. Please refer to Master Response GEN-1.

Kohlman, Brian

Comment IND90-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undarn the Klamath!

Response to Comment IND90-1
Thank you for your comment. Please refer to Master Response GEN-1.

Kosh, Ryan

Comment IND266-1

I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND266-1

Thank you for your comment. Please refer to Master Response GEN-1.

Kress, Larry

Comment IND372-1

I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of darn removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND372-1
Thank you for your comment. Please refer to Master Response GEN-1.

Krivan, William

Comment IND190-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND190-1
Thank you for your comment. Please refer to Master Response GEN-1.

Krizo, David

Comments IND270-1 and IND271-1
I believe keeping the dams is essential for many reasons.

Response to Comments IND270-1 and IND270-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comments IND270-2 and IND271-2
The dams were put in after major flooding on the river with a great deal of property and personal damage. It is not a good idea to expose the occupants downriver to those dangers again.

Response to Comments IND270-2 and IND270-2
Please refer to Master Response FLD-1.

Comments IND270-3 and IND271-3
With the push for green energy by the government, why would we destroy an important source of that green energy which would need to be replaced by fossil fuels?

Response to Comments IND270-3 and IND271-3
This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Greenhouse Gas Emissions and Energy*).

Comments IND270-4 and IND271-4
As a farmer, water storage is very important to me. It is a waste to let water uselessly go to the ocean.

Response to Comments IND270-4 and IND271-4
Please refer to Master Responses WSWR-1 and WSWR-3.

Comments IND270-5 and IND271-5
Removing dams would destroy wildlife habitat.

Response to Comments IND270-5 and IND271-5
Please refer to Master Response TER-1.

Comments IND270-6 and IND271-6
The decisions to destroy the dams were done in closed door meetings with no input accepted or allowed from those most affected.

Response to Comments IND270-6 and IND271-6
Please refer to Volume I Section 1.4 *Introduction – EIR Process Overview* (pages 1-3 and 1-4) and Section 1.5 *Introduction – Public Involvement and Agency Consultation in Preparing Draft EIR* (pages 1-4 to 1-8) for a discussion of activities that have occurred since the State Water Board issued the Notice of Preparation on December 22, 2016, to the circulation of the Draft EIR for agency and public review, as well as a review of public stakeholder outreach, scoping meetings, scoping comments, and agency and Tribal consultation during this period.

Comments IND270-7 and IND271-7
There is clear evidence that dam removal would cause a major environmental catastrophe. I have not seen this refuted. Those pushing the removal have separated themselves from any financial or other responsibility in the case that this catastrophe does happen. This seems very unethical. Also unethical is forcing those who do not agree with removal to pay for it.

Response to Comments IND270-7 and IND271-7
Please refer to Master Response GEN-1. Please also refer to Section 3 of the Draft EIR for detailed discussions of the potential physical effects of the proposed project on the environment.

With respect to the comment's assertions regarding financial responsibility for the Proposed Project, including the potential for unexpected environmental impacts relating to dam removal, please note that this issue does not constitute substantial evidence regarding the potential physical impacts of the Proposed Project on the environment (CEQA Guidelines section 15384). To the extent the comment raises concerns about the enforceability of requirements that the applicant address the environmental impacts of the Proposed Project, and of the ability of the applicant to do so, please note that pursuant to CEQA section 15126.4 subdivision (a) (2), mitigation measures must be fully enforceable through permit conditions, agreements, or other legally binding instruments. Please refer to Master Response CEQ-2 for further discussion of the enforceability requirement for CEQA mitigation measures in the context of FERC proceedings. The State Water Board has issued a draft water quality certification and will issue a final certification that includes implementing water-quality related requirements as a condition of certification. These requirements would become enforceable through incorporation into any Federal Energy Regulatory Commission (FERC) surrender license, as well as under the Clean Water Act (CWA). Please note that potential environmental impacts that are not mitigable are analyzed in the EIR as significant and unavoidable. Volume III Attachment 1 Table ES-1 summarizes the results of the EIR impact analyses, including identifying impacts that are significant and unavoidable and impacts that are avoidable with mitigation.

Please note that the applicant explains mitigation surety for the Proposed Project in updates to the Definite Plan. Klamath River Renewal Corporation (KRRC) has identified Resources Environmental Solutions LLC (RES) as the entity that would assume responsibility for long-term maintenance and adaptive management of mitigation measures, and would function as a specialty corporate indemnitor to cover risks not otherwise fully covered by the Project Agreement or insurance and bond programs (KRRC 2019b, 2020). Please also refer to: http://www.klamathrenewal.org/wp-content/uploads/2019/07/KRRC-July-29-FERC-Filing.pdf and http://www.klamathrenewal.org/wp-content/uploads/2020/02/Public-02-28-2020-Supp-Response-Letter.pdf.

Comments IND270-8 and IND271-8

These and many other concerns I have are included in the attachment. Please see the attachment: "MEMORANDUM OF LAW - THE FOUR KLAMATH RIVER HYDROELECTRIC POWER DAMS CANNOT BE REMOVED PURSUANT TO THE KLAMATH BASIN AGREEMENTS WITHOUT THE CONSENT AND RATIFICATION OF THE UNITED STATES CONGRESS"

Response to Comments IND270-8 and IND271-8

This comment relates to the Klamath Basin Restoration Agreement (KBRA), Klamath Hydropower Settlement Agreement (KHSA), Upper Klamath Basin Comprehensive Agreement (UKBCA), Amended Klamath Hydropower Settlement Agreement (KHSA), Klamath Power Facility Agreement (KPFA), SA 3288, and the Klamath River Basin Compact. Comment noted. Please also refer to Master Response CEQ-4 for a discussion regarding the Klamath River Basin Compact.

Krizo, Jacqui

This commenter provided the same set of comments twice. Please see below responses for the first set of comments 1–20.

Comment IND272-1

80% of Siskiyou County, and the majority of Klamath County voters, voted to keep the dams. The dams are in their back yards and affect these citizens the most. Our region's representatives, with their massive amounts of study on the issue, support keeping our dams. We must live with the disastrous results of this immense dam removal "experiment" as stated at meetings by the "experts." Everyone, including the public, has been excluded from all the closed-door negotiations except those who support dam destruction.

Response to Comment IND272-1

Thank you for your comment. Please refer to Master Response GEN-1.

Comment IND272-2

70,000 households receive the green clean power from our hydroelectric dams.

Response to Comment IND272-2
This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Greenhouse Gas Emissions and Energy*).

Comment IND272-3
We live in this pristine rural area. We don't want 22 million cubic yards of sediment to flow to the Pacific with dam removal, sterilizing the entire river for decades.

Response to Comment IND272-3
The State Water Board is not aware of any scientific evidence that sediment release from behind the Lower Klamath Project would result in "sterilizing the entire river." Please refer to Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 (pages 3-765 to 3-775) and to Master Response GEO-1.

Comment IND272-4
In 2011, Interior's report said that the entire dam removal and restorations could boost salmon population in parts of the upper basin by 10%, only if all the other water quality problems were solved first. Solving all the water quality problems would require reversing "mother nature's" natural occurring phosphorus that is prevalent in the entire upper basin. Before our Klamath dams and before the Klamath Reclamation Project, historians wrote that Klamath Lake quality was so bad that even their horses would not drink from it.

Response to Comment IND272-4
Please refer to Master Response WQ-1 for a discussion of the role of the Lower Klamath Project dams/reservoirs on overall water quality. The Proposed Project does not include any changes to the amount of flow released by the United States Bureau of Reclamation's (USBR's) upstream Klamath Irrigation Project and the applicable biological opinion(s), and historical observations of low flows and associated poor water quality are not anticipated to reoccur due to removal of the Lower Klamath Project Dams

Comment IND272-5
With the massive amounts of wildfires, we'd like to keep the dam reservoirs created by our dams, because the water for firefighting has saved many communities from being incinerated. Our little communities are important to us. Wildfires severely affect our air quality and oxygen in the river. Without firefighting capabilities, forests, wildlife and housing get totally burned up.

Response to Comment IND272-5
Please refer to Master Response HAZ-2.

Comment IND272-6
We support fish ladders and trucking fish like on the Columbia River and others.

Response to Comment IND272-6
Please refer to Volume I Section 4.4 *Continued Operations with Fish Passage Alternative* (pages 4-99 to 4-180) for the analysis of the provision of fish passage on the Lower Klamath Project dams using fish ladders.

Comment IND272-7
Dean Brockbank, vice president and general counsel of PacifiCorp was quoted as saying the government "made it very clear from a public policy point of view that they did not want these dams relicensed. Once that became abundantly clear, we shifted our framework from relicensing to a settlement involving a possible dam removal framework". This statement makes apparent that top level officials within the Department of Interior conspired to orchestrate the removal of the dams from the beginning and that the rest of this discussion was not a sincere attempt to settle the issues with all options available.

Response to Comment IND272-7
Please refer to Volume I Section 1.4 *Introduction – EIR Process Overview* (pages 1-3 and 1-4) and Section 1.5 *Introduction – Public Involvement and Agency Consultation in Preparing Draft EIR* (pages 1-4 to 1-8) for a discussion of activities that have occurred since the State Water Board issued the Notice of Preparation for the Lower Klamath Project EIR on December 22, 2016, including a review of public stakeholder outreach, scoping meetings, scoping comments, and agency and Tribal consultation during this period.

Comment IND272-8
Dam removal will destroy the economy of Siskiyou County, and greatly impair Modoc and Klamath Counties, so we want to keep our dams.

Response to Comment IND272-8
Please note that CEQA documents analyze significant effects on the physical environment; CEQA does not address potential social or economic effects from implementing a project (CEQA Guidelines, section 15131(a).

Comment IND272-9
We want to keep the water storage, ecosystems for wildlife in and near the reservoirs, flood control, recreation, clean green energy, forests, water in reservoirs for firefighting, agriculture, water quality from the dam reservoirs, and air quality that these dams provide. We have had some record runs of salmon since the dams were built.

Response to Comment IND272-9
Please refer to Master Responses TER-1, FLD-1, HAZ-2, and WQ-1.

Comment IND272-10
According to the Bureau of Reclamation, additional Upper Basin water storage would cost more than 10 billion dollars. Klamath Project water storage that could be destroyed is already paid for, inexpensive, and maintenance is paid through hydropower production.

Response to Comment IND272-10
Please refer to Master Responses WSWR-1 and WSWR-3.

Comment IND272-11
I know people who lived downriver before the dams were built, who survived the floods. We want to continue preventing flash floods, deaths, loss of homes, buildings, fish and wildlife habitat, and erosion caused by preventable floods.

Response to Comment IND272-11
Please refer to Master Responses FLD-1 and TER-1.

Comment IND272-12
We want to keep the hatcheries that produce millions of fish that will be destroyed with dam removal.

Response to Comment IND272-12
Please refer to Master Response AQF-2.

Comment IND272-13
In your EIR you celebrate the possible production of more lampreys. These fish parasites eat other fish. With the demand that if salmon and suckers don't thrive, our irrigation water will be sent to the ocean, we really don't want these to parasites to thrive in our already-fragile ecosystem. Also planted into our Tulelake and Lower Klamath wildlife refuges are little islands to attract Caspian terns. The tern population along the Columbia River has been responsible for around 15 million to 20 million salmon smolts being eaten annually. The cormorant population growing on East Sand Island is estimated to be responsible for an additional 11 million young salmon each year. With these fish predators, Lampreys, dams or no dams, the survival of fish in the Klamath Basin, by design, is hindered.

Response to Comment IND272-13
Pacific lamprey do not eat other fish in the Klamath River. As adults in the marine environment, lamprey are parasitic on large fish and whales, which does not result in mortality of their hosts. For a discussion on the anticipated loss of aquatic and shoreline habitat associated with the Proposed Project, the potential effects on fish-eating birds including bald eagle, osprey, merganser, cormorant, egret, and heron, please refer to Volume I Section 3.5.5 *Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities* Potential Impact 3.5-21 (pages 3-562 to 3-563).

Comment IND272-14
We want to keep the dam reservoirs that provide recreation, an established ecosystem, reduction of algae, nutrients and toxins, and habitat for endangered species.

Response to Comment IND272-14
Please refer to Master Responses GEN-1, TER-1, WQ-1, PAP-1, PAP-2, and REC-1.

Comment IND272-15
The Shasta Tribe opposes dam and lake destruction. They are the only Tribe which held the ancestral grounds where the dams are located, and they have not been allowed a voice in the KHSA or any settlement "agreements." Dam destruction would expose and further damage ancestral Shasta burial and village sites with no known benefit to them of any kind. They sacrificed their homeland sacred ground for these dams.

Response to Comment IND272-15
Please refer to Section 3.12 *Historical Resources and Tribal Cultural Resources* for a discussion of the consultation process that the State Water Board engaged in with both the Shasta Indian Nation and the Shasta Nation to identify potentially-impacted resources, discern potential impacts, and develop potential mitigation measures related to the Proposed Project. Please refer to Volume III Attachment 1 for the final Section 2.12 *Historical Resources and Tribal Cultural Resources*.

Comment IND272-16
We want to keep our world class whitewater rapids and deep water lakes for competition quality lake fishing, boating and water skiing.

Response to Comment IND272-16
Please refer to Master Response REC-1.

Comment IND272-17
We Klamath Basin farmers have been forced to allow our stored water to be diverted downstream for mandatory "pulse flows." Farmers here, many families of WWI and WWII veteran homesteaders, are terrified that our water storage will be gone along with any possible water, including our aquifer, for mandated river flows and lake levels and pulse flows, with nothing left to water our crops. We pride ourselves in a growing number of organic crops, water conservation, and improved water quality, providing certified healthy American grown food. We want to keep growing food that provides waterfowl with 35 million pounds of food annually; Klamath Basin is the most important waterfowl area in North America.

Response to Comment IND272-17
Please refer to Master Responses WSWR-1 and WSWR-3.

Comment IND272-18
We have received terrifying information from Stephen Koshy, "United Nations Earth Dam Design trained engineer and former Deputy Director, Earth Dams Directorate of India." He designed clay core dams. He has researched destruction of clay core dams and predicts the "catastrophic collapse" resulting from the attempt to remove Iron Gate Dam. He cites specific knowledge of internal clay core saturated lower level pore pressure rendering that core unstable upon reduction of external pressure (drawdown and excavation). He has warned agencies of removal failure and loss of life. Agenda driven agencies have repeatedly marginalized his concerns, refusing to adequately address his scientific predictions. The KRRC's Definite Plan does not consider, address or provide for a catastrophic collapse and loss of life.

If you are interested in more information that Stephen Koshy has compiled on a clay core dam removal impending catastrophe, I will be happy to send that to you.

Response to Comment IND272-18
Section 3.6.5.3 *Flood Hydrology – Potential Impacts and Mitigation – Risks of Dam Failure* Potential Impact 3.6-6 has been revised to clarify the discussion of risks of dam failure under existing conditions, during reservoir drawdown, and dam deconstruction; as well as the most recent (2019) Division of Safety of Dams ratings and hazard classifications for the three California dams. Please refer to Volume III Attachment 1 Section 3.6.5.3 *Flood Hydrology – Potential Impacts and Mitigation – Risks of Dam Failure* Potential Impact 3.6-6 for the revisions.

Comment IND272-19
When Interior decided to destroy Chiloquin dam, we were assured that it would increase Lost River and Shortnose sucker spawning range by 95%, bringing our suckers to no longer be endangered. That promise and experiment obviously did not work to increase sucker population, but it was obviously one step closer to eliminating dams and rewilding the west.

Response to Comment IND272-19
The comment raises a prior, unrelated dam removal effort that does not relate to the potential physical impacts of the Proposed Project on the environment. Please refer to Master Response GEN-2.

Comment IND272-20
In your draft EIR we find no accountability or mitigation certainty for all the resulting destruction listed above. Perhaps the California State Water Resources

Control Board will be the agency to compensate and mitigate the resulting destruction to our communities, resources and lives.

Response to Comment IND272-20
Regarding the comment on accountability and mitigation certainty, please note that pursuant to CEQA section 15126.4 subdivision (a) (2), mitigation measures must be fully enforceable through permit conditions, agreements, or other legally binding instruments. Please refer to Master Response CEQ-2 for further discussion of the enforceability requirement for CEQA mitigation measures in the context of Federal Energy Regulatory Commission (FERC) proceedings. The State Water Board has issued a draft water quality certification and will issue a final certification that includes implementing water-quality related requirements as a condition of certification. These requirements would become enforceable through incorporation into any FERC surrender license, as well as under the Clean Water Act (CWA). Please note that potential environmental impacts that are not mitigable are analyzed in the EIR as significant and unavoidable. Volume III Attachment 1 Table ES-1 summarizes the results of the EIR impact analyses, including identifying impacts that are significant and unavoidable and impacts that are avoidable with mitigation.

Please note that the applicant explains mitigation surety for the Proposed Project in updates to the Definite Plan. Klamath River Renewal Corporation (KRRC) has identified Resources Environmental Solutions LLC (RES) as the entity that would assume responsibility for long-term maintenance and adaptive management of mitigation measures, and would function as a specialty corporate indemnitor to cover risks not otherwise fully covered by the Project Agreement or insurance and bond programs (KRRC 2019b, 2020). Please also refer to: http://www.klamathrenewal.org/wp-content/uploads/2019/07/KRRC-July-29-FERC-Filing.pdf and http://www.klamathrenewal.org/wp-content/uploads/2020/02/Public-02-28-2020-Supp-Response-Letter.pdf.

Kroeker, Curtis

Comment IND128-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year,

which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND128-1
Thank you for your comment. Please refer to Master Response GEN-1.

Krohn, Jerry

Comment IND415-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND415-1
Thank you for your comment. Please refer to Master Response GEN-1.

Krupinski, K

Comment IND389-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND389-1
Thank you for your comment. Please refer to Master Response GEN-1.

Kryger, Robert

Comment IND288-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND288-1
Thank you for your comment. Please refer to Master Response GEN-1.

Kuhwarth, Richard

Comment IND299-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND299-1
Thank you for your comment. Please refer to Master Response GEN-1.

Kwok, Steven

Comment IND240-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND240-1
Thank you for your comment. Please refer to Master Response GEN-1.

L. Martin, William

Comment IND188-1
Thank you for this opportunity to comment upon the current application by Klamath River Renewal Corporation (KRRC) to remove four dams on the Klamath River.

I strongly support the application and the final Project of dam removal. The Klamath dams block salmon and steel head from reaching more than 300 miles of spawning and rearing habitat in the upper basin. Historically, the Upper Klamath-Trinity Rivers spring-run Chinook salmon was the most abundant run on the river. Today less than 3% remain, in large part because they cannot access historical habitat in the Upper Klamath Basin A non-profit organization, the Klamath River Renewal Corporation (KRRC), was formed in 2016 to take ownership of four PacifiCorp -owned dams (Copco #1, Copco #2, Iron Gate and JC Boyle), for the purpose of overseeing the dam removal process.

All the pieces are in place for these dams to be removed by 2021 pending the license transfer.

Funding for the projects is set, with up to $450 million secured from PacifiCorp ratepayers and the state of California through the 2014 Proposition 1 Water Bond.

Please continue to support this major project by granting licenses and applications.

Response to Comment IND188-1
Thank you for your comment. Please refer to Master Response GEN-1.

Lahti, Derald

Comment IND168-1
Please proceed with the obvious best solution and remove the four lowest dams on The Klamath River. This will be good for the local and indigenous people, the environment and the economic health of the entire area. Thanks for doing the right thing.

Response to Comment IND168-1
Thank you for your comment. Please refer to Master Response GEN-1.

Lapcevic, William

Comment IND187-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND187-1
Thank you for your comment. Please refer to Master Response GEN-1.

Larson, Edward

Comment IND201-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND201-1
Thank you for your comment. Please refer to Master Response GEN-1.

Lee, Scott

Comment IND261-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND261-1
Thank you for your comment. Please refer to Master Response GEN-1.

Lester, Paul

Comment IND314-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND314-1
Thank you for your comment. Please refer to Master Response GEN-1.

Lima, Chris

Comment IND117-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath! While now a resident of Idaho, I have spent most of my life living in California and working towards improving watershed health for both fish, wildlife, and people.

Response to Comment IND117-1
Thank you for your comment. Please refer to Master Response GEN-1.

Lonergan, David

Comment IND149-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND149-1
Thank you for your comment. Please refer to Master Response GEN-1.

Lorenson, R.B.

Comment IND303-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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It's time to undam the Klamath!

Response to Comment IND303-1
Thank you for your comment. Please refer to Master Response GEN-1.

Luby-Prikot, Lukas

Comment IND366-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND366-1
Thank you for your comment. Please refer to Master Response GEN-1.

Mace, Bruce

Comment IND99-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND99-1
Thank you for your comment. Please refer to Master Response GEN-1.

Maier, Kenny

Comment IND376-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND376-1
Thank you for your comment. Please refer to Master Response GEN-1.

Makshanoff, William

Comment IND186-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the

project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND186-1
Thank you for your comment. Please refer to Master Response GEN-1.

Maniatis, Terez

Comment IND227-1
I would like to see full removal of the lower 4 Klamath River Dams! I am a business owner in Mt. Shasta and enjoy fishing and rafting on the Klamath river and would like to see the water quality improve! Thanks for considering my opinion.

Response to Comment IND227-1
Thank you for your comment. Please refer to Master Responses GEN-1 and GEN-2.

Manning-Brown, Helen

Comment IND436-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND436-1
Thank you for your comment. Please refer to Master Response GEN-1.

Mar, Terry

Comment IND232-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND232-1
Thank you for your comment. Please refer to Master Response GEN-1.

Marsden, Michael

Comment IND341-1
Dear State Water Resources Control Board,

I strongly support the full removal of the lower four Klamath River Dams. The Draft Environmental Impact Report (DEIR) affirms that the dam removal is the best alternative and would comply with the water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoration a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for the struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Sincerely,

Michael Marsden

Martinez

Response to Comment IND341-1
Thank you for your comment. Please refer to Master Response GEN-1.

Marta, Michele

Comment IND336-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND336-1
Thank you for your comment. Please refer to Master Response GEN-1.

Martin, Rosada

Comment IND279-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND279-1
Thank you for your comment. Please refer to Master Response GEN-1.

Mattson, William

Comment IND195-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) a:ffinns that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND195-1
Thank you for your comment. Please refer to Master Response GEN-1.

McCalister, R.B.

Comment IND302-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND302-1
Thank you for your comment. Please refer to Master Response GEN-1.

McClintock, Robert

Comment IND289-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND289-1
Thank you for your comment. Please refer to Master Response GEN-1.

Mcgee, Thomas Sr.

Comment IND224-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND224-1
Thank you for your comment. Please refer to Master Response GEN-1.

McGrew, Marisa

Comments IND359-1 and IND360-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project Purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comments IND359-1 and IND360-1
Thank you for your comment. Please refer to Master Response GEN-1.

McKernan, Patrick

Comment IND317-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND317-1
Thank you for your comment. Please refer to Master Response GEN-1.

McKinley, Charles

Comment IND111-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND111-1
Thank you for your comment. Please refer to Master Response GEN-1.

McLaren, Graham

Comment IND443-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND443-1
Thank you for your comment. Please refer to Master Response GEN-1.

McMorrow, John

Comment IND404-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND404-1
Thank you for your comment. Please refer to Master Response GEN-1.

Meamber, Sheila and Don

Comment IND185-1
It makes no sense to convert from the clean hydro power produced by the 4 dams, and converting to carbon polluting natural gas generators as has been reported.

Response to Comment IND185-1
Thank you for your comments. This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Greenhouse Gas Emissions and Energy*).

Comment IND185-2
The use of Upper Klamath Basin streams for enhanced natural spawning habitat river miles, will not work. Except during the winter, Upper Klamath Lake and Lake Ewauna are too warm, along with a lethal shortage of dissolved oxygen there for Salmonid smolts to survive the trip back to the ocean.

Response to Comment IND185-2
As decribed in Section 3.3.5.3 *Aquatic Resources – Potential Impacts and Mitigation – Water Quality – Upper Klamath River and Connected Waterbodies*, water quality in the Upper Klamath Basin under the Proposed Project would not preclude the occurrence of anadromous salmonids upstream of Iron Gate Dam. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment IND185-3
Chinook Salmon never migrated past J.C. Boyle due to the natural reef at that site, Moonshine Falls. Early explorers reported observing the salmon piled up at the base of the Falls, unable to swim any further.

Response to Comment IND185-3
As described in Section 3.3.5.8 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Habitat*, there is no evidence of a natural reef at J.C.Boyle that historically blocked upstream migration of salmonids. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment IND185-4
Biologists from USF&W wrote articles about the salmon that used to travel to the Upper Basin. They have no concrete proof.

Response to Comment IND185-4
The research of Hamilton et al. (2005) and Hamilton et al. (2016) was published in peer-reviewed journals and is considered the best available and most current scientific and factual data on Chinook salmon historical use of the upper Klamath River Basin. These studies involved authors from the U.S. Fish and Wildlife Service, the U.S. Bureau of Reclamation, and the National Marine Fisheries Service.

Comment IND185-5
The reservoirs behind the hydro dams provide large safe water sources for the helicopters to dip water to dump on the forest fires that have been so destructive to the natural forests and air quality all over the West Coast.

Response to Comment IND185-5
Please refer to Master Response HAZ-2.

Comment IND185-6
The reservoirs trap the nutrients consumed by the algae, dropping to the bottom of the lakes keeping both out of the downstream Klamath River, and cleaner than prior to dams over 100 years ago. The nutrients all originate in Oregon; they are stopped by the reservoirs, keeping the water quality of the River cleaner at a reasonable cost.

Response to Comment IND185-6
Please refer to Master Response WQ-1.

Comment IND185-7
It makes no sense to report that removal of the dams will improve water quality. Leave them in place !!!

Response to Comment IND185-7
Please refer to Master Responses WQ-1 and GEN-1.

Mees, Michael

Comment IND340-1
My name is Michael Mees a student at HSU and I am honored to be currently living on unceded Wiyot land. I am writing to voice my support for this project. The DEIR was conducted and presented very thoroughly. Salmon are vital to the lively hoods and way of life for traditional peoples in these areas. It is tantamount to their culture and is what connects them to each other and the land. Salmon is also vital to a thriving fishing economy. These dams have all but killed these practices along the Klamath watershed. It is about time that we right the wrongs from our past and remove them to restore and revitalize these areas. Thank you for your hard work and collaboration.

Response to Comment IND340-1
Thank you for your comment. Please refer to Master Response GEN-1.

Menard, Robert

Comment IND287-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles

of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND287-1
Thank you for your comment. Please refer to Master Response GEN-1.

Merlone, Steven

Comment IND239-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND239-1
Thank you for your comment. Please refer to Master Response GEN-1.

Metzler, Michael

Comment IND339-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND339-1
Thank you for your comment. Please refer to Master Response GEN-1.

Michaelides, Peter

Comment IND309-1

I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND309-1

Thank you for your comment. Please refer to Master Response GEN-1.

Mikeska, Jeff

Comment IND273-1

I am writing you to let you know that I am encourage you to remove the dams on the Klamath River below Klamath Lake.

Response to Comment IND273-1

Thank you for your comment. Please refer to Master Response GEN-1.

Comment IND273-2

I fish the Klamath River below Iron Gate Dam a number of times a year. Mostly in the summer months. When the fish aren't biting the water is certainly warm and pleasant for swimming. Unfortunately the elevated water temperatures are not good for the fishery and water quality issues caused by plant life blooms. At times there is so much seaweed that the water barely flows. Higher water

temperatures encourage plant life growth-which encourages even slower water- which in turn encourage higher temperatures creating a destructive loop. Removal of the dams will bring the water temperatures down and return the river bottoms to a more natural and less silted state in which weeds cannot flourish so readily. Lower water temperatures will also discourage destructive algae blooms which are main contributors to water quality problems.

Response to Comment IND273-2
Section 3.2.5.1 *Water Quality – Potential Impacts and Mitigation – Water Temperature* Potential Impact 3.2-1 provides an analysis of the short-term and long-term alterations in water temperature due to conversion of the reservoir areas to a free-flowing river. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Further, Volume I Section 3.4.5 *Phytoplankton and Periphyton – Potential Impact and Mitigation – Phytoplankton* Potential Impacts 3.4-1 through 3.4-5 (pages 3-426 to 3-440) present the analysis of the short-term and long-term changes to phytoplankton and periphyton in the Klamath River under the Proposed Project, including the potential for increased scour of periphyton during winter and spring storm events under dam removal and compared to existing conditions. Please also refer to Master Response GEN-2.

Comment IND273-3
Please consider removing the dams for the health of the river ecosystem.

Response to Comment IND273-3
Comment noted.

Miller, Susan

Comment IND233-1
I attended the meeting referenced above and listened carefully to all the comments presented. What I noticed is that the commenters who spoke for retaining the dams cited practical reasons and benefits for their retention. Specifically:

1. *Clean hydroelectric power to 70,000 homes and businesses in three counties,*
2. *Electric power independence and lower power rates,*
3. *Flood control,*
4. *Fire suppression,*
5. *Groundwater recharge, especially in the Copco Lake area,*
6. *Adequate cold water for a large salmon fish hatchery,*
7. *Recreation and*

Response to Comment IND233-1
Thank you for your comment. Please refer to Master Responses GEN-1, ENR-1, FLD-1, HAZ-2, GRW-1, REC-1 and AQF-2. With respect to the comment about

hydroelectric power, this topic pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (Greenhouse Gas Emissions and Energy).

Comment IND233-2

8. Water retention for discharge during fall fish runs, while those who were pro dam removal discussed fish and river restoration, as if dam removal were the panacea for all their ills, when in reality the poor fish runs have nothing to do with the dams. (The Copco lake dam has been in existence for over 100 years and there is documented evidence that a lake was present before the dam, due to the existence of a basalt reef.) In fact the dams are beneficial to the anadromous fish for the following reasons:

1. Iron Gate dam provides cold water for a much larger fish hatchery than formerly existed on Fall Creek.

2. The dams create a barrier to the transmission of toxic algae downstream.

3. The dams provide a consistent flow of cold water for discharge downstream, as the water is released from the bottom of the dams.

4. The dams release extra water during the critical months of September and October for supporting the fall fish run, without which the river flow would be inadequate in 3 out of 5 years to support a fall fish run, due to low precipitation.

Scientific evidence has shown that the poor fish runs are caused primarily by the following:

1. Less phytoplankton food supply in the oceans due to pollution and ocean oscillating currents.

2. The comeback of marine mammals, such as seals, now that they are protected. It is estimated that one seal can eat 18 lbs of fish/day.

3. Commercial fishing pressure

4. The allowance of gill netting at the mouth of the river by the Yurok tribe.

5. Overfishing in general, both in the river and the ocean.

Response to Comment IND233-2

There is no available scientific information to suggest that the Lower Klamath Project dams are beneficial to anadromous fish in the Klamath River. Section 3.3.2 *Aquatic Resources – Environmental Setting* describes the best available and most current scientific and factual data on aquatic resources in the Klamath River basin, their current status, and factors affecting their habitat suitability and

population abundance. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Please refer to Master Responses WQ-1, WQ-2, and PAP-1 with respect to the role of the Lower Klamath Project dams/reservoirs with respect to water quality, including toxic algae and associated algal toxins, water temperature, and river flow.

Comment IND233-3
The environmentalists talk about the "pristine" river and environment of 200 years ago, yet I don't see any of them living without modern conveniences, such as running water and electricity, made possible by our technological society. In fact they will likely be the first ones to whine when

1. their electric rates double or triple when the dams are removed,

Response to Comment IND233-3
Please refer to Master Response GEN-2.

Comment IND233-4
2. The fish hatchery is no longer supplying millions of fry to the river yearly,

3. The spawning holes and the mouth of the river are filled in with sediment for years to come (as has been already demonstrated by the removal of Condit Dam),

4. Their fall fish runs are severely impacted by low flows and warm water coming from upstream sources, no longer moderated by the dams and

Response to Comment IND233-4
With regard to the potential for impacts on salmonid populations due to a reduction in hatchery production under the Proposed Project, please refer to Master Response AQF-2.

With regard to the potential for sediment-related impacts on salmonid habitat due to dam removal, please refer to response to comment LA6-4.

"Fall fish runs" (presumably fall-run Chinook salmon) are not predicted to be "severly impacted by low flows and warm water" under the Proposed Project, as described in Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-7. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*. Additionally, all flows are released at Keno Dam; no perscribed flows are released from any of the Lower Klamath Project dams.

Comment IND233-5
5. toxic algae are allowed to contaminate the entire river, instead of being held behind the dams.

Response to Comment IND233-5
Please refer to Master Responses WQ-1 and PAP-1.

Comment IND233-6
No, the environmentalists and tribes don't talk about these facts. They only talk nostalgically about Native American ceremonies and practices from over 100 years ago, as if they are more important than the 79% of Siskiyou County residents who voted to retain the dams.

Response to Comment IND233-6
Please refer to Master Responses GEN-1 and GEN-2.

Comment IND233-7
The dams in question are an intregal part of the infrastructure supporting our modern society. As scientists and engineers, please don't get swept away with nostalgia and wishful thinking. Instead, apply your scientific analytical skills to a critical review of the facts and pertinent scientific evidence. Thank you.

Response to Comment IND233-7
Comment noted.

Moitoza, Franklin

Comment IND213-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam

removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND213-1
Thank you for your comment. Please refer to Master Response GEN-1.

Montes, Luis

Comment IND367-1
You are urged to vote to remove the environmentally disastrous Klamath River Dams. I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, thus restoring substantial rearing habitat for endnagered Salmon and Steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are the leading cause of salmon and Steelhead declines in the Klamath Basin watershed. The Water Board's DEIR supports what dam removal advocates have said all along • dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of darn removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND367-1
Thank you for your comment. Please refer to Master Response GEN-1.

Moran, Michael

Comment IND343-1

I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of darn removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND343-1

Thank you for your comment. Please refer to Master Response GEN-1.

Most, Stephen

Comment IND248-1

As the author of River of Renewal, Myth and History in the Klamath Basin and the writer/producer of a documentary film, also called River of Renewal, about Klamath Basin history, I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam

removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. They brought about the closure of the canneries on the Klamath River estuary and the near extinction of the river's Spring chinook species. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND248-1
Thank you for your comment. Please refer to Master Response GEN-1.

Muller, Trevor

Comment IND206-1
I implore you to please remove the dams. Thanks you for your consideration.

Response to Comment IND206-1
Please refer to Master Response GEN-1.

Murphy, Dennis

Comment IND167-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND167-1
Thank you for your comment. Please refer to Master Response GEN-1.

Murphy, John

Comment IND403-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of darn removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND403-1
Thank you for your comment. Please refer to Master Response GEN-1.

Murphy, Ronald

Comment IND280-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND280-1
Thank you for your comment. Please refer to Master Response GEN-1.

Muscatine, Jeffrey

Comment IND419-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the

project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-tem1 benefits of darn removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND419-1
Thank you for your comment. Please refer to Master Response GEN-1.

Muzzio, Andy

Comment IND74-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam

removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND74-1
Thank you for your comment. Please refer to Master Response GEN-1.

Myers, Cynthia

Comment IND130-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND130-1
Thank you for your comment. Please refer to Master Response GEN-1.

Naughton, James

Comment IND429-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of darn removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND429-1
Thank you for your comment. Please refer to Master Response GEN-1.

Neal, David

Comment IND151-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND151-1
Thank you for your comment. Please refer to Master Response GEN-1.

Nelson, Greg

Comment IND441-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of darn removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND441-1
Thank you for your comment. Please refer to Master Response GEN-1.

Nelson, Sarah

Comment IND264-1
I support the full removal of the lower four Klamath River dams. I have friends and co-workers who are members of the Yurok tribe, and the dams have negatively impacted their lives and culture. The dams have also damaged the lives of a lot of the fishing families I know in our region. If the salmon begin to thrive, then all of our people will as well. I'm worried about our future on the northcoast. Please remove the dams.

Response to Comment IND264-1
Thank you for your comment. Please refer to Master Response GEN-1.

Nelson, Steven

Comment IND238-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND238-1
Thank you for your comment. Please refer to Master Response GEN-1.

Netti, Steve

Comment IND244-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND244-1
Thank you for your comment. Please refer to Master Response GEN-1.

Neuman, Dick

Comment IND174-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles

of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND174-1
Thank you for your comment. Please refer to Master Response GEN-1.

Newton, Jerry and Linda

Comment IND173-1
I am writing concerning the removal of the Klamath Dams in Siskiyou County California.

I'm not going to tell you all the reason why they should not be taken out I Don't think I can add anything that has not already been wrote.

But we are a Christian Family and we are quit aware that we are to take care of our earth thats our God given right! But I know we are created in God's image and we are his Children and it's pretty sad when fish + nature become more important than His Children + and their happiness.

I'm quit aware that in the day like a few thousand yrs Dinasours roamed this earth but my life is not any worse because I don't have a dinasour stake on my plate!! The salmon will always be here and if not so b it people a 1,000 yrs from now will not be effected.

Please do whatever you can so that we can keep our beautiful lakes.

Response to Comment IND173-1
Thank you for your comment. Please refer to Master Responses GEN-1 and GEN-2.

Nguyen, Megan

Comment IND346-1

I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) a:ffinns that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND346-1

Thank you for your comment. Please refer to Master Response GEN-1.

Nickelson, Thomas

Comment IND222-1

I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) a:ffinns that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND222-1
Thank you for your comment. Please refer to Master Response GEN-1.

Niebruegge, Dave

Comment IND140-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) a:ffinns that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND140-1
Thank you for your comment. Please refer to Master Response GEN-1.

Nilsson, Tim and Debbie

Comment IND152-1
My husband, Tim Nilsson, and I would like to go on record as objecting to the removal of the 3 dams in Siskiyou County and the Boyles Dam.

Response to Comment IND152-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment IND152-2
In light of the recent fires, not having access to the reservoirs could hugely impact firefighting. The "plan" that pilots will know the deep holes to draw water from is not even realistic. The water would be so low in the summer that there probably wouldn't be deep holes.

Response to Comment IND152-2
Please refer to Master Response HAZ-2.

Comment IND152-3
The river was so low near the coast, prior to the dams, that wagon trains could cross it. How is that going to help the fish?

This is not about the fish, but about "stealing" our North state water. Removing the dams will greatly damage fisheries for years to come.

Response to Comment IND152-3
The Lower Klamath Project dams do not result in an increase in flows in the Klamath River near the coast. Please refer to Volume I Section 3.6.2.2 *Flood Hydrology – Environmental Setting – Basin Hydrology* (pages 3-590 to 3-621) for a description of hydrology in the basin.

The analysis in the Lower Klamath Project EIR does not find that removal of the dams under the Proposed Project would greatly damage the fisheries for years to come. Please refer to Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* for a comprehensive analysis of the effects of the Proposed Project on aquatic resources in the Klamath River. Please see Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment IND152-4
Removing the dams will cause great financial damage to our County if we lose the dams. Pulling dams in the Gold Hill, Oregon area has damaged their economy for many years, if not permanently.

Response to Comment IND152-4
Comment noted. Please note that CEQA documents analyze significant effects on the physical environment; CEQA does not address potential social or economic effects from implementing a project. (CEQA Guidelines, section 15131(a).) However, to inform the public and decisionmakers regarding the potential economic consequences of the proposed project, Volume I Section 5.4.1 *Other Required CEQA Discussion and Consideration of Social and Economic Factors – Social and Economic Factors Under CEQA – Consideration of Economic Information for Resources Potentially Affected by Dam Removal* (pages 5-4 to 5-11) summarizes the results of prior economic studies conducted by the U.S. Department of the Interior (DOI) to characterize potential effects on property value.

Comment IND152-5
Removing the dams will cause loss of recreation and tourism opportunities.

Response to Comment IND152-5
Please refer to Section 3.20.5 *Recreation – Potential Impacts and Mitigation* for a discussion of potential impacts of the Proposed Project on recreation. Please refer to Volume III Attachment 1 for the final Section 3.20 *Recreation*.

Comment IND152-6
Our County overwhelmingly voted in favor of keeping our dams.

Response to Comment IND152-6
Please refer to Master Response GEN-1. Volume I Section 2 *Proposed Project* (page 2-21) acknowledges in Table ES-2 on page ES-23 and in that during the Siskiyou County Advisory Election Vote on November 2, 2010 (Measure G), approximately 79 percent of voters expressed their opinion and voted “No” to dam removal, while 22 percent voted “Yes”.

Comment IND152-7
The dams produce clean energy where all other options are environmentally negative.

Response to Comment IND152-7
This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (Greenhouse Gas Emissions and Energy).

Comment IND152-8
Just talk of removal has seriously damaged property values and thus income to our county. We are already considered a low income or poverty area so addition damage to our tax base would be devastating.

Response to Comment IND152-8
Comment noted. Please note that CEQA documents analyze significant effects on the physical environment; CEQA does not address potential social or economic effects from implementing a project (CEQA Guidelines, section 15131(a).) However, to inform the public and decisionmakers regarding the potential economic consequences of the proposed project, Volume I Section 5.4.1 *Other Required CEQA Discussion and Consideration of Social and Economic Factors – Social and Economic Factors Under CEQA – Consideration of Economic Information for Resources Potentially Affected by Dam Removal* (pages 5-4 to 5-11) summarizes the results of prior economic studies conducted by the U.S. Department of the Interior (DOI) to characterize potential effects on property value.

Comment IND152-9
We believe this proposal is supposedly putting the needs of fish ahead of those real people who live in and love Siskiyou County!

Response to Comment IND152-9
Please refer to Master Response GEN-1.

Nomellini, Angela

Comment IND75-1
Though I am a resident of Arizona, I and my husband spend considerable time fishing in California. In fact, we are supporters of the California Salmon and Steelhead Coalition, a combined effort of California Trout, Trout Unlimited and the CA chapter of The Nature Conservancy.

Response to Comment IND75-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment IND75-2
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND75-2
Thank you for your comment. Please refer to Master Response GEN-1.

Nourish, Bruce

Comment IND100-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND100-1
Thank you for your comment. Please refer to Master Response GEN-1.

O'Brien, Jess

Comment IND412-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies withClean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND412-1
Thank you for your comment. Please refer to Master Response GEN-1.

O'Callaghan, Dennis

Comment IND164-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND164-1
Thank you for your comment. Please refer to Master Response GEN-1.

O'Dowd, Alison

Comment IND70-1
I am a River Ecologist and Professor at Humboldt State University. My research area includes the impacts of dams on aquatic ecosystems. I strongly support the full removal of the lower four Klamath River dams.

Response to Comment IND70-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment IND70-2
Ecologically, the lower four Klamath River dams have been disastrous for the aquatic communities in the Klamath River basin. Toxic algal blooms and warmer temperatures in the reservoirs combined with the altered flow regime has reduced salmon populations in particular. Despite the impacts of the dam, the Klamath River is still one of the most productive fisheries on the West Coast and dam removal will only bolster this fishery further. Dam removal is a golden opportunity that should not be passed up, particularly given the imperiled species that are at risk of extirpation (or eventually extinction) if the dams are not removed in the near future.

Dam removal will reopen for 400 miles of spawning and rearing habitat for salmonids and will improve water quality throughout the mainstem Klamath River.

Response to Comment IND70-2
Please refer to Master Response GEN-1.

Comment IND70-3
In addition to the ecological benefits of the Klamath dams removal, it is my understanding that dam removal will not adversely affect irrigated agriculture because none of the dams slated for removal provide agricultural water supply.

Response to Comment IND70-3
Please refer to Master Response GEN-1.

Comment IND70-4
I am currently the faculty director of a place-based learning community called "Klamath Connection" at Humboldt State University. This learning community is for incoming freshmen and we use the Klamath River as a case study to show an example of how people from a variety of backgrounds can come together to solve complex environmental problems. We take 170 freshman each August to the Klamath River mouth during the week of freshman orientation and the experience for the students to be able to put their feet in the river and learn about the issues surrounding the Klamath is truly transformative for them. The beautiful Klamath River makes a difference in the lives of incoming freshmen at Humboldt State University and undoubtedly the lives of countless others throughout Northern California. The intrinsic value of the free-flowing Klamath River cannot be quantified or commodified.

Response to Comment IND70-4
Please refer to Master Responses GEN-1 and GEN-2.

Comment IND70-5
It is my hope that the dam removal process will proceed in a timely manner. I agree with the key findings of the draft EIR that supports dam removal.

Many thanks to the State Water Board for moving this process forward.

Response to Comment IND70-5
Please refer to Master Response GEN-1.

Ohara, Stanley

Comment IND252-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND252-1
Thank you for your comment. Please refer to Master Response GEN-1.

Olitzky, Bruce

Comment IND101-1
Dams that no longer serve any function should all be removed. Our habitat is at peril and your support is desperately needed.

Response to Comment IND101-1
Thank you for your comment. Please refer to Master Response GEN-1.

Pace, Felice

Comment IND161-1
My comments on the DEIR for DRAFT ENVIRONMENTAL IMPACT REPORT FOR THE LOWER KLAMATH PROJECT LICENSE SURRENDER FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 14803 are attached.

I want to get the contact information which all those who commented at the hearings or otherwise have submitted and, in particular, names and email addresses. Please either provide that via return email or inform me that you will require a Public Records Request to provide the information and/or documents

containing contact information for all those commenting on the DEIR or testifying at DEIR hearings.

Response to Comment IND161-1
Thank you for your comment. Per your request, State Water Board staff provided the requested information on February 15, 2019. Additionally, original comments on the Lower Klamath Project EIR are presented in this volume (Volume III) of the EIR. The comments themselves include contact information provided by the commenters.

Comment IND161-2
PacifiCorp should be responsible for removing the dams they own which have become non-performing assets because, if relicensed, they loose an estimated $20 million per year.

Response to Comment IND161-2
Comment noted. Please note that CEQA documents analyze significant effects on the physical environment: CEQA does not address potential social or economic effects from implementing a project (CEQA Guidelines, section 15131(a). Please also refer to Volume I Section 5.4 *Social and Economic Factors Under CEQA*.

Please refer to Master Response ENR-1 for a discussion of the potential for rate increases associated with dam removal, including PacifiCorp's claims regarding the cost of relicensing over a 40-year license term.

Comment IND161-3
The KHSA is a sweetheart deal for a 1% corporation at taxpayer and ratepayer expense (I am both!) in order to save the stockholders money. Still, it does get the dams out, maybe.

Response to Comment IND161-3
The State Water Board is not a signatory to the Klamath Hydroelectric Settlement Agreement (KHSA) or the Amended Klamath Hydroelectric Settlement Agreement. Please also refer to Master Comment GEN-2.

Comment IND161-4
Delay also serves the Corporation which gets to continue making $ without having to do very much to help salmon. The Water Board should require that PacifiCorp do a lot more to help salmon until the dams are actually out.

Response to Comment IND161-4
Please refer to Master Comment GEN-2. Please also refer to Volume I Section 2.7.9 *Proposed Project –KHSA Interim Measures* for a discussion of the series of interim measures that have been implemented by PacifiCorp since 2010 to

assess and address environmental conditions and improve fisheries prior to dam removal.

Comment IND161-5
If the Klamath Renewal Corporation fails, the Hoopa Tribe will be there to make sure the dams come out. Their recent court victory assures that and that interim measures to better protect salmon, which the Water Board should also require, will be implemented between now and when dam removal takes place.

Folks should rethink the delusion that dam removal will fix the Klamath's problems. The Bureau of Reclamation will still control Klamath flows and will do all they can to minimize flows in order to maximize delivery of irrigation water to federal irrigators.

Response to Comment IND161-5
Please refer to Master Response WSWR-1 and WSWR-2.

The U.S. Bureau of Reclamation's (USBR's) management of Klamath River flows for irrigation water supply purposes is beyond the scope of the EIR.

Comment IND161-6
Folks should also rethink the delusion that removing four dams will solve the Klamath's water quality problems. The main source of water quality degradation basin-wide is not dams but rather irrigated agriculture in the Upper Basin, Shasta and Scott Basins. We will not solve the Klamath's water quality ills unless and until we can get the NCWQCB and Oregon DEQ to effectively regulate agriculture in the Upper Basin, Shasta and Scott.

Response to Comment IND161-6
Section 3.2.2.1 *Water Quality – Environmental Setting – Overview of Water Quality Processes in the Klamath Basin* provides a general summary of the effects that Lower Klamath Project hydroelectric facilities and operations have on Klamath River water quality, including changes in water temperature, dissolved oxygen, phytoplankton (suspended algae), nutrients, suspended sediment (turbidity), and periphyton (attached algae). Figure 3.2-2 illustrates the general seasonal influence of reservoirs formed by large dams, such as Copco No. 1 and Iron Gate reservoirs, on water quality parameters. The specific influence of the Lower Klamath Project dams and reservoirs on water quality parameters in the Klamath River are summarized in Section 3.2.2 *Water Quality – Environmental Setting* and further detailed in Appendix C *Water Quality Supporting Technical Information*. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality* and the final Appendix C *Water Quality Supporting Technical Information*. Please also refer to Master Response WQ-1 for further discussion of the influence of the Lower Klamath Project dams/reservoirs on the overall water quality in the Klamath River. Issues associated with diversions in other parts of the Klamath River watershed are beyond the scope of the EIR, which

focuses on impacts related to actions proposed in the California portion of the Lower Klamath Project, including the Copco No. 1, Copco No. 2, and Iron Gate dam complexes.

Comment IND161-7

A fifth PacifiCorp Dam, Keno, will be transferred to Reclamation and will remain. It receives most of the highly polluted federal irrigation water and has the worst water quality in the entire Klamath River Basin. That water leaves Keno and flows down the Klamath River. Fixing Klamath water quality requires fixing Keno and the Water Boards, PacifiCorp and NMFS are remiss in not making that happen. We can only fix Keno's water quality problems by effectively regulating agricultural pollution and by restoring marshes on the margins of Keno Reservoir.

Response to Comment IND161-7

Addressing water quality concerns in Keno Reservoir, which is located in Oregon, is not part of the Klamath River Renewal Corporation's (KRRC's) Proposed Project or an alternative and therefore is not considered in this EIR. As described in Volume 1 Section 1.1 *Authorization, Purpose, and Use of EIR* (page 1-1), the EIR focuses on impacts related to actions proposed in the California portion of the Lower Klamath Project, including the Copco No. 1, Copco No. 2, and Iron Gate dam complexes. Additionally, throughout the EIR analyses, including Section 3.2 *Water Quality* and Section 3.3 *Aquatic Resources*, conditions in Oregon, including water quality conditions in Keno Reservoir, are considered to the extent that they influence water quality downstream in California. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality* and the final Section 3.3 *Aquatic Resources*.

Comment IND161-8

Estimates of water quality improvements resulting from dam removal contained in the DEIR have a wide range, for example estimates of temperature improvements in the DEIR have something like a 20 degree range. The FEIR should explain why that is the case and put that into the summary and introduction. This is important because some interests are making fantastic claims for water quality degradation or improvement on both sides of the dam removal issue. Therefore, it is important that those reading the FEIR understand the uncertainty in estimates of water quality improvements and degradation as well and, especially, the source of the uncertainty.

Response to Comment IND161-8

Please refer to the Volume I *Executive Summary – Issues to be Resolved* (page ES-24) for a brief discussion of the degree of environmental impacts and benefits for the proposed restoration project. Potential Impact 3.2-1 discusses the anticipated short-term and long-term alterations in water temperatures due to conversion of the reservoir areas to a free-flowing river. As discussed in Section 3.2.2.1 *Water Quality – Environmental Setting – Overview of Water Quality Processes*, large reservoirs like Iron Gate Dam retain their water temperature for

weeks or months, so releases from Iron Gate Reservoir would alter the natural downstream Klamath River water temperature conditions. In the late summer/fall, Iron Gate Dam continues to release warmer water than would naturally occur because the reservoir still contains water that was heated during the summer months. As summarized in Section 3.2.2.2 *Water Quality – Environmental Setting – Water Temperature* and discussed further in Potential Impact 3.2-1, modeling indicates that water released from Iron Gate Dam under existing conditions is approximately 4 to 18°F warmer in the summer and fall as compared to modeled conditions without J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate dams (i.e., the Proposed Project) (PacifiCorp 2004a-1; Dunsmoor and Huntington 2006; North Coast Regional Board 2010). There is a wide range in the water temperature variation between existing conditions and the Proposed Project since the relatively low variability in the reservoir water temperature results in relatively low variability in the water temperature downstream of Iron Gate Dam under existing conditions, yet the water temperature downstream of Iron Gate Dam under the Proposed Project fluctuates with natural meteorological changes (i.e., solar radiation, heating and cooling due to ambient air temperature). As a result, there are periods in the fall when modeling indicates the Klamath River water temperature downstream of Iron Gate Dam under the Proposed Project would substantially decrease (i.e., greater than 10°F) over the course of several days in response to meteorological changes (e.g., a cold front), but water temperature downstream of Iron Gate Dam under existing conditions would only decrease by only a few degrees due to the slower response of the reservoir water temperature. While the difference in water temperature downstream of Iron Gate Dam between existing conditions and the Proposed Project is up to approximately 18°F warmer in the summer and fall, the difference typically is less and varies based on changes in meteorological conditions. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality,* including Figure 3.2-3 that shows the difference between water temperature downstream of Iron Gate Dam under existing conditions and the Proposed Project.

Comment IND161-9

Free the Klamath, not just from dams but from the tyranny of irrigation interests and the US Bureau of Reclamation who leave too little water in our rivers and who pollute and degrade the water which remains.

Response to Comment IND161-9

Please refer to Master Response GEN-1.

Pagliaro, Ignacio

Comment IND435-1

I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of darn removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND435-1
Thank you for your comment. Please refer to Master Response GEN-1.

Pagones, Dennis

Comment IND166-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND166-1
Thank you for your comment. Please refer to Master Response GEN-1.

Palmer, Neil

Comment IND329-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND329-1
Thank you for your comment. Please refer to Master Response GEN-1.

Paoluccio, Joseph

Comment IND399-1

I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND399-1

Thank you for your comment. Please refer to Master Response GEN-1.

Parcell, Ruth

Comment IND277-1

I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND277-1
Thank you for your comment. Please refer to Master Response GEN-1.

Parry, Stephen

Comment IND247-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND247-1
Thank you for your comment. Please refer to Master Response GEN-1.

Peck, Medwin

Comment IND347-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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Response to Comment IND347-1
Thank you for your comment. Please refer to Master Response GEN-1.

Pendergast, Fred

Comment IND217-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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Response to Comment IND217-1
Thank you for your comment. Please refer to Master Response GEN-1.

Perry, Stan

Comment IND253-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

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Response to Comment IND253-1
Thank you for your comment. Please refer to Master Response GEN-1.

Person, Molly

Comment IND332-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

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Response to Comment IND332-1
Thank you for your comment. Please refer to Master Response GEN-1.

Piimauna, Kevin

Comment IND374-1
Bring back the wildlife. Dams ruin the river. I can' t make it to any meetings because I'm in Orange County and work and go to school. You guys should stream the meetings on Facebook.

Response to Comment IND374-1
Thank you for your comment. Please refer to Master Response GEN-1.

Piziali, Robert

Comment IND286-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

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Response to Comment IND286-1
Thank you for your comment. Please refer to Master Response GEN-1.

Plopper, Charles

Comment IND112-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

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Response to Comment IND112-1
Thank you for your comment. Please refer to Master Response GEN-1.

Preskenis, Dan

Comment IND136-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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Response to Comment IND136-1
Thank you for your comment. Please refer to Master Response GEN-1.

Pryor, Geoff

Comment IND228-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND228-1
Thank you for your comment. Please refer to Master Response GEN-1.

Raddue, Rick

Comment IND297-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND297-1
Thank you for your comment. Please refer to Master Response GEN-1.

Raffel, Corey

Comment IND125-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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It's time to undam the Klamath!

Response to Comment IND125-1
Thank you for your comment. Please refer to Master Response GEN-1.

Raivio, Matt

Comment IND350-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND350-1
Thank you for your comment. Please refer to Master Response GEN-1.

Ramp, Rudy

Comment IND278-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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It's time to undam the Klamath!

Response to Comment IND278-1
Thank you for your comment. Please refer to Master Response GEN-1.

Reynolds, Phil

Comment IND285-1
Dam removal on the Klamath.
I am against the removal of this clean renewable hydroelectric project.
The residents of Siskiyou County are overwhelmingly against the removal of this project. This non stop removal agenda(attack) must be stopped.
I have resided at Copco Lake since October of 1980. In these many years I witnessed the beginning talks on dam removal, scientific studies, reports, and endless public comment meetings. In all these years no state or federal agency has ever truly listened to the things we as citizens of these lakes have said. The dam removal project in an agenda that is filled with false science. And yes the word is agenda. This project is set to move forward regardless of the devastation it may cause.

Response to Comment IND285-1
Thank you for your comment. Please refer to Master Responses GEN-1 and GEN-2.

Comment IND285-2
Facts are useful pieces of information. Fact : If the dams were the true cause of the fish declines it would have been noticeable from the first years of power generation.

Response to Comment IND285-2
Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*, specifically Section 3.3.2 *Aquatic Resources – Environmental Setting*, which discusses current and historical fish distribution, fish populations, and citations for observed fisheries declines in the Klamath Basin.

Comment IND285-3
Fact: The water that leaves John Boyle, Copco, and Irongate lakes is cooler than the water that comes out of upper Klamath Lake. Fact: the volcanic legacy of this water drainage causes natural phosphorus and nitrogen level to be above normal. Fact: the algae grows in the waters that feed upper Klamath Lake. Fact: Free flowing rivers are the agenda of this experiment in the sparsely populated regions of California and Oregon.

Response to Comment IND285-3
Please refer to Master Responses WQ-1 and PAP-1 for a discussion of the role of the Lower Klamath Project dams/reservoirs with respect to water quality in the Klamath River, where the information provided is supported by peer-reviewed literature citations and data.

Comment IND285-4
Fact: River populations of fish will not increase if consumption of salmon world wide are over resourced in our oceans by all nations foreign and domestic. Fact:

Salmon populations are struggling throughout the northwest so this is not a reservoir or dam issue but a over consumption issue.

Response to Comment IND285-4
Comment noted. There is no available scientific information to suggest that over-consumption is leading the current decline in anadromous salmonids. There is currently no commercial fishery for coho salmon or steelhead. Please refer to Section 3.3.2 *Aquatic Resources – Environmental Setting,* which describes the best available and most current scientific and factual data on aquatic resources in the Klamath Basin, the current status of those resources, and factors affecting habitat suitability and population abundance for aquatic resources. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment IND285-5
Here in lies the problem facts are not what are being used to decide the fate of these dams. Predetermined agendas that over time have morphed to fit the political ideals of the agencies and people running these agencies. I urge whatever agency that would see this letter would use common sense and decency to come to any final conclusion for this century old ecosystem slated for destruction.

NO DAM REMOVAL from the residents of the lakes.

NO DAM REMOVAL by the residents of Siskiyou county.

NO DAM REMOVAL PERIOD!!!!!!!

Response to Comment IND285-5
Please refer to Master Response GEN-1.

Robb, Carol

Comment IND106-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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I caught my first steelhead on the Klamath. I want future generations to be able to say the same!

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND106-1
Thank you for your comment. Please refer to Master Response GEN-1.

Roff, Gabriella

Comment IND225-1
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It's time to undam the Klamath!

Response to Comment IND225-1
Thank you for your comment. Please refer to Master Response GEN-1.

Rogers, Anna

Comment IND77-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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Response to Comment IND77-1
Thank you for your comment. Please refer to Master Response GEN-1.

Rogers, Hamilton

Comment IND439-1
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Response to Comment IND439-1
Thank you for your comment. Please refer to Master Response GEN-1.

Rogers, Mike

Comment IND334-1
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Response to Comment IND334-1
Thank you for your comment. Please refer to Master Response GEN-1.

Romberger, Christian

Comment IND119-1
I strongly support the full removal of the lower four Klamath River dams. The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only economically viable project alternative that will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead.

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Response to Comment IND119-1
Thank you for your comment. Please refer to Master Response GEN-1.

Rood, Edson

Comment IND199-1
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Response to Comment IND199-1
Thank you for your comment. Please refer to Master Response GEN-1.

Rosenberg, Bob

Comment IND85-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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It's time to undarn the Klamath!

Response to Comment IND85-1
Thank you for your comment. Please refer to Master Response GEN-1.

Rusert, Frieda

Comment IND221-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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It's time to undam the Klamath!

Response to Comment IND221-1
Thank you for your comment. Please refer to Master Response GEN-1.

Ryan, Bill

Comment IND83-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undarn the Klamath!

Response to Comment IND83-1
Thank you for your comment. Please refer to Master Response GEN-1.

S., Ron

Comment IND281-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND281-1
Thank you for your comment. Please refer to Master Response GEN-1.

Salkas, Jim

Comment IND410-1
I am strongly in favor of the proposed removal of dams on the Klamath River. The restoration of the salmon runs on the Klamath River will be greatly enhanced with the removal of these dams increasing upstream nesting opportunities and improved riparian ecology.

Response to Comment IND410-1
Thank you for your comment. Please refer to Master Response GEN-1.

Salle, Nicholas

Comment IND327-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam

removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND327-1
Thank you for your comment. Please refer to Master Response GEN-1.

Schaaf, Cody

Comment IND123-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND123-1
Thank you for your comment. Please refer to Master Response GEN-1.

Schadlich, Daisy

Comments IND155-1 and IND131-1

I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comments IND155-1 and IND131-1

Thank you for your comment. Please refer to Master Response GEN-1.

Schmidt, Bill

Comment IND180-1

The Klamath River is a NatuRlay A upSide Down River. With worm, PoulateD, + Low oxygen At the Head Watters (coming out of Oregon) thare At the mouth.

In your Sienc Reports the watter Below the Dams is cleaner than Above them. Except For two time A year. When the watter Head to Be cooler + more Oxyegon. Why Not Draw the watter out of Iron Gate ReservoR At the Cooler Leveal that the watter is At the DesiReD Cooler temiture + Run over Rifels to At Oxygon to the watte At the two time A year? In Doing so the watter would Be good All year.

Response to Comment IND180-1
Thank you for your comment. Please refer to Master Responses WQ-1, and WQ-2. Additionally, the Lower Klamath Project EIR presents a range of reasonable alternatives to the Proposed Project. Volume I Section 4.1 *[Alternatives Selection/Overview]* (pages 4-1 to 4-15) discusses 17 potential alternatives in relation to the Proposed Project's underlying purpose and objectives, six of which are examined in detail. Of these six alternatives, two involve removal of all four Lower Klamath Project dams, and four involve two or three dams remaining in place. Potential impacts and beneficial effects are identified for each of these alternatives in the EIR and each will be fully considered by the State Water Board before certifying the EIR (CEQA Guidelines section 15090).

Comment IND180-2
In All the Meetting And what I Have Herd And Read there is Nothing proposed to clean the River Watter Better or As Mutch As the Dam's.

If Not How can A Board in charge of Clean watter Even Intertain the Idea oF Dam Removal with A clear Conision?

Response to Comment IND180-2
Please refer to Master Responses WQ-1 and PAP-1. Please also refer to Section 3.2.5 *Water Quality – Potential Impacts and Mitigation* for analysis of the water quality potential impacts and mitigation measures under the Proposed Project. As analyzed in Section 3.2.5 *Water Quality – Potential Impacts and Mitigation*, the three significant and unavoidable impacts to water quality are all limited to the short-term (i.e., one to three years before dam removal, dam removal year 1, dam removal year 2, and post-dam removal year 1) and there are no long-term significant and unavoidable impacts to water quality under the Proposed Project. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Comment IND180-3
Down Below Happy Camp the watter Quality is Better Becaus of the PulouteD watter is mixed with more clean watter. In This thought of oulting PulouteD watter with clean. What About all the clean watter that is DiverteD to the Rouge Valley FRome the upper Klamath watter SHead?

Response to Comment IND180-3
As a potential long-term approach to improving water quality in the Klamath River, the suggestion in the comment to dilute water in the Klamath River in California using water that is currently diverted from Jenny Creek, a tributary to the Klamath River, into the Rogue River Valley in Oregon, does not meet screening levels of feasibility. There is no project proponent with the authority to implement it and no analysis of water quantity needed to sufficiently improve the mainstem Klamath River water quality as suggested by the comment.

Furthermore, the suggestion made in the comment is not appropriate as a mitigation measure for short-term water quality impacts due to dam removal under the Proposed Project. Please refer to TR18-6 for a discussion of how additional Klamath River flows would have a minimal to no reduction in the suspended sediment concentrations (SSCs) during drawdown that cause a short-term significant and unavoidable impact to water quality (Potential Impact 3.2-3) and additional flows would potentially increase the duration that suspended sediment concentrations exceed the threshold of significance by transporting more reservoir sediments downstream. The short-term significant and unavoidable decrease in dissolved oxygen that would occur under the Proposed Project (i.e., Potential Impact 3.2-9) is due to high suspended sediment concentrations during reservoir drawdown, so this potential impact would not be substantially reduced by river dilution flows since suspended sediment concentrations would not be substantially reduced by additional flows. The short-term significant and unavoidable increase in water temperature and decrease in dissolved oxygen downstream of the Klamath River confluence with Fall Creek under the Proposed Project (i.e., Potential Impact 3.2-17) also would not be substantially reduced by river dilution flows since Fall Creek Hatchery (FCH) operations would potentially result in a localized increase in water temperature and decrease in dissolved oxygen as Fall Creek flows enter the mainstem Klamath River regardless of the magnitude of Klamath River flows.

This comment does not introduce a feasible project alternative or mitigation measure considerably different from others previously analyzed that would clearly lessen the environmental impacts of the project (CEQA Guidelines Section 15088.5(a)(3)).

Comment IND180-4

As to the Idea of Large NumBer oF Mile of sponing Above Iron Gate. You Have NatuRal Barrier. Like ReaFs + Hat SpRing Above Iron Gate Dam.

In the Arkoligal FinD oF ImDiPle Camps on up the River they FounD Fish Skellitons with No Head's. I have Herd Shasta Indians Say the caut Fish Down By the Shasta And tRape them For Obisideon with the upper Klamath Indians.

When Iron Gate Was Built there was Fund + Plans to Build A Fish Labber. The Research At that time Concluted that Not Be of Mutch use to warent iT. Why is this not consider?

Response to Comment IND180-4

Please refer to Master Responses AQF-4 and AQF-11.

As described in Section 3.3.5.8 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Habitat*, there is no evidence of a natural reef at J.C.Boyle

that historically blocked upstream migration of salmonids. The final Section 3.3 *Aquatic Resources* is presented in Volume III Attachment 1.

Comment IND180-5
Since the Fish Numbor Are Down why is their omleg 3 BeDs a Iron gate Hachry Being uses Rather than the Full 12? Everyone Points to A larg Fish Run. Back when Hachings wer in Full operaton with Rearing Bed up + Down the RiveR.

BeSiDe we All Know the lerger + Fish Loss is in the Ocean. Why Not Do Like wasiton + Alaska And Buld Hacherys to Flood more Junivels out to the ocean, For a Larger RetuRn?

Response to Comment IND180-5
Please refer to Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Fish Hatcheries* for a description of current Iron Gate Hatchery operations, including a discussion of the net effect of hatchery releases on naturally occurring fish stocks. The final Section 3.3 *Aquatic Resources* is presented in Volume III Attachment 1.

Comment IND180-6
With the Dam's + manament their can Be Clean watter. With out no change.

Response to Comment IND180-6
Please refer to Master Responses WQ-1 and PAP-1.

Comment IND180-7
I Can Not JustiFy How You Can give a clean watter CenteFact with sound Judment

Response to Comment IND180-7
The comment does not focus on the sufficiency of the EIR in identifying and analyzing the possible impacts on the environment and ways in which the significant effects of the project might be avoided or mitigated (CEQA Guidelines section 15204(a)).

Please note that the Klamath River Renewal Corporation (KRRC) has included a Water Quality Monitoring Plan in their proposed Definite Plan (Volume II Appendix B: *Definite Plan – Appendix M*) that would assess the Proposed Project's impacts to water quality. Volume I Section 2.7.8.7 *Proposed Project – Proposed Project – Water Quality Monitoring and Construction BMPs* (pages 2-97 to 2-99) provides a general summary of the water quality monitoring proposed in the Definite Plan, and Section 3.2.5 Water Quality – Potential Impacts and Mitigation provides a discussion of water quality monitoring with regards to the individual water quality parameters (Potential Impact 3.2-1 for water temperature; Potential Impact 3.2-3 for suspended sediments; Potential Impact 3.2-7 for

nutrients; Potential Impact 3.2-9 for dissolved oxygen; Potential Impact 3.2-11 for pH; Potential Impact 3.2-12 for chlorophyll-a and algal toxins; and, Potential Impact 3.2-14 for inorganic and organic contaminants). The final Section 3.2 Water Quality is presented in Volume III Attachment 1. The State Water Board has authority to review and approve any final Water Quality Monitoring Plan through its water quality certification under Clean Water Act (CWA) Section 401.

Further, the State Water Board has issued a draft water quality certification which sets forth water quality monitoring, adaptive management, and compliance requirements for any Water Quality Monitoring Plan to meet, as Condition 1 and Condition 2. The Oregon Department of Environmental Quality (ODEQ) has issued a final water quality certification that sets forth water quality monitoring and adaptive management conditions for points upstream of California.
Comments on the California Draft Water Quality Certification for the Lower Klamath Project should be submitted to the State Water Board's Water Quality Certification Program following the instructions provided at https://www.waterboards.ca.gov/waterrights/water_issues/programs/water_quality_cert/lower_klamath_ferc14803.html.
The Oregon Water Quality Certification for the Lower Klamath Project is available at https://www.oregon.gov/deq/FilterDocs/ferc14803final.pdf.

Schoettgen, Scott

Comment IND260-1

Thank you for all of your work and deliberation in pursuit of just and sustainable water management practices in California. I am writing in support of the removal of the Klamath River Dams and subsequent restoration of the Klamath River system.

As large dams like the Klamath Dams, and the Lower Elwha Dam in Washington come down, I encourage the state water board to leverage our research institutions to their fullest capabilities studying the long term effects on local environment (climate) and economy.

Here are some interesting studies to consider in regards specifically local climate temperatures and greenhouse gases.

"The interaction of rivers and urban form in mitigating the Urban Heat Island effect: A UK case study"
https://www.sciencedirect.com/science/article/pii/S0360132312001722

"Significant cooling effect on the surface due to soot particles over Brahmaputra River Valley region, India: An impact on regional climate"
https://www.sciencedirect.com/science/article/pii/S0048969716305770?via%3Dihub

I've also seen estimates that upwards of 10% of the world's methane gas emissions come from the breakdown of organic matter sitting stagnant in reservoirs that wouldn't exist if the rivers were flowing freely.

In regards to economy...there are without a doubt substantial opportunities in water conservation technology development. The resent studies in the Tulare Valley showed significant increases in crop yields and decreases in water use when pressurized water systems were used. This is just the tip of the iceberg when you start considering other developments like large scale hydroponics and non-reservoir off-drainage water storage.

California prides itself on being the innovation Mecca of the world. Developments in water technology can be utilized all around the world and provide massive economic potential for business here in California.

Response to Comment IND260-1
Thank you for your comment. Please refer to Master Response GEN-1.

Schramm, Steve

Comment IND243-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND243-1
Thank you for your comment. Please refer to Master Response GEN-1.

Schug, Axel

Comment IND81-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undarn the Klamath!

Response to Comment IND81-1
Thank you for your comment. Please refer to Master Response GEN-1.

Schweitz, Joshua

Comment IND396-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND396-1
Thank you for your comment. Please refer to Master Response GEN-1.

Sedlock, Evan

Comment IND210-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND210-1
Thank you for your comment. Please refer to Master Response GEN-1.

Segelke, Trevor

Comment IND204-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND204-1
Thank you for your comment. Please refer to Master Response GEN-1.

Self, Ann

Comment IND76-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND76-1
Thank you for your comment. Please refer to Master Response GEN-1.

Shadden, Bryan

Comment IND104-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

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Response to Comment IND104-1
Thank you for your comment. Please refer to Master Response GEN-1.

Shank, Amelia

Comment IND71-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND71-1
Thank you for your comment. Please refer to Master Response GEN-1.

Shaw, William

Comment IND184-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND184-1
Thank you for your comment. Please refer to Master Response GEN-1.

Shell, Christopher

Comment IND121-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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It's time to undam the Klamath!

Response to Comment IND121-1
Thank you for your comment. Please refer to Master Response GEN-1.

Shields, Thomas

Comment IND226-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND226-1
Thank you for your comment. Please refer to Master Response GEN-1.

Shin, Donald

Comment IND189-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND189-1
Thank you for your comment. Please refer to Master Response GEN-1.

Shoop, Carter

Comment IND107-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND107-1
Thank you for your comment. Please refer to Master Response GEN-1.

Sieber, Michael

Comment IND338-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND338-1
Thank you for your comment. Please refer to Master Response GEN-1.

Sievert, Jane

Comment IND424-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND424-1
Thank you for your comment. Please refer to Master Response GEN-1.

Silver, Dan

Comment IND137-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND137-1
Thank you for your comment. Please refer to Master Response GEN-1.

Simon, James

Comment IND428-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND428-1
Thank you for your comment. Please refer to Master Response GEN-1.

Sinclair, Kimberly

Comment IND275-1
I'm at a loss regarding the blatant disregard for the communities that have spoken up against the dam removal project.
They have expressed their concerns for their livelihood, property value, aesthetic value, water rights, home safety as it pertains to fire, recreation, farming, drought concerns, and so many other concerns. They have almost unanimously voted in opposition to the removal of the dams, yet for some reason there is still a good chance that the removal project could still move forward.

Response to Comment IND275-1
Thank you for your comment. Please refer to Master Response GEN-1. As required under CEQA, the EIR analyzes 22 environmental resources (see list in Volume I Section 3.1 *Introduction* page 3-1), including the topics mentioned in the comment (i.e., aesthetic resources, water supply and water rights [including consideration of drought conditions], wildfire-related hazards, recreational resources, and agricultural resources. Please note that CEQA documents analyze significant effects on the physical environment; CEQA does not address potential social or economic effects from implementing a project (CEQA Guidelines, section 15131(a)). However, to inform the public and decisionmakers regarding the potential economic consequences of the Proposed Project, the EIR includes Section 5.4.1 *Consideration of Economic Information*

for Resources Potentially Affected by Dam Removal (pages 5-4 to 5-11) which summarizes the results of prior economic studies conducted by the U.S. Department of the Interior (DOI) to characterize potential effects on property value.

Please also refer to Master Responses WSWR-1, WSWR-3, HAZ-2, and REC-1.

Comment IND275-2
In addition, I have seen letters to residents around the lake concerning possible landslides as a direct result of the lake removals.

Response to Comment IND275-2
Regarding potential for landslides, please refer to Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-3 (pages 3-761 to 3-765) and to Master Response GEO-2.

Comment IND275-3
Furthermore, I have read over the EIS that was submitted and don't believe that their research, assessment, and plans, are even close to complete. As a graduate of natural resource management at OSU, I understand the implications of smaller dam removals , and what they entail. I also have seen first hand what kind of aftermath they can leave behind, both environmentally and economically.

Response to Comment IND275-3
This comment raises a concern that the research, assessment, and plans related to dam removal are incomplete, and that dam removal can environmental and economic impacts. Please note that comments on the Definite Plan should be submitted to the Klamath River Renewal Corporation. Additionally, please refer to response to comment IND275-1.

Comment IND275-4
I have also seen the benefits of fish ladders on the Columbia River, which would seem a way better option at this time.

Response to Comment IND275-4
Please refer to Volume I Section 4.4 *Continued Operations with Fish Passage Alternative* (pages 4-99 to 4-180), which analyzes the provision of fish passage for the Lower Klamath Project dams using fish ladders.

Comment IND275-5
These lakes have created a working ecosystem for 100years, with aquatic life, water foul, wildlife - such as eagles, osprey, pelicans, deer, mountain lions, bears, and so many other things that rely on the lake for their sustenance.

Response to Comment IND275-5
Please refer to Master Response TER-1.

Comment IND275-6
I implore you to please consider the people and the environment in this particular situation. There are other options that would be far more beneficial to both the environment and the people .

Response to Comment IND275-6
Please refer to Master Responses GEN-1 and GEN-2.

Skenes, Joshua

Comment IND395-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND395-1
Thank you for your comment. Please refer to Master Response GEN-1.

Skinner, R.B.

Comment IND305-1
I believe it is vitally important to remove the dam's that have affect native fish and wildlife for far to long. Hatchery's don't work and I am tired of paying for them.

Please consider removal for the future generations, if you don't it will be on your watch. You have a chance to make a change for the better, can you live with that possibility of loosing a natural resource for ever? I couldn't.

Give Nature a chance.

Response to Comment IND305-1
Thank you for your comment. Please refer to Master Response GEN-1.

Slightom, Bruce

Comment IND102-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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Response to Comment IND102-1
Thank you for your comment. Please refer to Master Response GEN-1.

Smaldino, Eric

Comment IND205-1

I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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Response to Comment IND205-1

Thank you for your comment. Please refer to Master Response GEN-1.

Smith, Harry

Comment IND438-1

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It's time to undam the Klamath!

Response to Comment IND438-1
Thank you for your comment. Please refer to Master Response GEN-1.

Smith, Karri

Comment IND387-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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It's time to undam the Klamath!

Response to Comment IND387-1
Thank you for your comment. Please refer to Master Response GEN-1.

Solway, Sean

Comment IND257-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND257-1
Thank you for your comment. Please refer to Master Response GEN-1.

Sommer, Karen

Comment IND315-1
My husband and I strongly support the removal of dams on the Klamath River, for the health of the river and the health of the fish. The scientific studies show that it would not harm the towns nearby.

Response to Comment IND315-1
Thank you for your comment. Please refer to Master Response GEN-1.

Sosnove, Nancy

Comment IND331-1

I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND331-1

Thank you for your comment. Please refer to Master Response GEN-1.

Sowell, Margaret

Comment IND361-1

I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND361-1
Thank you for your comment. Please refer to Master Response GEN-1.

Spaller, William

Comment IND183-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) a:ffinns that dam removal is the best alternative and would comply with water quality requirements.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND183-1
Thank you for your comment. Please refer to Master Response GEN-1.

Spurr, Jeffrey

Comment IND420-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply witl1 water quality requirements.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND420-1
Thank you for your comment. Please refer to Master Response GEN-1.

Stanley, Brent

Comment IND88-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undarn the Klamath!

Response to Comment IND88-1
Thank you for your comment. Please refer to Master Response GEN-1.

Stauss, Arthur

Comment IND78-1

I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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Response to Comment IND78-1
Thank you for your comment. Please refer to Master Response GEN-1.

Steffan, Fred

Comment IND219-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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It's time to undam the Klamath!

Response to Comment IND219-1
Thank you for your comment. Please refer to Master Response GEN-1.

Steinhart, John

Comment IND64-1

Dear State Water Resources Control Board,

I strongly support saving Scott dam at Lake Pillsbury. Keeping this dam is way more beneficial then destroying it. The people of Potter Valley have been depending on this water for a hundred years. Without the water from Scott dam. Potter Valley would dry up. Also Lake Mendocino would go dry 60 percent of the time!

Due to climate change and global warming, destroying Scott dam would actually have devastating impacts on Salmon in the Eel river. In the summer months Scott dam releases cold oxygenated water for fish to survive. Without the dam, the upper Eel river would become a small trickle in the summer months killing fish due to lack of oxygen.

Wildlife depends on Lake pillsbury, Elk, Eagles, Bear, Deer, Mountain lion, are all well established thanks to Lake Pillsbury.

Please save Scott dam and Lake pillsbury !

Sincerely,

John Steinhart

Response to Comment IND64-1

This comment was intended for a different project and was submitted for this project in error. It therefore has been omitted from the record.

Stewart, James

Comment IND427-1

I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply witl1 water quality requirements.

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It's time to undam the Klamath!

Response to Comment IND427-1
Thank you for your comment. Please refer to Master Response GEN-1.

Stokes, John

Comment IND402-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of darn removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND402-1
Thank you for your comment. Please refer to Master Response GEN-1.

Street, Bill

Comment IND84-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steel head on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND84-1
Thank you for your comment. Please refer to Master Response GEN-1.

Suarez, Alicia

Comment IND69-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND69-1
Thank you for your comment. Please refer to Master Response GEN-1.

Swan, Tim

Comment IND218-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND218-1
Thank you for your comment. Please refer to Master Response GEN-1.

Sway, Scott

Comment IND259-1
California: Approve Klamath Dam Removal 401 Permit

I am writing to you to comment on the Draft EIR for the removal of the 4 dams on the Klamath River.

I urge the Water Resources Control Board to approve the 401 Permit and let's get those dams removed from the Klamath River.

We need to bring the Salmon back to healthy population levels. Lots of Salmon is a win win for everyone in our region. Environmentally, Economically, Culturally and it's also the right thing to do.

Response to Comment IND259-1
Thank you for your comment. Please refer to Master Response GEN-1.

Teakle, Ken

Comment IND380-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of darn removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND380-1
Thank you for your comment. Please refer to Master Response GEN-1.

Tomlinson, Michael

Comment IND337-1
The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND337-1
Thank you for your comment. Please refer to Master Response GEN-1.

Tone, Jerry

Comment IND414-1

I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of darn removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND414-1

Thank you for your comment. Please refer to Master Response GEN-1.

Tontz, Rick

Comment IND296-1

I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND296-1
Thank you for your comment. Please refer to Master Response GEN-1.

Toretta, Tom

Comment IND209-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND209-1
Thank you for your comment. Please refer to Master Response GEN-1.

Torre, Robert

Comment IND284-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND284-1
Thank you for your comment. Please refer to Master Response GEN-1.

Toth, Rob

Comment IND267-1
I am a fly fisherman as well as a small scale miner and have conducted both activities on the Klamath river during my 55 year lifetime. I'm all for protecting the environment and its fish, but not at the cost of illogical or unfair regulations. I understand that the recently released DEIR on the Klamath River dam removal project determined that, over the 24 months following the proposed removal,

there would be zero impact to water quality despite an estimated 20-30 million cubic yards of sediment being flushed through the system.

I also understand that the moratorium placed on gold dredging in the Klamath River was supported by the theory that dredging would have a negative impact on water quality, both from sediment as well as heavy metals being stirred up, despite the fact that it would likely take generations for 4" dredges to produce the same amount of sediment that the dam removal project would.

So my question is this: how can the 20-30 million cubic yards of sediment be determined to have no impact on water quality while that of a limited number of gold dredges scattered throughout the Klamath system be determined to have a detrimental affect so severe that a moratorium was placed on their usage?

I look forward to your answer to this question.

Response to Comment IND267-1

Thank you for your comment. Section 3.2.5.2 *Water Quality – Potential Impacts and Mitigation – Suspended Sediments* Potential Impact 3.2-3 finds that there would be a significant and unavoidable impact to water quality in the short-term due to release of reservoir sediments currently trapped behind the Lower Klamath Project dams, but the reservoir sediments would not continue to be a source of suspended sediments that result in an exceedance of water quality objectives in the long-term. As explained in Potential Impact 3.2-3, modeling indicates that the suspended sediment concentrations (SSCs) would resume modeled natural background levels by the end of post-dam removal year 1. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Additionally, Section 3.2.5.2 *Water Quality – Potential Impacts and Mitigation – Suspended Sediments* Potential Impact 3.2-13 includes implementation of Mitigation Measure WQ-2 and WQ-3 to reduce the potential for short-term impacts due to exposure to inorganic and organic contaminants in the Middle and Lower Klamath River and the Klamath River Estuary during and after reservoir drawdown to a less than significant level. As explained in Potential Impact 3.2-13, there would be little to no long-term potential for adverse impacts to human health from exposure to river water due the release of inorganic or organic contaminants associated with sediments deposits behind the Lower Klamath Project dams because potential exposure would be associated with elevated suspended sediment concentrations and modeling indicates that SSCs would return to background levels (i.e., existing conditions) by the end of post-dam removal year 1 under all water year types. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Please refer to Section 3.2.5 *Water Quality – Potential Impacts and Mitigation* for further discussion of the short-term and long-term water quality potential impacts due to the release of sediments currently trapped behind the Lower Klamath

Project dams (Potential Impact 3.2-2 for water temperature; Potential Impact 3.2-3 for suspended sediments; Potential Impact 3.2-7 and 3.2-8 for nutrients; Potential Impact 3.2-9 and 3.2-10 for dissolved oxygen; Potential Impact 3.2-11 for pH; Potential Impact 3.2-12 for chlorophyll-a and algal toxins; and, Potential Impact 3.2-13 and 3.2-14 for inorganic and organic contaminants). Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

This comment raises concerns with gold dredging activities in the Klamath River. Comment noted.

Trafican, Jeffrey

Comment IND418-1

I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of darn removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND418-1

Thank you for your comment. Please refer to Master Response GEN-1.

Triska, Mark

Comment IND352-1
I strongly support the full removal of the lower four Klamath River darns. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND352-1
Thank you for your comment. Please refer to Master Response GEN-1.

Tucker, Scott

Comment IND258-1
I strongly support the full removal of the lower four Klamath River darns. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND258-1
Thank you for your comment. Please refer to Master Response GEN-1.

Turner, Eli

Comment IND202-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND202-1
Thank you for your comment. Please refer to Master Response GEN-1.

Turner, Todd

Comment IND211-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

If the Hoopa and Yuroks would police the so called subsistence gill net fishing it would go a long way to helping this fishery. Lots of adult steelhead also end their return to spawn in the nets.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

Undam the Klamath!

Response to Comment IND211-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment IND212-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND212-1
Thank you for your comment. Please refer to Master Response GEN-1.

Umeda, Marc

Comment IND362-1
How incredible it must be for you to sit in a position, at this moment in time, capable of making a decision that is going to MAKE HISTORY! You are too well aware of the BENEFITS TO NATURE for me to even discuss them. You also know that ALL STAKEHOLDERS AGREE that dmn removal is required. SIEZE THIS MOMENT! Show the world that California knows how to make the hard decisions mid LEAD THE WORLD by removing the Klamath dams. When you do, the WORLD WILL FOLLOW!

Response to Comment IND362-1
Thank you for your comment. Please refer to Master Response GEN-1.

Van De Hey, Abigail

Comment IND65-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND65-1
Thank you for your comment. Please refer to Master Response GEN-1.

Vincent, Bruce

Comment IND103-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND103-1
Thank you for your comment. Please refer to Master Response GEN-1.

Volk, Grant

Comment IND442-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND442-1
Thank you for your comment. Please refer to Master Response GEN-1.

Vorik, Dmitriy

Comment IND176-1
My name is Dmitriy Vorik and apologizing ahead of time for my English since it is my fours language. I like to tell you about one of the biggest scam happening now in California. As you know we have crazy wildfires in last years and there is shortage of drinking water.

In 2020 l environmentalists are going to remove three hydroelectric dams in California and one in Oregon. This dams are located on Klamath river.
This project was given by Jerry Brown to KRCA non-profit corporation owned by environmental fanatics.

Response to Comment IND176-1
Thank you for your comment. Please refer to Master Responses HAZ-2 for a discussion of the potential for increased wildfire risk due to the loss of the Lower Klamath Project reservoirs under the Proposed Project. With respect to drinking water, please refer to Volume I Section 3.8 *Water Supply/Water Rights* (pages 3-667 to 3-684) for information regarding the potential effects of the Proposed

Project on surface water supply availability for existing water rights, including drinking water.

Comment IND176-2
According KRCA removal of the dams will cost about $500 million but we all know how government operates with taxpayers money and it will cost over billion.

Response to Comment IND176-2
Comment noted. Please note that CEQA documents analyze significant effects on the physical environment; CEQA does not address potential social or economic effects from implementing a project (CEQA Guidelines section 15131(a).

Comment IND176-3
The environmentalist simply have an agenda to destroy all dams in USA and it has nothing to do with the saving Salmon. Salmon population is very healthy on Klamath River. This is my arguments why dams must stay in place:

Response to Comment IND176-3
The status of anadromous salmonid populations in the Klamath River are described in Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species*. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment IND176-4
Three out of four dams providing clean renewable energy. You can't go "greener" than that.

Response to Comment IND176-4
Comment noted. This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (Greenhouse Gas Emissions and Energy).

Comment IND176-5
Since 1970 population in California was doubled from 20 to 40 million and no single reservoir was built. In 2022 each resident of California will be limited by only 55 gallons a day and in 2024 by only 50 gallons. Thanks to Gov. Brown. Two huge freshwater reservoirs, Iron Gate and Copco lake will be flush to the ocean.

Response to Comment IND176-5
Please refer to Volume I Section 3.8 *Water Supply/Water Rights* (pages 3-667 to 3-684) for information regarding the potential effects of the Proposed Project on surface water supply availability for existing water rights, including drinking water.

Comment IND176-6
The wildfires are destroying property's and lives of the residents of California . Firefighters using water from this reservoirs to save our lives.

Response to Comment IND176-6
Please refer to Master Response HAZ-2.

Comment IND176-7
This dams preventing from floods in raining season. Without dams fire and flood insurance will go to sky for local residence. Also the level of water wells will go down for locals.

Response to Comment IND176-7
Comment noted. Please note that CEQA documents analyze significant effects on the physical environment; CEQA does not address potential social or economic effects from implementing a project (CEQA Guidelines section 15131(a). However, to inform the public and decisionmakers regarding the potential economic consequences of the proposed project, Volume I includes Section 5.4.1 *Other Required CEQA Discussion and Consideration of Social and Economic Factors – Social and Economic Factors Under CEQA – Consideration of Economic Information for Resources Potentially Affected by Dam Removal* (pages 5-4 to 5-11) which summarizes the results of prior economic studies conducted by the U.S. Department of the Interior (DOI) to characterize potential effects on property value. Please also refer to Master Responses FLD-1 and GRW-1.

Comment IND176-8
The month of September is one of the driest month of the year and that's when the Salmon heading from the ocean to the spawning grounds. This time of the year dams releasing cold water toward the ocean to help Salmon.

Response to Comment IND176-8
As described in Section 3.3.5.4 *Aquatic Resources – Potential Impacts and Mitigation – Water Temperature* the Proposed Project is predicted to result in cooler water temperature in the fall compared with existing conditions. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment IND176-9
The upper Klamath river is naturally contaminated from Klamath Lake and several hot springs located above Copco Lake. Upper Klamath water is to warm for Salmon.

Response to Comment IND176-9
Please refer to Master Responses WQ-1. Please also refer to Section 3.2.2 *Water Quality – Environmental Setting* and Appendix C *Water Quality Supporting Technical Information* (pages C-1 to C-119) for further information

about the water quality variations in the Klamath River from J.C. Boyle Reservoir to the Pacific Ocean, including data quantifying water temperature changes in the Klamath River from the natural hot springs upstream of Copco No. 1 Reservoir. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Comment IND176-10
When I talk to upper Klamath Indian tribes they mentioned to me that even without dams they never so any Salmon coming up so far. There is a good reason why they call Copco Lake lake not a reservoir. It was a 30 foot waterfall before the dams been build and Salmon will never jump over.

Response to Comment IND176-10
As described in Section 3.3.5.8 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Habitat*, there is no evidence of an impassible barrier at the location of Copco No. 1 Dam that historically blocked upstream migration of salmonids. Please refer to the available data on historical abundance of salmon in the Klamath River watershed prior to Lower Klamath Project construction, as summarized in the Section 3.3.2.1 *Aquatic Resources – Environmental Setting – Aquatic Species – Anadromous Fish Species*. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Please also refer to Master Response AQF-4.

Comment IND176-11
By destroying Iron gate dam they will destroy fish hatchery. Every year hatchery releases millions of baby salmon steelhead and trout back in to the system. Plus hundreds of Pacific corporation and hatchery workers will have to look for another job.

Response to Comment IND176-11
The Iron Gate Hatchery operations under existing conditions are described in Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Fish Hatcheries*. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Please also refer to Master Response AQF-2.

Please note that CEQA documents analyze significant effects on the physical environment; CEQA does not address potential social or economic effects, such as reductions in jobs, from implementing a project (CEQA Guidelines section 15131(a)).

Comment IND176-12
By removing dams they will contaminate the hole river with a settlement from the lakes. Not only Salmon population will be destroyed for many years but also endangered Green Sturgeon.

Response to Comment IND176-12
The Iron Gate Hatchery operations under existing conditions are described in Section 3.3.2.3 *Aquatic Resources – Environmental Setting – Habitat Attributes Expected to be Affected by the Proposed Project – Fish Hatcheries*. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Please also refer to Master Response AQF-2.

Please note that CEQA documents analyze significant effects on the physical environment; CEQA does not address potential social or economic effects, such as reductions in jobs, from implementing a project (CEQA Guidelines section 15131(a)).

Comment IND176-13
This is not very politically correct to say but the native Indians are catching hundreds of thousands of Salmon by using gill nets. The department of fish and wildlife of California has no authority to count legal catch of native Indians. And since they using local Indian police nobody can control them.

Response to Comment IND176-13
Comment noted. Please note that CEQA documents analyze significant effects on the physical environment; CEQA does not address potential social or economic effects from implementing a project (CEQA Guidelines section 15131(a)).

Comment IND176-14
Many people including myself my friends and my family using this reservoirs for recreation such as boating, fishing, hunting..... Siskiyou county will lose ton of tourist on the top of losing money from the property taxes since the value of the properties went down dramatically.

Response to Comment IND176-14
Please refer to Master Response REC-1. Please note that CEQA documents analyze significant effects on the physical environment; CEQA does not address potential social or economic effects, such as reductions in property values, loss of property tax revenues, and increases in energy costs, from implementing a project. (CEQA Guidelines section 15131(a)).

Comment IND176-15
Majority of Siskiyou residents voted against dam removal and our voices have been ignored as always.
Residents of local communities are devastating and we need your help. PLEASE help us. Let know the world and Trump administration what's going on here. We counting on you.

Response to Comment IND176-15
Please refer to Master Response GEN-1.

Waite, Ryan

Comment IND265-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND265-1
Thank you for your comment. Please refer to Master Response GEN-1.

Walden, Charlene and James

Comment IND109-1
We purchased our property in Siskiyou County at Iron Gate Lake Estates in 1999. We began our fight to save the Dams on the Klamath River in 2003-2004, we then built our home at Iron Gate Lake Estates in 2005. We have one of the best wells ever drilled for our water and now the KRRC is wanting to put a meter of some sort into our well to see if Dam Removal will effect our water, levels, silt etc... We have declined this procedure and will continue to fight the Dam Removal. As a resident and property owner we implore you to please stop the removal of these Dams.

Being raised down river since the 60's we understand what the river can do during very wet years and very dry years. We also know how the hydroelectric dam is providing clean energy, renewable energy to over 70,000 residents and businesses in Northern California and Southern Oregon. The Dams play a very vital part to this county.

As a resident and property owner here in Siskiyou County I implore you to please stop the removal of these dams. I feel that the real reason behind the removal is more of one of dollars than it is a betterment for the river and fish. The dams play a very vital part to this county. They provide clean energy, flood control, enough water in the river for the salmon to return and spawn, water for wild fire protection, a bird and turtle refuge, and many more benefits.

Response to Comment IND109-1
Thank you for your comments. Please refer to Master Responses GEN-1, GEN-2, FLD-1, HAZ-2, and TER-1. The comments regarding renewable energy pertain to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Greenhouse Gas Emissions and Energy*).

Comment IND109-2
What happens to all of us property owners when all of this is destroyed by dam removal?? No one wants to answer our questions or concerns. Will this effect our water tables?

Response to Comment IND109-2
Please see Master Response GRW-1.

Comment IND109-3
Will all of us that have properties near the existing lakes lose our wells? Who will compensate us for our devaluation of property if our wells are gone?

Response to Comment IND109-3
Comment noted. Please note that CEQA documents analyze significant effects on the physical environment; CEQA does not address potential social or economic effects from implementing a project. (CEQA Guidelines, section 15131(a).)

Comment IND109-4
Where will the CDF and local volunteer fire departments obtain water for fighting fires? What about the current established eco-system that exists here?

Response to Comment IND109-4
Please refer to Master Responses HAZ-2 and TER-1.

Comment IND109-5
What about the local farmers and ranchers that depend on the lakes and rivers for crops and livestock?

Response to Comment IND109-5
Please see Master Response WSWR-1, Volume I Section 3.8.1 *Water Supply/Water Rights – Area of Analysis* (page 3-667), Volume I Section 3.8.5 *Water Supply/Water Rights – Potential Impacts and Mitigation* Potential Impact 3.8-2 (pages 3-679 to 3-680), and Volume I Section 3.15.5 *Agriculture and Forestry Resources – Potential Impacts and Mitigation* (pages 3-899 to 901). For additional information regarding groundwater supply, please refer to Volume I Section 3.15.5 *Agriculture and Forestry – Potential Impacts and Mitigation* (page 3-900) and Volume I Section 3.7.5 *Groundwater – Potential Impacts and Mitigation* (pages 3-663 to 3-665).

Comment IND109-6
Pacific Power have nothing to lose as they will come out on top either way this goes as does KRRC.

Response to Comment IND109-6
Comment noted.

Comment IND109-7
This year with all of the wildfires in Northern California and Southern Oregon these lakes were crucial in the fighting of these devastating fires. Although we were evacuated the Irongate Lake saved us and many others from total burn out. The waters from all of the lakes in this removal project were used to supply water for all of the water drops done by fire fighters. We have been speaking with the Cal-Fire employees and whether or not the big wigs in Cal-Fire agree or not is irrelevant, the employees, the ones with the boots on the ground and fighting these wildfires will tell you KRRC plans of dry hydrants and/or deep pools in the river to be used for firefighting is not a viable solution. It has been stated by a local firefighters, with concern, that in this time with the kind of fires that we have experienced and will very likely be experiencing in the future, along with the loss of life and property that we have seen, it is just beyond belief that dam removal with loss of such water resources is still on the table. The reservoirs are used every year and the loss of these resources are inconceivable, and could result in loss of life and property!

Response to Comment IND109-7
Please refer to Master Responses HAZ-2 and GEN-2

Comment IND109-8
In addition to the environmental impact, the fire fighting resources, potential devaluation of property, and the strong possibility of a change in the groundwater tables and loss of our wells, there is the loss of a source of clean energy from the

hydro-plant on Irongate Lake. Ex Governor Jerry Brown just signed into law that all energy in the state of California by 2045 must be from a clean energy source. So why would it be agreeable to take out an existing clean energy source only to turn around and have to build another?? This defies all logic and reasonable sense.

Response to Comment IND109-8
Comment noted. This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Greenhouse Gas Emissions and Energy*).

Comment IND109-9
As a resident of Irongate Lake Estates I find KRRC's plan for the removal and restoration totally unacceptable. It is filled mostly with speculation of how it will go and end up, with no sound science backing any of it up. And their plan for just piling up the debris of concrete, dirt, clay and whatever else in to hills, covering it up with topsoil and planting local plants on it to make it blend in to surroundings totally absurd. If this is so appealing to them then let them build these hills of debris in their back yards!!!!

Response to Comment IND109-9
Disposal of debris from dam removal is described in Volume I Sections 2.7.1.2 *Proposed Project – Copco No. 1 Dam and Powerhouse*, 2.7.1.3 *Copco No. 2 Dam and Powerhouse*, and 2.7.1.4 *Iron Gate Dam and Powerhouse – Staging Areas and Disposal Sites* (pages 2-30 to 2-40, 2-41 to 2-45, and 2-45 to 2-53), and the associated disposal site locations are shown on Figures 2.7-2 and 2.7-4. Present-day contours suggest that the disposal sites were originally used as borrow sites during dam construction, thus returning material to these areas could represent a return to pre-dam conditions. Please note that Section 3.19.5 *Aesthetics – Potential Impacts and Mitigation* has been revised to clarify how grading and revegetation of staging areas and onsite disposal areas included in the proposed restoration activities would affect views in the aesthetic Area of Analysis. Please refer to Volume III Attachment 1 Section 3.19.5 *Aesthetics – Potential Impacts and Mitigation*, including Potential Impact 3.19-5, for the revisions.

Comment IND109-10
You have the opportunity to stop this tragedy now instead of waiting until it all goes terribly wrong and reaping the consequences of the error of your decision to remove these dams.

Ultimately when all is said and done and this whole scenario goes totally array we will hold YOU responsible and liable.

Response to Comment IND109-10
Please refer to Master Response GEN-1.

Wangerin, Joyce

Comment IND394-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of darn removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND394-1
Thank you for your comment. Please refer to Master Response GEN-1.

Ward, Charles

Comment IND114-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND114-1
Thank you for your comment. Please refer to Master Response GEN-1.

Warner, Patrick

Comment IND316-1
An avid fisherman and outdoorsman, I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements. Additionally, this would restore many miles of affected riparian ecosystem to the benefit of thousands of people and millions of organisms.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND316-1
Thank you for your comment. Please refer to Master Response GEN-1.

Waters, Brian

Comment IND91-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undarn the Klamath!

Response to Comment IND91-1
Thank you for your comment. Please refer to Master Response GEN-1.

Webb, David

Comment IND159-1
Perhaps I missed it in the document, but in meetings and general discussion I have never seen any effort to describe the likely design life of any of the power

plants to be removed. I do know that back in the 1990's I was speaking to the operator of Iron Gate hydro plant, who at the time was struggling with trying to figure out how to remove and replace the runner in the plant, which had been weld repaired so many times that it was warped and cracking. Most plants have large hatches or other openings, and a place to park a crane so that large and heavy items can be lifted out. At the time we spoke he told me that in designing that plant, PP&L had assumed that by the time anything major needed to be replaced, nuclear plants would have made power so cheap that the plant would be abandoned instead of repaired.

All the discussion I have heard to date opposing dam removal seems to be predicated on the unspoken assumption that all these plants would continue to fill their design function forever unless removed, something that simply cannot be true. All machinery eventually reaches the point where its cost of repair cannot be recovered, and it winds up getting scrapped. The same holds true for steel, and for reinforced concrete, where eventually it too ages and cracks and is eventually irreparable.

I recall that ~ 20 years ago FERC directed operators of all high risk hydro plants to travel down the inside of their penstocks beating on them with a hammer, searching for weak spots. Sounded somewhat crude, but likely indicative that some plants' penstocks had nearly rusted through and would need difficult and expensive repairs if they were to continue in operation.

Response to Comment IND159-1
Thank you for your comment. Please refer to Master Response GEN-2.

Comment IND159-2
At any rate, while it is clear that for many people dam removal and related restoration work is strictly an emotional issue, (i.e. not one where opinions will change as a result of factual discussion), for those others seeking the whole picture, I think it would help to understand that the discussion is not whether the dams will be removed, but when it should be done, as eventually it must.

Response to Comment IND159-2
Please refer to response to comment IND159-1 and Master Response GEN-2.

Comment IND159-3
Another aspect affecting the useful life of the plants is the likely rate of return they will yield going forwards. Siskiyou County is right now struggling with the near complete loss of income from the sale of power from Box Canyon Dam on the Sacramento River, where PP&L is apparently showing little interest in buying the hydro power produced even for ~ $.04/kwh. This suggests that the energy market is oversupplied, at least for much of the year, and may indicate that aging plants like those on the Klamath where maintenance costs are probably rising,

have become more liabilities than assets. This aspect of the plant economics also seems to have escaped everyone's attention also.

Response to Comment IND159-3
Please refer to response to comment IND159-1.

Comment IND160-1
At the meeting in Yreka, Wayne Hammar noted that PP&L is the largest single property tax payer in the county, one of the few substantive comments I heard at the meeting. What was not clear at all was whether he was referring to all PP&L assets, (poles, lines, buildings, trucks, etc., along with real property along the Klamath and elsewhere) or just the dams and their built in equipment themselves as would be most appropriate in the context of the discussion. Can you get clarification on that and provide dollar amounts also?

Response to Comment IND160-1
Please note that under CEQA, potential effects from implementing a project that are solely social or economic in nature, such as reductions in property values, loss of property tax revenues, and increases in energy costs, do not constitute an effect (i.e., an impact) to the physical environment. Please also refer to Master Response GEN-2.

Weber, Eugene

Comment IND208-1
I strongly support the full removal of the lower four Klamath River dams.

Response to Comment IND208-1
Thank you for your comment. Please refer to Master Response GEN-1.

Weddle, Pat

Comment IND318-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND318-1
Thank you for your comment. Please refer to Master Response GEN-1.

Weeder, Julie

Comment IND391-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND391-1
Thank you for your comment. Please refer to Master Response GEN-1.

Weidenfeld, Jessica

Comment IND411-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND411-1
Thank you for your comment. Please refer to Master Response GEN-1.

Weiner, Andrew

Comment IND72-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural di versions.

It's time to undam the Klamath!

Response to Comment IND72-1
Thank you for your comment. Please refer to Master Response GEN-1.

West, Richard

Comment IND298-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND298-1
Thank you for your comment. Please refer to Master Response GEN-1.

Westberg, Paul

Comment IND312-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND312-1
Thank you for your comment. Please refer to Master Response GEN-1.

Whelan, Bruce

Comment IND96-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND96-1
Thank you for your comment. Please refer to Master Response GEN-1.

White, Adam

Comment IND66-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

The dams are a leading cause of salmon declines in the Klamath Basin. The reservoirs created by these dams host massive blooms of toxic algae every year, which impairs water quality and poses health risks for people and pets. The Water Board's DEIR supports what dam removal advocates have said all along - dam removal helps alleviate these conditions.

Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND66-1
Thank you for your comment. Please refer to Master Response GEN-1.

Whitton, James

Comment IND426-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND426-1
Thank you for your comment. Please refer to Master Response GEN-1.

Williamson, Peter

Comments IND307-1 and IND308-1

I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comments IND307-1 and IND308-1

Thank you for your comment. Please refer to Master Response GEN-1.

Wilson, Eric

Comment IND203-1

I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND203-1
Thank you for your comment. Please refer to Master Response GEN-1.

Windflower, Lisa

Comment IND369-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal improves water quality. This includes getting rid of the blue green algae blooms and fish disease problems below the dams. While the dam removal process will create temporary sediment impacts, the long-term benefits of darn removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND369-1
Thank you for your comment. Please refer to Master Response GEN-1.

Wong, James

Comment IND425-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND425-1
Thank you for your comment. Please refer to Master Response GEN-1.

Worcester, Chris

Comment IND118-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles

of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND118-1
Thank you for your comment. Please refer to Master Response GEN-1.

Wrisley, Gregg

Comment IND440-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND440-1
Thank you for your comment. Please refer to Master Response GEN-1.

Wrisley, Michael

Comment IND342-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND342-1
Thank you for your comment. Please refer to Master Response GEN-1.

Wyro, John

Comment IND401-1
I strongly support the full removal of the lower four Klamath River dams. One small step for man, one giant leap for our fisheries!

Do it!

Response to Comment IND401-1
Thank you for your comment. Please refer to Master Response GEN-1.

Yyeki, William

Comment IND181-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND181-1
Thank you for your comment. Please refer to Master Response GEN-1.

Zampino, Jerry

Comment IND413-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the

project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND413-1
Thank you for your comment. Please refer to Master Response GEN-1.

Zufelt, Steven

Comment IND237-1
I strongly support the full removal of the lower four Klamath River dams. The Draft Environmental Impact Report (DEIR) affirms that dam removal is the best alternative and would comply with water quality requirements.

The Klamath is the third most productive fishery for salmon and steelhead on the West Coast. Dam removal is the only project alternative that achieves the project purpose of restoring a free-flowing river, and will re-open over 400 miles of spawning and rearing habitat for struggling salmon and steelhead. Dam removal improves water quality and complies with Clean Water Act water quality objectives.

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removal process will create temporary sediment impacts, the long-term benefits of dam removal include stronger salmon runs and better water quality.

Dam removal will not affect irrigated agriculture: none of the dams slated for removal provide agricultural diversions.

It's time to undam the Klamath!

Response to Comment IND237-1
Thank you for your comment. Please refer to Master Response GEN-1.

2.4 Oral Comments and Responses – Draft EIR

This section presents oral comments received on the Draft EIR during the four public meetings held in 2019 and the State Water Board's responses to those comments. Comments written on speaker cards and written comments submitted at the public meetings are also included in this section. Comments and responses in this section are organized by meeting location. To determine which meeting location your comment is associated with, please refer to Table 2-3.

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2.4.2 Arcata Public Meeting—February 6, 2019 2-1657

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2.4.1 Yreka Public Meeting—February 5, 2019

This section presents comments received on the Draft EIR during the Yreka public meeting on February 5, 2019, and the State Water Board's responses to those comments. Oral comments (including written comments submitted at the public meeting) and responses in this section are organized alphabetically by affiliation name, and for individuals, by last name, first name, following the set of commenters with affiliations. To determine whether your comment is associated with another meeting location, please refer to Table 2-3.

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California State Assemblymember, Kevin Kiley

Comment SA2-ORAL-1
Good evening. I'm Kevin Kiley. I'm a member of the State Assembly representing California's 6th Assembly District.

You know, I came to tonight's meeting with an open mind but with deep concerns about this proposed project. I'm concerned about the absence of local control. Residents of the Klamath Dam Basin have been disenfranchised. They are overwhelmingly against the dams but, instead, misguided environmentalists and bureaucrats in Sacramento and Washington are making the decision to remove them.

Response to Comment SA2-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment SA2-ORAL-2
I'm concerned that there are no good replacements. There's no plan for finding replacement water. New reservoirs on feeder streams north of Klamath Lake would cost an estimated $8 billion.

Response to Comment SA2-ORAL-2
Please refer to Master Responses WSWR-1, WSWR-2, and WSWR-3.

Comment SA2-ORAL-3
And yes, I'm concerned about environmental damage. Removing the dams would result in a significant release of sediments down the river up to an estimated 20 million cubic yards of silt. There is a risk that sediment release will cause significant environmental damage to the area south of Iron Gate dam. It could also be harmful to the salmon, a species the supporter of the removal project supposedly wants to protect.

Response to Comment SA2-ORAL-3
With respect to the release of sediments during Proposed Project dam removal, please refer to the analysis in Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources - Potential Impacts and Mitigation* Potential Impact 3.11-5 (pages 3-765 to 3-775) and Master Response GEO-1. With respect to the potential impacts of sediment release on fish in the Klamath River, please refer to the analyses in Potential Impacts 3.3-1, 3.3-4, 3.3-7, 3.3-8, and 3.3-9 in Section 3.3.5.9 *Aquatic Resources, Potential Impacts and Mitigation Aquatic Resource Impacts.* Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment SA2-ORAL-4
I'm concerned about economic damage. There's been inadequate analysis of the consequences of removing the dams to the economy of Siskiyou and Modoc Counties, particularly to the farmers and ranchers that rely on its water.

Over the last few decades, we've seen how misguided policies related to logging have decimated communities in this area. Removing the dams would be another blow to the region. Removing the four clean power hydroelectric facilities could also cause energy prices to rise hurting rate payers.

Response to Comment SA2-ORAL-4
Please note that under CEQA, potential effects from implementing a project that are solely social or economic in nature, such as reductions in property values, loss of property tax revenues, and increases in energy costs, do not constitute an effect (i.e., an impact) to the physical environment.

With respect to the comment's concern regarding water availability for farmers and ranchers, please refer to Master Responses WSWR-1, WSWR-2, and WSWR-3.

With respect to the comment's concern regarding energy prices, please refer to Master Response ENR-1.

Comment SA2-ORAL-5
But after tonight I have an even bigger concern, and that's that I see the State Water Resources Control Board which has been a source of so much misery to so many people in this state using the public comment period as a statutory box to check rather than an opportunity to meaningfully engage with the public, to listen and to learn.

[Applause.]

MR. KILEY: It's a perfect example of why so many people feel that the state only cares about our North State communities to the extent that there are tax dollars to collect or resources to purloin or lives to control. But I do want the folks that came here tonight to know that I'm fighting for you. There are a few of us that are with the State, and I'll be fighting to make sure that the fate of this project is up to the citizens of Siskiyou County.

Response to Comment SA2-ORAL-5
Comment noted.

California Trout Incorporated, Andrew Braugh

Comment ORG3-ORAL-1, Speaker Card
Support project

Response to Comment ORG3-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment ORG3-ORAL-2
MR. BRAUGH: Good evening. My name is Andrew Braugh, A-N-D-R-E-W, B-R-A-U-G-H.

Thank you for your presentation. I appreciate your time tonight. I'm here on behalf of California Trout. We are a private 50—501(c)(3) that solves complex natural resources issues by balancing the needs of water, people, and fish.

Response to Comment ORG3-ORAL-2
Comment noted.

Comment ORG3-ORAL-3
I believe that an abundance of wild fish indicates healthy waters, and that healthy waters mean a better California. We strongly support this dam removal project and a free-flowing Klamath River.

Response to Comment ORG3-ORAL-3
Please refer to Master Response GEN-1.

Comment ORG3-ORAL-4
We are pleased that the Draft EIR confirms that the proposed project will have long-term benefits associated with protecting water quality which, in turn, ensures a healthier aquatic habitat, greater spawning opportunities, and a reduction in the incidence of fish disease. Many species of fish are imperiled in California and my organization is committed --

THE COURT REPORTER: Can you—I—can you back up a little? I can't hear you clearly.

MR. BRAUGH: How's that?

THE COURT REPORTER: I think so. Back up just a bit, please.

MR. BRAUGH: How am I doing now?

THE COURT REPORTER: Back up on your wording or what you were reading.

MR. BRAUGH: Back up on my wording.

Many species? Right there?

THE COURT REPORTER: Yes.

MR. BRAUGH: Many species of fish are imperiled in California and my organization is committed to restoring fisheries' vitality around the state. This project will remove the dams that now serve as barriers that block migration upstream to high quality habitat. The removal of the Copco 1 and 2 and Iron Gate dams as well as the JC Boyle dam in Oregon is the best chance to once again give native salmon and steelhead access to the clean, cold water of their historic spawning riparian habitat.

We have extensively studied the issue of the Klamath River dam removal and support scientific evidence demonstrating that fish can and will return to the upper regions of the watershed even in areas that have been blocked for decades or more.

Response to Comment ORG3-ORAL-4
Comment noted. Recolonization of salmon as a response to dam removal is discussed in Section 3.3.5.9 *Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-7, Potential Impact 3.3-8, Potential Impact 3.3-9, and Potential Impact 3.3-10. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment ORG3-ORAL-5
In addition, revival of the salmon-steelhead fisheries on this river system will provide economic benefits to the region by creating local jobs and boosting tourism and recreation in the area.

Response to Comment ORG3-ORAL-5
Please refer to Section 3.20.5 *Recreation – Potential Impacts and Mitigation* Potential Impact 3.20-6 (pages 3-1013 to 3-1015) for a discussion of the potential for changes to river-based recreation including fishing under the Proposed Project. Please refer to Volume III Attachment 1 for the final Section 3.20 *Recreation*.

Comment ORG3-ORAL-6
Cal Trout asks that our support for the project to remove Klamath River dams be answered in this public record.

Response to Comment ORG3-ORAL-6
Please refer to Master Response GEN-1.

County of Siskiyou, Wayne Hammar

Comment LA3-ORAL-1, Speaker Card
Pacificorp is the largest taxpayer in the County, roughly $2M annually. What is the tax loss to the County with the removal of the dams? FYI, 70% of the loss will directly impact County schools. What is the loss for taxpayers with lakeside property?

Response to Comment LA3-ORAL-1
Thank you for your comment. Please note that under CEQA, potential effects from implementing a project that are solely social or economic in nature, such as reductions in property values, loss of property tax revenues, and increases in energy costs, do not constitute an effect (i.e., an impact) to the physical environment. Please also refer to Volume I Section 5.4.1 *Consideration of Economic Information for Resources Potentially Affected by Dam Removal* (pages 5-4 to 5-11) which summarizes the results of prior economic studies conducted by the U.S. Department of the Interior (DOI) to characterize potential effects on property value.

Comment LA3-ORAL-2
MR. HAMMAR: Hi. My name is Wayne Hammar, W-A-Y-N-E, H-A-M-M-A-R.

I'm the Siskiyou County tax collector. I'm by no means an expert on water quality, but my questions that I would like answered have to do with some of the property taxes it will take in this county.

PacifiCorp is the largest single tax payer in the county to the tune of about $2 million which, you know, might be chump change in the Federal Government and the State Government but very important to this county.

Seventy percent of those dollars go directly to our schools, so whatever loss we'll take by the removal of the three dams and their infrastructure will directly hit our schools. Also, it will affect public safety.

And so I—I would just like to know what realistically those—those estimates would be on those property tax losses.

I've also heard—and I know it's hearsay, I can't say for a fact that—that it's been said that there's a minimal impact on property tax values in Siskiyou County, and I just don't believe that.

You can probably talk to anybody at Copco lakefront property and ask them what's going to happen when that lake disappears. I'm sure that will have some impacts. And again, in the bigger scheme of things, it may not—it may not seem large but, to our account, those are very important revenues.

So that's really my question is what, realistically, will have an affect on the property tax values here and what the removal of those dams will mean to that.

Thank you.

Response to Comment LA3-ORAL-2
Please refer to response to comment LA3-ORAL-1.

County of Siskiyou, Board of Supervisors, Brandon Criss

Comment LA1-ORAL-1

Siskiyou County appreciates the opportunity to comment on the Draft Environmental Impact Report for the Lower Klamath Project. Tonight the County's comments will be limited to highlighting a few of the concerns our Environmental Consultants, SWCA, have identified in its initial review of the Draft EIR. These are only preliminary highlights, and the County will be submitting its formal written comments to the State Water Control Resources Board at a later date, prior to February 26th.

The County's first concern is that many sections of the Draft EIR rely on future surveys and studies to identify resources or habitats that are in the project area, making the impact analysis unreliable. An EIR must include a description of the physical environmental conditions in the vicinity of the project as they exist at the time of the Notice of Preparation, or at the time of the commencement of environmental analysis. This description generally constitutes the baseline physical conditions by which a lead agency determines whether an impact is significant. Here, the EIR relies on future surveys and studies to identify wetlands, special-status plants, culturally significant plants, special-status wildlife, and groundwater wells, among others. This hinders realistic and accurate impact determinations, which are evaluated by comparing expected environmental conditions after project implementation to the existing baseline conditions. It is also very concerning that much of the underlying data that is relied on in the EIR for impact determinations is primarily decades-old data that no longer reflects existing conditions.

Response to Comment LA1-ORAL-1

Thank you for your comment. Please refer to response to comment LA9-12 for a discussion of future surveys and Master Responses WQ-4 and TER-1.

Comment LA1-ORAL-2

The County's second concern is that the Draft EIR considers a proposed project that is not yet stably defined. The Definite Plan is still being reviewed for technical adequacy, among other things, by FERC and an Independent Board of Consultants, and KRRC has recently agreed to submit an updated Definite Plan to FERC by April 29, 2019. Given the potential for changes to the Proposed Project by KRRC, or changes that may result from the pending FERC review of the Definite Plan, the project is essentially in flux and the Water Board's failure to wait for FERC's input on the Definite Plan prior to forging ahead with the Draft EIR has set the stage for an environmental analysis that is inadequate.

The Water Board's failure to wait for the final Definite Plan also creates the potential for future amendments to the Draft EIR, requiring recirculation, which results in financial hardship to economically stressed stakeholders and local agencies, such as Siskiyou County, who will be obligated to expend further

limited resources to review and respond to the new documents the Board circulates. Had the Water Board followed typical and acceptable procedural steps in developing this EIR, there would have been a significant decrease in the financial strain experienced by affected stakeholders and local agencies, including Siskiyou County.

Response to Comment LA1-ORAL-2
Please refer to response to comment LA9-4.

Comment LA1-ORAL-3
Finally, the Draft EIR appears to use (quote, unquote) "Recommended Measures" as a substitute for feasible mitigation measures. If the Water Board is relying on these measures to reduce environmental impacts, it should refer to them as mitigation measures. Under CEQA's Guidelines, it is the policy of the state that public agencies should not approve projects as proposed if there are feasible alternatives or feasible mitigation measures available which would substantially lessen the significant environmental effects of such projects. The "Recommended Measures" that are throughout the Draft EIR, appear both feasible and would lessen environmental impacts, and should be identified as "Mitigation Measures" to ensure implementation.

Response to Comment LA1-ORAL-3
Please refer to Master Response CEQ-2.

Comment LA1-ORAL-4
Again, Siskiyou County appreciates the opportunity to appear and comment on the Draft EIR and looks forward to submitting further written comments.

Response to Comment LA1-ORAL-4
Comment noted.

Comment LA1-ORAL-5
Hi, my name is Brandon Criss. I'm current Chair of the Siskiyou County Board of Supervisors.

Siskiyou County appreciates the opportunity to comment on the Draft Environmental Impact Report for the Lower Klamath Project. Tonight, the county's comments will be limited to highlighting a few of the concerns. Our nat-—our environmental consultants have identified in this initial review of the Draft EIR. These are only primary highlights and the county will be submitting its final written comments to the State Water Control Resources Board at a later date prior to February 26.

Response to Comment LA1-ORAL-5
Comment noted.

Comment LA1-ORAL-6

The county's first concern is that many sections of the Draft EIR rely on future surveys and studies to identify resources or habitats that are in the project area making the impact analysis unreliable.

An EIR must include a description of the physical environmental, environmental conditions in the vicinity of the project as they exist at the time of the Notice of Preparation or at the time of the commencement of an environmental analysis. This description generally constitutes the baseline physical conditions by which a lead agency determines whether impact is significant. Here, the EIR relies on future surveys and studies to identify wetlands, special status plants, culturally significant plants, special status wildlife, and groundwater wells among others.

This hinders realistic and accurate impact determinations which are evaluated by comparing expected environmental conditions after project implementation to the existing baseline conditions. It is also very concerning that much of the underlying data that is relied on in the EIR for impact determinations is primarily decades old data that no longer reflects existing conditions.

Response to Comment LA1-ORAL-6

Please refer to response to comment LA1-ORAL-1.

Comment LA1-ORAL-7

The county's second concern is that the Draft EIR considers a prop-—proposed project that is not yet stably defined. The definite plan is still being reviewed for technical adequacy among other things by FERC and an independent board of consultants, and KRRC has recently agreed to submit an updated definite plan to FERC by April 29th, 2019.

Given the potential for changes to the proposed project by KRRC are changes that may result from the pending FERC review of the definite plan. The project is essentially in flux and the Water Board's failure to wait for FERC's input on the definite plan prior to forging ahead with the Draft EIR has set the stage for an environmental analysis that is inadequate.

The Water Board's failure to wait for the definite plan also create the potential for future amendments to the Draft EIR requiring recirculation, which results in financial hardship to economically stress—stress stakeholders and local agencies such as Siskiyou County.

Response to Comment LA1-ORAL-7

Please refer to response to comment LA1-ORAL-2.

Comment LA1-ORAL-8

Finally, the EIR prepares to use, "recommended measures" as a substitute for feasible mitigation measures. Under CEQA's guidelines, it is the policy of the

state that public agencies should not approve projects as proposed if there are feasible alternatives or feasible mitigation measures available which would substantially lessen the significant environmental effects of such projects. The recommended measures that are throughout to Draft EIR should be identified as mitigation measures to ensure the implementation.

Response to Comment LA1-ORAL-8
Please refer to response to comment LA1-ORAL-3.

Comment LA1-ORAL-9
I'm getting the hint here. Thank you for your time. And the county appreciates being able to speak on the subject. Here's my written comment.

Response to Comment LA1-ORAL-9
Comment noted.

County of Siskiyou, Board of Supervisors, Lisa L. Nixon

Comment IND60-ORAL-1
My name is Lisa, L-I-S-A, Nixon, N-I-X-O-N.

I'm speaking to you this evening as a private individual, a citizen of Yreka and Siskiyou County and as – as an individual member of the county board of supervisors.

Response to Comment IND60-ORAL-1
Thank you for your comment.

Comment IND60-ORAL-2
I echo our Board Chair Supervisor Brandon Criss' comments, because they—they were provided on behalf of our entire board.

Response to Comment IND60-ORAL-2
Please refer to responses to comments LA1-ORAL-1 through LA1-ORAL-9.

Comment IND60-ORAL-3
I do feel compelled, however, to speak to you on one aspect and this is largely extemporaneous.

I—I harken back to the comments of my grandfather and my father and my uncles about the pre-river conditions before the dams. And they—they mirror largely Mr. Cozzalio's comments that he's made to you through the years. So sometimes it's hard for me to reconcile what is happening here today.

Response to Comment IND60-ORAL-3
Comment noted.

Comment IND60-ORAL-4
I want to touch on the very important point of the phraseology used in your very detailed report, and I thank you for your care and detail, the "recommended mitigation measures. "Well, "recommended," I—I do not understand the legal ramifications of this terminology. I don't know what the legal enforceability of that terminology is. There may be some. I just don't understand it at this point.

Siskiyou County has been advocating for years—for many years before I came on the board against dam removal largely, not entirely, but largely because no one has been able to give us definitive mitigation measures that would result in the citizens of your county not holding the bag for any insufficiently mitigated negative impacts. It seems like we're moving closer to that point, but recommended mitigation measures are not good enough for me.

We are looking to all of the players in this proposal, especially the project proponent KRRC and FERC and now to our Water Board to give us certainty on what mitigation measures will be taken. We need certainty, we need them to be enforceable so that our citizens are—are not left with the adverse impact. So I thank you for your care.

Response to Comment IND60-ORAL-4
Please refer to Master Response CEQ-2.

Environmental Protection Information Center, Rogue Climate, Allie Rosenbluth

Comment ORG1-ORAL-1, Speaker Card
Remove the dams!

Response to Comment ORG1-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment ORG1-ORAL-2
MS. ROSENBLUTH: Hello.

So first I would like to thank the California Water Board for the opportunity –

MS. RAGAZZI: Can you introduce your name and –

MS. ROSENBLUTH: —to testify on this dam removal permit site.

My name is Allie Rosenbluth, it's spelled A-L-L-I-E, Rosenbluth, R-O-S-E-N-B-L-U-T-H. And I live in Jackson County, Oregon.

I am the campaign's director for Rogue Climate, a Medford based nonprofit with over 6,000 supporters in Southern—Southern Oregon region.

Today, we are here to testify in support of the removal of all four Klamath dams. This Friday, the Oregon Climate Change Research Institute released their 2019 climate assessment which declared Southern Oregon, including parts of the Klamath River Basin, has experienced the worst impacts of climate change throughout the state.

At Rogue Climate, we believe that it is critical to reduce emission and transmission to clean energy while our communities prepare and mitigate the climate change but impact the climate change that we are already experiencing.

River water temperatures are impacting the health of the Klamath River and it's salmon population. It's clear that the dams are compounding these impacts.

In the summer, the dams/reservoirs host massive blooms of toxic algae each year posing health risks to people who are using the river.

In recent years, there have been extremely few or no salmon available for these communities. Dam removal is coupled with restoration and greenhouse gas reduction is a key to a healthy Klamath River that can support varieties of salmon populations that is critical for the Klamath, Yurok, Karuk and Hoopa Valley tribes, and as it creates jobs in fishing and tourism, that our communities in Southern Oregon and Northern California rely on.

Additionally, removing the dams would also support California's goals as they relate to environmental justice and tribal consultation. For these reasons and more, we urge the California Water Board to approve permits for the removal of the four Klamath dams.

Thank you.

Response to Comment ORG1-ORAL-2
Comment noted.

Karuk Tribe, Alex Watts-Tobin

Comment TR2-ORAL-1, Speaker Card
General support for the DEIR Acknowledging complexities of the project

Response to Comment TR2-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment TR2-ORAL-2
MR. WATTS-TOBIN: Good evening.

My name is Alex Watts-Tobin, A-L-E-X, last name W-A-T-T-S, hyphen T-O-B-I-N.

I live with the Karuk tribe which is on record as strongly advocating for dam removal.

And I just wanted to remind them—the board in my remark tonight that the Klamath Basin is a very large constituency, certainly including this area but all—but also in fact all the way from Crater Lake roughly down through Klamath Falls down through here and the downriver communities. And everybody who's living here is part of that community that depends on that river and always has.

It's part of my job to advocate for people to listen to the native people, of course, who live on the river. And I will be—I have some—in my job, I have some reservations about the DEIR and I will be making some comments on that.

But to speak personally now, as part of that big constituency, I really would like to invite some of the people from this town to come down to the hearings in Orleans and Arcata because, frankly, they get very boring when you just let—listen to people that are always "Take the dams down, take the dams down." I come up to Yreka for an interesting discussion.

The big picture of this, I think, is I—personally, I would—I'm in favor of dam removal and that I think that the DEIR has—has done a very good job of assessing the impacts.

Some of the things which I noticed in it, even if you're not inclined to listen to the native people that much, you need to listen to just the white settlers—a majority of the white settlers. Look at the Siskiyou Pioneer from the 1960s, fish were extremely abundant on this river prior to that dam removal, and that is very much on record. If you look at that, some of the comments have relied on a large amount of cherry picking this data.

The impacts also, in—it was good to see that the impacts from the drawdown of the JC Boyle Reservoir, I don't think, will have much—too much impact on the stretch of the river between JC Boyle and Copco Reservoir. It's something like calculations from JC Boyle being 381 acres, it would be only about a thousand cubic feet per second which is also well within a normal range.

So overall, I would like to amend the report and—and recommend taking out the dams.

Thank you.

Response to Comment TR2-ORAL-2
Please refer to Master Responses GEN-1 and GEN-2.

Karuk Tribe, Robert J. Super

Comment TR1-ORAL-1, Speaker Card
hAve tAlKing poiNts SUPPort DAM REmoval

Response to Comment TR1-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment TR1-ORAL-2
I would like to say that the—the reports that you were given are—we have a division of natural resources that have comments about there being algae and—and to back up what you were saying. And we believe that if you take the dams out that the dams that are in there, they are—the water that goes through them has—it doesn't go to agriculture.

Response to Comment TR1-ORAL-2
Please refer to Master Response GEN-2.

Comment TR1-ORAL-3
And this last—last year, we only gathered salmon for our ceremonies. We didn't gather like we usually do. So we were trying to help our salmon get through and so we were letting them go, the Yuroks, the Karuks, and the Hoopas.

And that sediment that we talked about, you know, it will—it will affect for a little while, but our salmon will come back and they talk about when they're taking out the dams that they will be taking 'em out during the off season when the salmon aren't coming up, so we won't—the salmon won't be able to come through.

Response to Comment TR1-ORAL-3
Please refer to Master Response AQF-10 for a summary of the potential impacts to fish resulting from sediment release due to dam removal.

Karuk Tribe, Sammi Jo Goodwin

Comment TR5-ORAL-1, Speaker Card
I support removal of the four Klamath dams, As a Karuk tribal member. The Klamath river is essential to our culture and our way of life. The quality of life is measured by our movement to restore a healthy river

Response to Comment TR5-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment TR5-ORAL-2
MS. GOODWIN: Hello. My name is Sammi Jo Goodwin, S-A-M-M-I, J-O, G O-O-D-W-I-N.

I am a—I am an indigenous woman who lives here in Siskiyou County who grew up on the Klamath River. And I am here as a water protector. I come before just to testify because living here knowing the devastation of what dams have done, you know, I am all for dam removal and anything that promotes dam remov—removal.

Being close to home and having it hit home is a little bit different. You know, growing up, you know, like my father was a cultural—you know, he believes in cultural preservation. So that's what I believe in. I come from a strong legacy of that. He was a archaeologist/anthropologist, so he was out looking for artifacts, he was out scoping looking for villages, he was out scoping looking for acorns, water, and, of course, preserving our villages on the Klamath River.

I come from two very big villages on the Klamath River: The Inam, Innova Panaminik [phonetic] villages. I grew up on in Somes Bar, California, and that is where our tribe's fishery is at. That's the main fishery.

And with that, I've watched the devastation of salmon go from hundreds from pictures—seeing pictures, having big hogs and they're, like, two feet fish down to we don't have any salmon coming up. And if they are, they're tired and they're diseased and the algae from the water is in their gills.

I've also seen with my own eyes a fish kill. I've also seen devastation of elders not having their natural foods, something that was given from the Creator to our people for all to like—for all to want and all to have.

As I testify, I also testify for my children who I would love them to also have the legacy of our natural food. And being indigenous doesn't necessarily mean that I'm tied to one certain spot because my spirit is very strong. And most of our spirits are very strong as long as we pray. So each year we pray at our ceremonies and we pray for salmon and we pray for the fish and—of all kinds, the trout, the suckers, the eels. It's not just one. It's all. And it all affects us. Steelhead. For those sport fisherman, it affects you, too. Once it's gone, it's gone for all.

So when will we know that water's life and when will we not know that money cannot feed us? So I stand just here saying I testify as a Karuk indigenous woman, and I am for dam removal.

Response to Comment TR5-ORAL-2
Please refer to Master Response GEN-2.

Karuk Tribe, Taylor Tupper

Comment TR4-ORAL-1, Speaker Card
In favor of Dam Removal. Since 2006 FERC Relicencing for Klamath.

Response to Comment TR4-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment TR4-ORAL-2
MS. TUPPER: Hello. My name is Taylor Tupper, T-A-Y-L-O-R, T-U-P-P-E-R.

I'm an enrolled member of the Klamath tribes of Oregon. I traveled here tonight with my elder and my father Rayson Tupper, who is also a Modoc elder of the Klamath tribes.

My tribe has been here since time immemorial. And we have always been at the forefront in providing leadership and support towards this monumental effort of dam removal.

I would like to be here to say—as a reminder, I'm here to state that the Klamath tribes won their FERC relicensing process in 2006. This is a key component to that effort. We know those dams block our promised 1864 Treaty right resource. It re—it blocks c'iyaals, that's in our tribal language which means salmon.

We know that the Federal Government has a trust and responsibility to the tribes as stated in the Constitution of the United States, Article 6. On January 31st, 2007, my tribe was notified that two federal agencies ruled that PacifiCorp must install the fish ladders at the four Klamath dams to receive the new license for operating the hydro facilities: Iron Gate, Copco 1, Copco 2, and—and JC Boyle.

After a—after they did their own feasibility studies, they determined that dam removal was cheaper than the ladders. So that's when this came about and we were asked that question.

The win in 2007 was both instrumental and monumental to these 2019 dam removal efforts. That win will—was upheld to our treaty rights for the tribes of Oregon.

Our journey has spanned almost two decades. We recall traveling and marching with the lower river tribes to the shareholders meeting in Scotland and then to the other parts of the nation, including the capitals in Oregon, California, and Washington, D.C., all in support of salmon recovery.

My people and myself and my father refuse to walk away. Our efforts in these past few decades help contribute and pave the way to the California State legislative actions that now support dam removal.

They are fish and water people and we have been waiting for over a hundred years for the return of the salmon for our treaty right to be upheld. Still today over 100 years since Iron Gate was built in 1917, the c'iyaals have continued to travel towards their home in Klamath. And still today they break themselves at

Iron Gate. My people will continue to fight to see these salmon return. We know all things come full circle.

Remove the dams as mandated in the FERC 2006 process.

Thank you.

Response to Comment TR4-2
Please refer to Master Response GEN-2.

Karuk Tribe, Vikki Preston

Comment TR3-ORAL-1, Speaker Card
Dam removal will be positive impact to river health. Spring salmon and other salmon are at risk from a unhealthy river.

Response to Comment TR3-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment TR3-ORAL-2
MS. PRESTON: Thank you.

My name is Vikki Preston and I am from Orleans. I grew up in Orleans my whole life.

I grew up the mouth of Red Cap Creek, which is the—a major tributary to the Klamath River. So I guess you can say that my first experience with this is just being a person who would go to the river constantly every day and that—I feel like even in the short time I feel like I've been alive, I have noticed changes along the river and the way that the changes have impacted my family personally with the amount of salmon that we're able to get and—you know, year to year. And I—I think that—firstly, I think of my own family, you know, being impacted, you know, physically, emotionally by—by the health of the river specifically.

Response to Comment TR3-ORAL-2
Please refer to Master Response GEN-2.

Comment TR3-ORAL-3
So just to speak on where I'm coming from, I—I feel like the—there are many significant long-term benefits from the proposed project and the Draft EIR does include that dam removal really improves water quality. It also says that the sediment impacts will be temporary while the long-term benefits are stronger runs of salmon and better water quality.

Response to Comment TR3-ORAL-3
Comment noted.

Comment TR3-ORAL-4
It also clarifies that dam removal will not affect irrigated agriculture. None of the dams we are removing provide agricultural diversions. The DEIR clarifies that dam removal will not affect Salmon River flow. That's controlled further upstream by the BOR Irrigation Project.

Response to Comment TR3-ORAL-4
Comment noted.

Comment TR3-ORAL-5
With salmon, the Karuk tribe agrees with the key findings of this document. And we support the proposed project to undam the Klamath.

Response to Comment TR3-ORAL-5
Comment noted.

Comment TR3-ORAL-6
And I would really—I really appreciate the very empowering things that people have said today regarding the youth, because we were—I was in the classroom today with some of the kids in Orleans and working on an old tradition of how salmon and acorns was given to the people. And I think the importance behind this story is to remind ourselves without salmon, without acorns, without these places and taking care of these places that we're not taking care of ourselves. And I think that, you know, the kids feel this.

And it is really empowering to have them—like, this is their sense of identity and the sense of identity that I have grown up with my entire life. And it is directly tied to the health of the river. And these are the things that are being impacted negatively by the dams. But to speak to this—to speak to the hope that the kids have, just because of the hope the community has to the benefits of this happening, I think is the stronger point to be made here today.

So thank you very much.

Response to Comment TR3-ORAL-6
Comment noted.

Klamath River Renewal Corporation, Matt Cox

Comment ORG14-ORAL-1
MR. COX: Hi. My name is Matt Cox, M-A-T-T, C-O-X.

I'm the communications director for Klamath River Renewal Corporation, and I'm speaking tonight on KRRC's behalf.

KRRC is part of a cooperative effort to reestablish the natural vitality of the Klamath River to support all communities in the Basin.

Our job is to take ownership of the four PacifiCorp dams, remove these dams, restore – inundated lands and implement entire mitigation measures --

THE COURT REPORTER: Slow down, please. I'm having a hard time hearing you.

MR. COX: No problem.

And implement required mitigation measure in compliance with all applicable federal, state, and local laws. KRRC is seeking regulatory permits to accomplish this project, including Water Quality Certification by the State of California.

The DEIR is an impressive and thorough review of potential benefits and impacts of removal of the Lower Klamath Project hydroelectric. KRRC commends the Water Board, staff and the consultants for its work on this analysis, and we think there's quite a bit for community members and stakeholders to learn from it.

The DEI- -- excuse me – the DEI [sic] showed – the DEIR showed the proposed project to be environmentally superior compared to the six alternatives to the project that the board analyzed in terms of both project benefits and the negative impacts. The report short that most potential impacts from the project are small and short term and can be reduced with mitigation. It also shows many project effects are beneficial in the short and long term, which is an important finding for those who are interested in the long-term health of the Klamath River and the communities and ecosystems that depend on it.

The DEIR also shows the proposed project protects water quality by restoring the free-flowing condition of the river and ensures volitional fish passage and that the project would be a boom to salmon and steelhead populations. Many of the species is expected to recover following dam removal are tribal trust species that are important to the culture and health of some tribes on the Klamath River.

The DEIR also shows an expected increase in recreational and commercial fishing industries.

KRRC is pleased with these findings in the DEIR and look forward to continue work with regulators in the community to finalize the EIR and other permits and then implement the project, including mitigation measures to enhance benefits and reduce adverse impacts.

KRRC will be submitting written comments regarding this DEIR in the near future. We are encouraged that this DEIR brings KRRC one step closer to project approval.

Thank you.

Response to Comment ORG14-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Klamath Riverkeeper, Andrew Marx

Comment ORG49-ORAL-1, Speaker Card
Undamn The Klamath. Bring the Salmon Home

Response to Comment ORG49-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment ORG49-ORAL-2
MR. MARX: Hi. I'm Andy Marx, it's A-N-D-Y, M-A-R-X.

So I'm been fly-fishing the Klamath since 1996. For the last five years, I've been a part-time fly guide. I have a full-time job as well, but during the Klamath steelhead season that's what I do with my spare time. I've also recently become a member of the Klamath River Keeper.

My first steelhead trip on the Klamath more than 20 years ago, I really didn't get it. It was a bust. We didn't catch any fish. I went down there with an old-timer local who had fished it for years. And I asked him, "Why did we come down here?" And he kind of shrugged his shoulders and said, "Well, you should have been here 20 years ago. You just couldn't beat it." Since that first trip, there's been great years and there's been terrible years.

On more than one trip, we've had to leave the river. It was pea-soup green. It wasn't fit to stand in, to fish, swim in or even really look at.

There is a book that I picked up not long after I started fishing the Klamath called California Steelhead by a guy named Jim Freeman. It was written in 1971 and he described a stretch of river down Beaver Creek that I fished year and in and year out, and he described it as the finest steelhead water in the world. And there have been years like that and there have been years when there were no fish in that run.

Dam removal will allow the Klamath salmon and steelhead access to clean, cool water above the dams. I've been up there and fished, caught trout—trout all day long until your arm's sore. And there's a reason, the water quality is there. Below Iron Gate, you couldn't buy a trout to save your life.

Sure. In October, there's some steelhead around; November, steelhead around. But for most of the year, it's uninhabitable.

The Draft EIR's conclusion is right on. The environmental cost of dam removal is outweighed by the benefits to all the beings that depend on a healthy river.

I understand the sediment issues and I – I understand that that they will impact the fly-fishing guiding business for a couple of years. I work for an outfit with a number of guides that are full-time, and it's going to impact them as well. And we're all in favor of dam removal, because we know what it's going to do to the fishing runs we depend on for economic reasons.

There used to be a vibrant economy along the river. If you drive the river, you see these closed up trailer parks, like Fishers or the Rainbow Resort, stores, Happy Camp with a faded sign that says "steelhead capital of the world." It's possible, if it's restored, the people will come back. And I think in the end, we owe it not only to ourselves but our children and all the beings that in the future are going to depend on the free-flowing vibrant river.

Thank you.

Response to Comment ORG49-ORAL-2
Please refer to Master Responses GEN-1 and GEN-2.

McCloud Watershed Council, Angelina Cook

Comment ORG4-ORAL-1, Speaker Card
We support River Restoration for the many benefits that intact ecosystems provide. We urge Siskiyou County to leverage the tremendous economic opportunities that Klamath Restoration would provide

Response to Comment ORG4-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment ORG4-ORAL-2
Good evening. My name is Angelina Cook, A-N-G-E-L-I-N-A.

I have been living in and working towards water conservation and ecosystem restoration in Siskiyou county for over 13 years. I'm speaking tonight on behalf of the McCloud Watershed Council.

We appreciate the concerns that have been expressed through this process and in this room tonight as this is a huge project and will certainly affect lives of many. Some questions, however, are likely to remain unanswered as they undoubtedly were when the dams were built.

I am grateful to the woman from Washington who traveled here tonight to speak to the success of the restoration and of the Elwha River.

When humans settled in the area that is now known as Siskiyou County, rivers flowed free from the mountains to the sea for a reason.

The economic disadvantage and environmental crises Siskiyou County and California now face are because of overengineering, ecosystems, and demanding more from nature than we are necessarily entitled to.

In short, we strongly support the removal of all four dams for the many economic and environmental benefits an intact Klamath River would provide.

We urge the State Water Resources Control Board to approve the Draft EIR. And we encourage Siskiyou County to respect our natural heritage and embrace the economic potential of river restoration and truly renewable industries.

Response to Comment ORG4-ORAL-2
Comment noted.

Mid Klamath Watershed Council, Devin Finegan

Comment ORG9-ORAL-1
MR. FINEGAN: My name is Devin Finegan, that's D-E-V-I-N, F-I-N-E-G-A-N.

Thank you for this opportunity to speak. Thank you for all the work that you guys have been doing in making sure these dams come out in a responsible way. And I appreciate and invite comments about how we feel about how that should be happening.

I am a fisheries technician with the Mid Klamath Watershed Council, so I've been on a majority of the fish-bearing streams for Weitchpec to Hornbrook. We just finished with coho surveys last week, and the numbers do not look good this year and they did not look good last year.

People are wondering if what some of this empty perfect spawning ground looks like is what extinction might look like. That is what the people on the ground are asking right now.

So the environmental impact of this dam has happened and is happening. And I hope that we can mitigate, which it sounds like there is some money and plans on how to mitigate the dam removal to mitigate the impact that has come from these dams.

It really feels like we are in a threshold right now where, if we don't make this change, it will be the extinction of the fish. And this isn't the only thing threatening the fish. Coho, who are a particular—they are on the endangered species list in a very particular kind of stream to spawn in, which is a low gradient stream that lends itself to human use.

So a lot of these streams that this endangered coho used to spawn in also have cows on them, they have logging going on in them, they have irrigation for fields. There's just—you know, there's a list of impacts that are happening. And this dam removal is something we do have power over to give them more habitat to continue living.

Hearing that the river was trashed before the dams came in is confusing to me. You know, it sounds like the river—this river and the fish in it and everybody in there has grown together over the years. And it was managed by people, the native people before the dams were in here.

And the stories I've heard of the past is that there were enough fish in there to feed tens of thousands or however many people were here without having to go to a grocery store. And the stories that I'm hearing now that there were no fish in here before the dams do not line up with my understanding of how that was.

You know, we see that PacifiCorp doesn't find us an efficient way to bring electricity in here, and that is why they are selling. And I think that that speaks to the argument of it being a reasonable way to generate electricity.

Thanks for your time.

Response to Comment ORG9-ORAL-1
Thank you for your comment. Please refer to Master Responses GEN-1 and GEN-2.

Office of Assemblymember Brian Dahle, Bruce Ross

Comment SA1-ORAL-1
Bruce Ross. That's B-R-U-C-E, R-O-S-S. And I'm the district director for Assemblyman Brian Dahle, and that's B-R-I-A-N, D-A-H-L-E.

The Assemblyman regrets that he wasn't able to be here tonight, but he did ask me to speak on his behalf.

Response to Comment SA1-ORAL-1
Thank you for your comment.

Comment SA1-ORAL-2
A lot of people are going to have a lot to say, so I will be brief. You know, this—this debate and discussion and analysis of this proposed dam removal—removal project has been going on for 10 to 15 years now, more like 15 at this point. And there's been a lot of reports and a lot studies and this is the latest analysis of it.

Given that really exhaustive background, one of the most recognized things in the EIR is a section about issues to be resolved. And there's one extraordinary sentence in it and it says, "The degree of environmental impacts and benefits for

the proposed restoration project are issues to be resolved as is the potential for mitigation of impacts both within and outside of the Water Board's purview."

And I'll—I'll be honest, it's striking to read an EIR—I mean, the point of it is to resolve those impacts and to find mitigations for them. So if the Draft EIR doesn't have all that information done, it—it seems that it's just not a finished product yet, so I don't know why it's being circulated. And I appreciate the candor of the report that it says that but, nonetheless, it doesn't seem like it's a completed report.

Response to Comment SA1-ORAL-2
Please refer to response to comment LA1-ORAL-1 and Master Response CEQ-2.

Comment SA1-ORAL-3
You know, people in Siskiyou County have long been saying that pulling the plugs on these dams and letting 15 million tons of sediment run downstream is precisely what you not want to do in the habitat of protecting salmon in a river with existing water quality problems. So I think everyone appreciates that the water quality of the dam removal are being taken seriously. It just doesn't seem like it's been resolved.

And in that vein, you know, if after all of this work has been done and the state is coming out with a report that says, "Well, we don't really know what—we haven't resolved the benefits and the impacts yet, we don't have the mitigation resolved, those are issues we're working on," why are we here? If the state, after pushing this for 15 years, can't answer those questions in a straightforward way, why are we here?

Response to Comment SA1-ORAL-3
Please refer to Master Response AQF-14 and Master Response CEQ-2.

Pacific Coast Federation of Fishermans Association, Glen Spain

Comment ORG12-ORAL-1, Speaker Card
The commercial fishing industry supports dam removal.

Response to Comment ORG12-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment ORG12-ORAL-2
MR. SPAIN: Thank you.

My name is Glen Spain, S-—excuse me. G-L-E-N, one N, last name, Spain like the country, S-P-A-I-N.

I'm the northwest regional director for the PacifiCorp Federation of Fishermen's Association. We are the largest trade association of commercial family fisherman on the West Coast representing something like a thousand different business operations up and down the coast, many of them salmon dependent. And many of them have been closed down repeatedly in the past few years because of the very simple problems in the Klamath Basin on the reduction of populations in the Klamath Basin. That triggers coastwide closures because of weak stock management, problems that we have to deal with on a daily basis.

Response to Comment ORG12-ORAL-2
Comment noted.

Comment ORG12-ORAL-3
We're very gratified to see that the EIR confirmed what science has been saying all along and that is that dam removal will completely benefit the river, decrease water temperatures, greatly reduce c. shasta and other fish diseases, protect water quality and very much improve the populations of not only coho, spring run chinook, fall run chinook and every other species in—in the Basin.

We're also very gratified to see a—a context for the whole issue of sediment. You know, big numbers like 15 million cubic yards sound like a lot of sediment. In fact, this is a major river. It carries between 4- and 6,000—or between 4 and 6 million cubic yards of sediment in a normal year. What we're talking about in terms of additional sediment is, as you point out in the DEIR rightfully, within the range of normal variability that the river can handle and would typically wash out in about two years. So that makes it very much a doable issue.

And also it debunks a lot of the sediment fears that are there. There are no toxins in the sediment, nothing to speak of. The EPA's confirmed that over and over.

Response to Comment ORG12-ORAL-3
Comment noted.

Comment ORG12-ORAL-4
Another myth is that there's flood protections here. There's no flood protections. These were not flood protection dams. They're not designed to do flood protection. They provide little or no flood protection, never have. In fact, the worst floods in the Basin were two and three years after the last dam, Iron Gate was completed. They have provided very little.

Response to Comment ORG12-ORAL-4
Comment noted.

Comment ORG12-ORAL-5
Another problem that I hear often repeated is the fear that there will be irrigation impacts. So these dams are below the irrigation system. They're hydrologically below, and there are no irrigation outflows from any of the lower dams to anywhere. So there is no irrigation impact. In fact, removing the dams and eliminating the pressure on the Upper Basin farmers to put more water in the river because of the c. shasta, which they're now under court order to do 50,000 feet, that c. shasta problem will probably disappear and that push for irrigation restrictions will disappear.

Response to Comment ORG12-ORAL-5
Comment noted.

Comment ORG12-ORAL-6
One last thing on replacement power, the dams were misquoted. They produce 82 megawatts for power on average. No dam systems over the last—this is FERC's numbers. Over the last years, no dam system can run 24/7 particularly in the summer when water levels are low.

The power has already been replaced. When PacifiCorp has purchased by Berkshire Hathaway a few years ago, Berkshire Hathaway promised to put in 1400 megawatts of renewable power, 17 times more than the 82 megawatts of the dams. They've already replaced the power 17 times over and total power is only 1.7 percent of their total capacity in generation. Thank you.

Response to Comment ORG12-ORAL-6
Comment noted.

Salmon Recovery Funding Board, Monica Harle

Comment ORG16-ORAL-1, Speaker Card
I support salmon recovery & most efforts in that direction. We have had success with dam removal in WA state.

Response to Comment ORG16-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment ORG16-ORAL-2, Speaker Card
Salmon & fish passage is part of American heritage

Response to Comment ORG16-ORAL-2
Please refer to Master Response GEN-2.

Comment ORG16-ORAL-3
MS. HARLE: Hi. My name—my name is Monica Harle. I don't usually speak in public.I'll just go like this. Okay. So --

THE COURT REPORTER: How do you spell your name, please?

MS. HARLE: M-O-N-I-C-A, H-A-R-L-E.

I did not know that I would be speaking tonight but I—I'm going to.

I'm a citizen advisory—I'm not from California. I'm from Washington State.

I'm a citizen advisory committee member for the Hood Canal Region for the Salmon Recovery Funding Board. And so I was so interested in—in this topic. I've been reading about it in the papers.

I just wanted to say the Hood Canal Region is three counties and two tribes. And so there's millions and millions of dollars coming in each year for salmon recovery.

I wanted to say Washington State supports all salmon recovery efforts, including dam removal if necessary.

Dam removal such as the Elwha River dam removal has been extremely successful. Documented.

Number 4. Healthy salmon populations and present in our lives and rivers, water bodies is essential, basically, to all Americans. I think it's a very American thing. Culturally, it's important, not just to tribes but to all people.

And the fifth thing I was going to say: I've seen the statistics, and healthy salmon in fisheries is a huge economic driver, recreational and commercial.

Response to Comment ORG16-ORAL-3
Consideration of the potential impacts of the Proposed Project on river-based recreation including fishing is presented in Section 3.20.5 *Recreation – Potential Impacts and Mitigation* Potential Impact 3.20-6. Please refer to Volume III Attachment 1 for the final Section 3.20 *Recreation*. Potential economic impacts of dam removal on commercial fishing are discussed in Volume I Section 5.4.1.1 *Other Required CEQA Discussion and Consideration of Social and Economic Factors – Social and Economic Factors Under CEQA – Consideration of Economic Information for Resources Potentially Affected by Dam Removal – Commercial Fishing* (pages 5-5 to 5-7).

Salmon River Restoration Council, Stefan Dosch

Comment ORG20-ORAL-1, Speaker Card
I just want to say that it is about time the Klamath wasn't toxic in the summertime, Salmon were given a chance to return home and these outdated, devastating dams come down. Let's keep moving forward on this.

Response to Comment ORG20-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment ORG20-ORAL-2
My name is Stefan Dosch, that's S-T-E-F-A-N, D-O-S-C-H.

Okay. Hi. I'm Stefan Dosch. I'm at settler living on the Karuk ancestor land, and I live in Orleans. And I work with youth in our area and we spend a great deal of time in the Klamath and Salmon Rivers counting salmon and carcasses with the kids—actually, count salmon carcasses. We also count living fish. And we understand through hands-on experience, it's an amazing, incredible keystone species.

Response to Comment ORG20-ORAL-2
Please refer to Master Response GEN-2.

Comment ORG20-ORAL-3
So this can be a really depressing job sometimes and—but the kids themselves have a whole lot of hope. And they're hope is that they know that the dams are coming down soon.

There has been a seam in human history, humans upstream neglecting to think of those who live downstream of themselves. And I think this picture will be incredibly clear as you move this discussion down the river. This has been an incredible movement to get to where we are right now, and it's high time for these dams to come down.

People have mentioned how there will still be water quality issues after dam removal and I think this is an interesting point. And I do think we should look into where all of that nutrient loading and eutrophication comes from as well.

Response to Comment ORG20-ORAL-3
Please refer to Master Responses WQ-1, PAP-1 and PAP-2.

Comment ORG20-ORAL-4
As for sediment, the salmon survived a period of unregulated hydrologic mining. The fish will recover.

Response to Comment ORG20-ORAL-4
Please refer to Master Responses AQF-3 and AQF-4.

Comment ORG20-ORAL-5
I support this dam removal project and if any of you have clots or dams in your bloodstreams, I'd advocate for their removal as well.

Response to Comment ORG20-ORAL-5
Comment noted.

Shasta Nation, Betty Hall

Comment TR21-ORAL-1
MS. HALL: Hello. I'm Betty Hall, B-E-T-T-Y, H-A-L-L. I am a liaison for the Shasta Nation.

Response to Comment TR21-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-2.

Comment TR21-ORAL-2
Well, I've been trying to get through that big, big report. But when I got, you know, as I think you already know, there's a lot I don't agree with. And all week I went over and over it and I still—still see some of the same things still there. But when I got to the section of the Quartz Valley Reservation, I was absolutely—almost terrified. That whole section needs to be deleted completely, totally.

When you recommend—well, they said there's Shasta and Karok Indians were on that reservation --

THE COURT REPORTER: Shasta and which Indian?

MS. HALL: Shasta and Karok Indian. And you state that if you want to know about the culture and history of the Shasta Indians, read what we have written about the Karok tribe. That is so wrong. That is so different. We are so different people.

I grew up on that reservation. My father started that reservation all by himself. He got in his little car and headed down to Sacramento and started wheels turning and then the reservation came about.

We moved there when I was four years old from Mugginsville, which is three miles on up the road. I grew up on that reservation. And what I observed is differences between the Wicks family that was Shasta. That's my family. Maiden name is Wicks.

And there was also Mark Purcell [phonetic] there. He was Shasta and some Karok, but he did not get along with the Karok people there very often. He was calling the police on them a lot a – a number of times.

But I represent what I saw, the children on that reservation, most of them my playmates, they suffered terribly. They were terribly neglected. They almost starved.

One couple would leave their little kids for two weeks or more. My father would go check on 'em. Here's a little one sitting on the floor trying to eat flour, only thing in the house, putting it in his mouth. He brought 'em all home, bed 'em down in our living room, mother would take care of 'em till the parents finally came back to get their kids. They knew where to come find their children, because my parents had 'em. My mother and father used to take care of 'em, or they'd come by hungry. It – it was hard to watch.

And then the school. I went to school with 'em at Quartz Valley School. One little boy was about maybe first, second grade and, all of a sudden in the classroom, he just bursted out sobbing so hard. The teacher ran up to him and said "What's the matter? Are you hurt? Are you sick?" Finally, he says, "I'm hungry."

They were starving. Most of those children and almost every one of those Karok families were always hungry. It's hard to watch.

And it – I grew up with this. I saw it. I watched it. It's hard – then one day cars came in – white cars came in. I don't know if it was from the welfare department or whatever and picked up all the kids and they went to Chemawa to go to school. I think possibly the teacher may have recommended that, because she saw that they were hungry and they didn't have food, and they needed to be cared for better.

And then to compare – to make the statement like that – I'm writing it. I've been working on it until about 2:00 in the morning on what I saw, what I observed when I grew up with on that reservation. Like a lot of those kids – a lot of them were my playmates, you know, I missed them.

MS. HALL: And it – it's hard to see. But that really needs to be changed. That's not correct. It refers to the Karok culture and custom is so different, their belief systems are different. They have a putawan. There's some here they know what the putawan is, the Indian devil.

MS. RAGAZZI: Thank you, Betty.

MS. HALL: Their windows are covered at night ter- -- ter--- terrified of that. I used to have to walk my little friend home because she was so afraid of Indian devil.

THE WITNESS: Yes. Well, I could go on all night, I know, but that needs to be changed and then I still – we still would prefer no project. And you understand why because of all our graves that could be damaged, the Civil War veterans that are buried up there that could be damaged, there's burials underneath those reservoirs. I mean, come on, think about 'em.

Response to Comment TR21-ORAL-2
Please refer to Section 3.12.5.1 *Historical Resources and Tribal Cultural Resources – Potential Impacts and Mitigation – Potential Impacts to Tribal Cultural Resources* Potential Impact 3.12-2 for a discussion of how drawdown of Iron Gate, Copco No. 1, and Copco No. 2 reservoirs could result in shifting, erosion, and exposure of known or unknown, previously submerged tribal cultural resources within the reservoir footprints. Potential Impact 3.12-3 includes a discussion of the potential for short-term erosion or flood disturbance impacts to tribal cultural resources located along the Klamath River during reservoir drawdown under the Proposed Project. Please refer to Volume III Attachment 1 for final Section 3.12 *Historical Resources and Tribal Cultural Resources*.

Siskiyou County Water Users Association, Richard Marshall

Comment ORG18-ORAL-1, Speaker Card
Comment on EIR

Response to Comment ORG18-ORAL-1
Thank you for your comment.

Comment ORG18-ORAL-2
MR. MARSHALL: Richard Marshall, R-I-C-H-A-R-D, M-A-R-S-H-A double L. I'm the president of the Siskiyou County Water Users Association. Is there a director here from the Water Board? Actual director? No.

Response to Comment ORG18-ORAL-2
Comment noted.

Comment ORG18-ORAL-3
Thank you once again for taking care of us citizens here in Siskiyou County but making sure that people who make the decision don't get to come up here and hear us firsthand. The last time we met was July 2018. Our group submitted comments at your request to assist in the Water Board's preparation of the EIR regarding Klamath dams. As part of that information, we provided a report on the PDO, Pacific Decadal Oscillation. And as usual, it seems comments that we make, whether from the county or our group or the citizens in general, we don't get appropriate consideration on the issues that we submit.

We are the group that's most impacted by the removal of the hydroelectric dams, not you in Sacramento or in other areas throughout the state who think this is a good thing to remove the dams.

A total of 1800 pages you've put together, amazingly regurgitates the outdated 2012 EIR done by DOI, a document which was questioned by Dr. Paul Hauzer, former quality control officer from the DOI. I object again to taxpayer funds being devoted to the effort to remove our dams that we have by popular vote

indicated that they should be kept. You don't listen to the citizens.

Response to Comment ORG18-ORAL-3
Please refer to Volume I Section 2.6.4 *Proposed Project – Prior/Related Environmental Reviews* (pages 2-24 to 2-25) for a list of the reasons that the State Water Board determined it should develop a separate EIR, rather than adopting one of the existing environmental reviews (e.g., 2012 Klamath Hydroelectric Settlement Agreement [KHSA] EIS/EIR).

With respect to Dr. Houser's whistleblower complaint relating to the prior Klamath dam removal proposal, the independent investigative panel report on this subject indicates that Dr. Houser's concerns were related to disagreements on how to present uncertainty in scientific data, rather than about the data or scientific analysis itself (RESOLVE [2012] - *Independent Investigation of the Scientific Record Pertaining to the Allegations of Dr. Paul Houser*). Ultimately, the panel determined that Mr. Houser's complaint did not have merit.

Additionally, please refer to Master Response AQF-13 for a discussion of how varying ocean conditions can affect anadromous fish.

Please also refer to Master Response GEN-1.

Comment ORG18-ORAL-4
Now, one of the issues I would like to bring up in particular, because I think it's interesting when you read that entire report, you don't see much about historical context of the river prior to the dams. And many times, we talk about issues that have nothing to do with the history of the dams which I think is really important—history of the river, I should say, before the dams.

In the 1850s, one gentleman was mentioning here there was an 1855 report by Commissioner Moneypenny which basically said that there were problems back in 1855 with the river producing fish and the—and the Native Americans were restless and they had problems along the river because the fish were in short supply. So the fish aren't always there as some of the Native Americans would like to have you believe and they say "since time immemorial fish have been coming here." That's not true.

The historic conditions effect in the Klamath River prior to the construction of the dams includes the information I just read. There's another very reliable report from Glenn Briggs who's not here, I guess, with us this evening, maybe he is, a retired civil engineer with the U.S. Bureau of Reclamation. His family history goes back to the 1860s along the Klamath River, which was his home—family home was situated in the area of Happy Camp.

And I'll just read something briefly from there. We're going to include this in our written report when we get that done. I'll get to it here in a second.

So he describes in the late summer through the fall the dry conditions of the river, which is the issue that is very difficult to deal with if you don't have the dams to flush the river.

In George Gibbs Journal of Redick McKee's Expedition through Northwestern California in 1851, which was published in Archaeological Research Report from the Department of Anthropology—I'm going to get the hook here. They indicate that the Klamath River contrasting with the Trinity River had a taint because of its origin; that means it's origin in Lower Klamath Lake because of the blue-green algae because of the lack of water, it is known as the stinky river --

You going to cut me short here?

MS. RAGAZZI: I want to make sure everybody has an opportunity to comment. You're welcome to come back later.

MR. MARSHALL: There's one more thing.

So this gentleman who is educated and worked for the Bureau of Reclamation talks about his family history going back then that the river was always a problem. I know Glenn Spain would like to think differently. Right, Glenn?

But in fact, it's not true. It was always bad. There was always a problem with fish in the late year. Taking the dams out, that's what we're talking about returning to, spend hundreds of millions of dollars to get back to a situation that was untenable to begin with.

Thank you.

Response to Comment ORG18-ORAL-4
Please refer to Master Responses WQ-1 and AQF-4.

Andrews, Esther

Comment IND3-ORAL-1, Speaker Card
Support dam removal very strongly.

Response to Comment IND3-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment IND3-ORAL-2
MS. ANDREWS: Hello. My name is Esther Andrews. That's E-S-T-H-E-R, Andrews, A-N-D-R-E-W-S.

I traveled here from Orleans to say that, every year I've lived there, I've seen a strong negative impact that the dams have on the environment there.

As far as power is concerned, it's not clean energy and it's not significant.

Response to Comment IND3-ORAL-2
Comment noted. This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (Greenhouse Gas Emissions and Energy).

Comment IND3-ORAL-3
MS. ANDREWS: So much in this area depends on the river and has developed on an undammed river, especially the fish but also the flora and every single animal up and down the food chain have developed with a symbiotic relationship to the beautiful Klamath, including us.

This is a very important step for habitat restoration. I work in fisheries. And I see so much of the streams and rivers, and I see how much the fish are struggling. And this is very important to me. It's very important for all of us that these dams come down. It's very exciting to see that moving forward.

Response to Comment IND3-ORAL-3
Please refer to Master Response GEN-2.

Banzali, Francine

Comment IND24-ORAL-1
MS. BANZALI: My name is Francine Banzali. That's B, as in boy, A-N-Z-A-L-I.

I'm relatively new to Siskiyou County. I've been coming up here for about 15 years, and I'm a resident only three years. I live in Happy Camp California.

And driving down the river, you can't ignore that there's a lot of problems socially and economically. There's a lot of poverty. Driving down the river, it's very obvious to me.

And it looks like this was a thriving area. There was a lot of fishing and people were making their living off the river with people coming here for – as tourists.

And I also wanted to comment: Two years ago, I went to the Salmon River Fish Dive. It was really fabulous. I was enthralled. I saw a huge fish. I had never seen anything like that.

I came out of the water—we were counting fish if anybody's never gone there. So I counted eleven fish in our group. We swam four miles and I was excited. I got out of the water, and I was like, "I saw eleven fish." And everyone there bowed their heads. They said, "There's usually thousands of fish. If you look down and you can't see, there's so many fish."

And it's really quite frightening when you hear about these stories. And these are people who were younger than me. I'm 50 and, in their lifetime, they've seen a huge decline in fish. So I think this is like the canary in the coal mine.

And I think everyone should come down. Come down, we'll show you. And please invite us up to see what your issues are, why you're afraid of giving—taking down the dams, because I'm not really sure why you would be afraid of this because it's obvious that whatever the price is, we need to take out these dams and—and fix the problems that are on the river.

So anyone please come down, and we'd be happy to show you the river and show you the fish. And that's all I have to say.

Thank you.

Response to Comment IND24-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-2.

Chichizola, Malcolm

Comment IND62-ORAL-1
MR. CHICHICOLA: Save the salmons. Destroy the dams. Oh, whatever, whatever.

Save the creatures and all sick or the creek anywhere that has water except for the one that you drink.

Response to Comment IND62-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Chichizola, Regina

Comment IND44-ORAL-1
MS. CHICHICOLA: Hi. My name is Regina Chichicola, C-H-I-C-H-I again, C-O-L-A.

I'm here today with a group of Save California Salmon and also as a resident of the town of Orleans, California.

As a resident of Orleans, I've seen what the loss of fisheries has done to the community. I've seen what it means to people when there's no fish for ceremonies. And I've seen what it does to people when the river turns green when ceremonies are going on and when fishing is happening. I've heard a lot of people talking about when people get sick from the water quality in the river. And I've also seen what it means to people when there's no fish coming back because 90 percent of the fish die from fish diseases because of these dams.

These dams have caused massive water quality issues: The blue-green algae which is a liver toxin, as I'm sure you guys know; and it also causes fish diseases that kill a lot of the fish in the river.

Furthermore, these dams are not used in any way for flood control. The dams are not used in any way for irrigation supply. And therefore, they can be taken out. And the company that owns them, PacifiCorp, as their private property wants to remove them. And therefore, it's a win-win for everyone.

Dam removal will create a lot of jobs within this county, and it will create a lot of short-term jobs for taking the dams down, but it will also create a lot of long-term jobs through restoring of the fishing industry. And that's going to be here locally through recreational jobs but also throughout the West Coast through jobs for fisherman.

As we know the fishing industry on the coast has really been suffering and that's looks like everyone on the coast. There's been widespread unemployment and depression and food insecurity because of the lack of salmon on the reservations and also in coastal communities.

I also work for a group called Pacific Coast Federation of Fishermen's Association. And to see the pain of dumping fourth-fifths of the fishing fleet for the people is intense. You know, knowing people cannot afford to feed their families and have to give up on their – on their dreams and their – and on what their fathers have done for work, too, is pretty intense.

And it's also intense to see what it means to the tribal communities to not have fish, because it means everything to people to have fish on the table. And to see the depression and the disease issues and the high, high heart disease and the – just the way that it affects people's health and mental states.

I mean, my area has 12 times the suicide rate of the – the nation because people don't have – feel hopeless and you can help bring their hope back. So this is a chance for jobs, for communities to be healthy again and to bring hope back to an area that's really suffering. So please do the right thing and remove the dams and help restore our salmon.

And thank you for coming to Yreka also.

Response to Comment IND44-ORAL-1
Thank you for your comment. Consideration of the potential impacts of the Proposed Project on river-based recreation including fishing is presented in Section 3.20.5 *Recreation – Potential Impacts and Mitigation* Potential Impact 3.20-6. Please refer to Volume III Attachment 1 for the final Section 3.20 *Recreation*. Potential economic impacts of dam removal on commercial fishing are discussed in Volume I Section 5.4.1.1 *Other Required CEQA Discussion and*

Consideration of Social and Economic Factors – Social and Economic Factors Under CEQA – Consideration of Economic Information for Resources Potentially Affected by Dam Removal – Commercial Fishing (pages 5-5 to 5-7).

Please also refer to Master Response GEN-2.

Corcoran, James

Comment IND28-ORAL-1, Speaker Card
Dam removal is not in the public interest. We need the flood control, water storage and the cleanest and cheapest electricity there is.

Response to Comment IND28-ORAL-1
Thank you for your comment. Please refer to Master Responses GEN-1, FLD-1, WSWR-1, WSWR-2, WSWR-3, and ENR-1.

Comment IND28-ORAL-2
MR. CORCORAN: James, J-A-M-E-S, Corcoran, C-O-R-C-O-R-A-N. I'm a resident of Siskiyou County.

I would like to point out that the proposed removal of these four dams on the Klamath River is not in the public interest. We need the water storage. We need the flood protection in the spring, and we need the hydroelectric power which is the most cost effective and greenest power that there is. If we remove these dams, they would have to be replaced by a gas-fired plant. That's not exactly green energy.

So who would benefit if the dams are removed? Well, there are investors and there are contractors that would make money on the removal of the dams and the building of a gas-fired power plant. So those are most important considerations. Would the public benefit if these dams were removed? It seems to me they would not.

Response to Comment IND28-ORAL-2
Comment noted. Please refer to response to comment IND28-ORAL-1. With respect to the comment regarding hydroelectric power, this topic pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (Greenhouse Gas Emissions and Energy).

Cozzales, Rex

Comment IND45-ORAL-1
MR. COZZALIO: Hi. My name is Rex Cozzalio, R-E-X, C-O-Z-Z-A-L-I-O.

Recent data and research supports positions of the region most sup-—most affected supermajorities in opposition.

Response to Comment IND45-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment IND45-ORAL-2
The Upper Klamath Lake core drills; sediment studies of historic nutrient loads and algae; water quality monitoring --

THE COURT REPORTER: Slow down, please.

MR. THALER: I've cut it four times to the point of virtual insignificance.

MS. RAGAZZI: We'll take the whole thing if you're not able to make it through it.

MR. COZZALIO: You can't even read this, not with—not with my notes.

MS. RAGAZZI: Okay.

MR. COZZALIO: Experimental water treatment attempts; discovered biological lake and instream characteristics of microcystis aeruginosa, including the production, breakdown and effects of microcystin toxins; downstream microcystis outbreak monitoring; sentinel fish studies regarding manayunkia speciose polychaete, parvicapsula minibicornus --

THE COURT REPORTER:Okay. Wait. Slow down.

MR. COZZALIO: All of the testing that has been done in the last few years actually supports the supermajority against the dams. None of this information is included. All of that—all of that paragraph lists those—those studies.

Response to Comment IND45-ORAL-2
While the comment lists multiple topics and asserts that information on these topics have not been included in the EIR, it does not specify which studies or reports are being referred to.

Comment IND45-ORAL-3
In addition to already known massive environmental resident, economic, and health and safety benefits, the dams and deep water lakes provide -- recent science also confirms they provide not only—the only cost-effective enhancement to naturally endemic Klamath environmental conditions. They provide habitat and protections to some of the most viable life stage populations of sucker fish, trout, wildlife, and other listed species based upon the recent data.

Response to Comment IND45-ORAL-3
Section 3.3.2 *Aquatic Resources – Environmental Setting* includes a comprehensive summary of conditions for aquatic resources within the Lower

Klamath Project reservoirs under existing conditions. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment IND45-ORAL-4

Destruction of the only deep water lakes and dams will infect resident Upper Basin polychaete with lethal—lethal ceratomyxa genotypes in a habitat historically nonconducive to salmon, compounding disease for all affected resident species throughout the entire downstream Klamath. Higher nutrient loads delivered downstream will engender higher instream competitive microcystis outbreaks producing far higher instream toxic impacts to all resident species, including human.

Those instream nutrients will support historically experienced increase of instream macrophyte and peri-—periphyton disease conducive growth, particularly during the lowest flows and highest temperature time of year coinciding with salmon migration.

Response to Comment IND45-ORAL-4

Please refer to Master Response WQ-1 for discussion of how the Lower Klamath Project dams and reservoirs influence overall water quality, including nutrients.

Please refer to Section 3.3.5.5 *Aquatic Resources – Potential Impacts and Mitigation – Fish Disease and Parasites* for discussion of how dam removal would influence fish disease and parasites in the Klamath River Basin. Volume III Attachment 1 presents the final Section 3.3 *Aquatic Resources*.

Please also refer to Master Responses AQF-5 and AQF-6. Please refer to Volume I Section 3.4.5.1 *Phytoplankton and Periphyton – Potential Impacts and Mitigation – Phytoplankton* Potential Impact 3.4-2 (pages 3-428 to 3-433) for analysis of potential blue-green algae [cyanobacteria] blooms in the Klamath River due to potential increases in nutrient concentrations following Lower Klamath Project dam removal. The potential summer and fall increases in nutrient concentrations from Lower Klamath Project dam removal (see also Volume III Attachment 1 Section 3.2.5.3 *Water Quality – Potential Impacts and Mitigation – Nutrients*), particularly directly downstream from Iron Gate Dam, would not substantially contribute to blue-green algae [cyanobacteria] blooms in the Klamath River due to the lack of the suitable habitat conditions required for extensive phytoplankton growth. Please also refer to Volume I Section 3.4.5.2 *Phytoplankton and Periphyton – Potential Impacts and Mitigation – Periphyton* Potential Impact 3.4-4 (pages 3-435 to 3-437) and Potential Impact 3.4-5 (pages 3-437 to 3-440) for analysis of the potential changes in periphyton abundance in the Klamath River Basin due to elimination of hydropower peaking operations, conversion of the reservoir areas to a free-flowing river, and increases in nutrients from dam removal.

With respect to the comment about macrophytes, please refer to response to comment ORG46-136.

Comment IND45-ORAL-5
The State Water Resources Control Board is appointed and serves at the pleasure of the governor, empowered to carry out the environmental policies of the governor. The legislature has the right to review and comment on those policies but not to amend them. The governor has directed agencies within the water management plan to facilitate Klamath Agenda Project destruction.

Response to Comment IND45-ORAL-5
Comment noted.

Comment IND45-ORAL-6
Within their current Draft EIS, Water Resources limited their review to outdated theoretical and amended altered premise science supplied by the KHSA/KRRC to support their acknowledged single objective of project destruction. In Water Resources' EIS budget request, not a single dollar was allocated to investigation and assessment of current science refuting agenda premise.

In their cut-and-paste report, Water Resources marginalizes acknowledged water quality, environmental, species, health, safety, economic, and property impacts. Admitting that retention of the project would eliminate those unmitigated impacts and degraded water quality, that option is dismissed as not supportive of applicant objectives, somehow leaving the unavoidable damages to a nonexistent third party good neighbor agreement.

The mere fact of performing a Draft Water Quality Certification before completion of the EIS demonstrates Water Resources' agenda bias. In ignoring the above recent data to appease agenda policy and produce a document facilitating FERC bypass of the new holistic EIS, Water Resources abrogates any intent of responsible regional and environmental accountability. In doing so, they guarantee irreversible evidenced devastation and loss to the region.

MS. RAGAZZI: Thank you, Rex.

Response to Comment IND45-ORAL-6
The State Water Board drafted an EIR, consistent with the requirements of the California Environmental Quality Act (CEQA). An Environmental Impact Statement (EIS) is a requirement of the National Environmental Policy Act (NEPA) and will be developed as part of the Federal Energy Regulatory Commission's (FERC's) process for the Proposed Project. Please also refer to Master Responses GEN-1 and CEQ-2.

Fischer, Stephen

Comment IND51-ORAL-1, Speaker Card
Life time resident of Klamath River sean the river before the Damns

Response to Comment IND51-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-2.

Comment IND51-ORAL-2
MR. FISCHER: Thank you. Stephen, S-T-E-P-H-E-N, Fischer, F-I-S-C-H-E-R. I'm a—I'm a long time resident of the Klamath River and if you take the dams out, the water isn't going to get hotter—or it's going to get hotter. It's not going to get cold. There's going to be less water going down the river. And without any snowpack or any water and, during the winter, we aren't going to have enough water. That water is going to go down.

We used to walk across. I was down there before the dams were put in, we could walk across the Klamath River over the rocks and get our—our socks wet and tennis shoes.

If you take them dams out, there's not going to be enough water for fish to come up there. All the fish are—are going to stop. They're going to be beat up, tore up. And the salmon can't make it. The steelhead will be tore up so bad you can't get 'em up the creeks.

And there will be a—an influx of eels and sucker fish on the bottoms of the river. And it's terrible. I've been swimming in it getting suckered by an eel. That's not a good thing.

Response to Comment IND51-ORAL-2
Please refer to Master Response WQ-2. Additionally, Section 3.3.5 *Aquatic Resources – Potential Impacts and Mitigation* includes a comprehensive analysis of the potential impacts of the Proposed Project on aquatic resources. Volume III Attachment 1 presents the final Section 3.3 *Aquatic Resources*.

Additionaly, please refer to Master Response AQF-4 for a discussion of the historical abundance of andromous fish in the Klamath River.

Comment IND51-ORAL-3
If you take the dams out, all the agriculture is going to get on—they can only use it certain amount per day, per week, a few days per week. It' going to ruin all the agriculture.

Response to Comment IND51-ORAL-3
Please refer to Master Responses WSWR-1, WSWR-2, and WSWR-3.

Comment IND51-ORAL-4
You take the dams out, you're going to kill us all. It's bullshit.

Thank you.

Response to Comment IND51-ORAL-4
Comment noted.

Foster, John

Comment IND31-ORAL-1
AGIANET

Response to Comment IND31-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment IND31-ORAL-2
MR. FOSTER: John Foster, J-O-H-N, F-O-S-T-E-R.

I don't see how it's—I've been speaking at all these things the last 15 years.

Response to Comment IND31-ORAL-2
Please refer to Master Response GEN-2.

Comment IND31-ORAL-3
It don't seem like your agenda's changed. It still—you just want to take the dams out, and you're going to make your thing match that. So what we, the people, here say or what science says, it doesn't seem to matter.

Because starting out at poor quality coming out of that shallow lake in—in Oregon, how can it not get better going to deep lakes? And taking out dams where there's nothing to improve it, how's it going to get better? There's a couple springs in there, but not enough to—this river's always been backwards and it's going to stay backwards. It doesn't start cold and end warm. It starts warm and gets colder as it goes. So I just don't agree with this.

Response to Comment IND31-ORAL-3
Please refer to Master Response WQ-1.

Grunbaum, Jon

Comment IND32-ORAL-1
MR. GRUNBAUM: Good evening. And thank you for coming here to hear our comments.
IND41-ORAl-1

My name is Jon Grunbaum, J-O-N, last name is G-R-U-N-B-A-U-M.

And I've been a full-time fishery biologist on the Klamath River for 25 years. My territory is basically 120 miles downstream from the dams to the Salmon River. And I've—of course I've read a lot of science and the studies and the EIR, and I really commend all the great science that has gone into this and your work on this project.

Response to Comment IND32-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment IND32-ORAL-2
So I'm here on behalf of the fish to talk for the fish because they can't talk.
And I would like to see the salmon restored in the Klamath Basin. This was the third largest run on the West Coast before the dams were put in. So, you know, I don't believe that the dams saved our water quality and saved—is saving our fish right now.

Response to Comment IND32-ORAL-2
Comment noted.

Comment IND32-ORAL-3
So I see many benefits of dam removal, and that's to restore the salmon/steelhead populations, the third largest fish run on the West Coast, improve the economy of river communities by improving river-related recreation opportunities, such as fishing, swimming, rafting, and sightseeing. It would benefit everybody in Siskiyou County economically.

Response to Comment IND32-ORAL-3
Comment noted.

Comment IND32-ORAL-4
So I've seen firsthand how the dams—and read scientific papers how the dams are impacting the salmon. And the most obvious one is that the dams prevent fish access to 300 miles of habitat for steelhead, over 300 miles, several hundred miles of habitat for chinook salmon, the spring run, which are extremely important which are nearly extinct right now in the Klamath Basin, and 80 miles of habitat for silver salmon, which would be restored by removing the dams.

One of the worst possible things that I think are happening to our salmon population and leading to extinction is fish disease. And it's mainly caused by the dams. A lot of algae's moved underneath the dams, has grown in there because the river doesn't flush every year. And this algae has moved in and it is habitat for the polychaete worm that is intermediate host for the two disease organisms that are just decimating our salmon.

Over 90 percent of our salmon are infected with these diseases. And we—on some years greater than 50 percent, we think, of the juvenile salmon that migrate down and perish because of these two diseases.

Response to Comment IND32-ORAL-4
Comment noted.

Comment IND32-ORAL-5
Also, dams are adversely affecting the water quality. People have already spoke about this and due to the thermal lag which the dams cause, the water is warmer in the fall which stresses the adult fish coming in to spawn, and they're more susceptible to these diseases. We've had fish kills.

Creates a lot of biological—which is hard on the fish.

THE COURT REPORTER:Biological what?

MR. GRUNBAUM: Biological oxygen demand. Depletes the oxygen in the water.

THE COURT REPORTER: Oh, oxygen. Thank you.

MR. GRUNBAUM: And it's just bad for a healthy economy.

Response to Comment IND32-ORAL-5
Comment noted.

Comment IND32-ORAL-6
And I don't see the downside to dam removal as being very serious, because not much power is generated.

Response to Comment IND32-ORAL-6
Comment noted.

Comment IND32-ORAL-7
These dams are not flood control dams. And they're—they wouldn't affect water supply for agriculture in the Upper Basin.

Response to Comment IND32-ORAL-7
Comment noted.

Comment IND32-ORAL-8
MR. GRUNBAUM: Okay. One more comment.

And also, I'm a strong advocate of private property rights, and I know a lot of people in this room are, too. So I think we ought to respect PacifiCorp and Warren Buffett's desire to remove the dams because that's their property.

Thank you.

Response to Comment IND32-ORAL-8
Comment noted.

Hendricks, Nicholas

Comment IND40-ORAL-1
As a resident of siskiyou, an outdoorsman, a farmer and a fisherman, I strongly support the Klamath dam removal project. We need to let these once anadromous waters flow free once again.

Response to Comment IND40-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment IND40-ORAL-2
My name is Nicholas Hendricks. N-I-C-H-O-L-A-S, H-E-N-D-R-I-C-K-S.

I currently live on Wintu and Shasta territory. I'm also a citizen of Northern California and Siskiyou County. And as an outdoorsman, a fisherman, a farmer, I strongly support the Klamath dam removal.

Combined with reduced industrial forestry, increased restorative forestry and wetland restoration, we can rebuild the legacy of a wild and flowing Klamath River. The Klamath—the project is essential in preventing disastrous environmental incidents like the 2002 Klamath fish kill, which killed between 40,000 and 70,000 adult fish. They died of disease and was the largest fish kill in history.

As far as removal as to limited short-term implications, the long-term benefits of the removal will greatly outweigh the dangers of not removing the dams.

THE COURT REPORTER: Slow down, please.

MR. HENDRICKS: There are over 13,000 dams in the state. Depending on who you ask, there's only one to five undammed waterways inside the state.

We do not need to save the dams. We need to save the fish. We need to protect the traditional way of life for the many tribes of the Klamath River and restore the wild and scenic aspect of the Klamath.

I also personally support with clear desires of the greater and of the majority of the first persons in indigenous nations whom have had historical and rightful control of the past and the future of the Klamath River. The actions of those three to four generations of settlements have run their course and it's their time to end.

Thank you.

Response to Comment IND40-ORAL-2
Please refer to Master Responses GEN-1 and GEN-2.

Jones, Marva

Comment IND37-ORAL-1
MS. JONES: [Speaking in native language.]

My name is Marva Jones, M-A-R-V-A, J-O-N-E-S.

I come from the village of Vilichanden, Mashymet, Watzek, and Wopum on the Klamath River and along the Smith River. And I'm Tolowa, Yurok, Karuk, and Wintu.

And I come here to support the removal of the four Klamath dams.

I come in a good way and I'm honored to be here from the country. I respect that. I've been passed down responsibilities to protect our homelands and this is one of the areas that I've been taught and committed to be a part of in the effort to restore and balance this world. A lot of teachings going on on this river.

We don't just use it for food, but it's also a spiritual place for balancing this whole entire world. We do ceremony along the river that restores and bounties for all of us, not just us locals but everybody on this whole entire earth. And so those thing is—the teachings are very powerful and they need to continue. And we know the earth—I mean, that the river is sick right now. And we know that this is the best method in restoring the life of the river. And it's urgent and—I don't know.

I just wanted to share with you how important it is to, not only me, but the healing of all of our people. I'm not just talking about our native people but all of us. And we're in a dire time right now with climate change and the effects of that. And we can't—we can't turn a blind eye and ignore this. There's got to be a—there's got to be a solution.

Response to Comment IND37-ORAL-1
Thank you for your comment. Please refer to Master Responses GEN-1 and GEN-2.

Joseph, Patricia

Comment IND42-ORAL-1
MS. JOSEPH: Patricia Joseph, P-A-T-R-I-C-I-A, J-O-S-E-P-H. I am a Hoopa tribal member, and I come here to let everyone know that I stand with the decisions of our tribe for dam removal.

Response to Comment IND42-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Joseph, Thomas

Comment IND53-ORAL-1
MR. JOSEPH: Good evening. My name is Thomas, T-H-O-M-A-S, last name Joseph, J-O-S-E-P-H.

I'm a member of the Hoopa Valley tribe, and the Trinity River which is a major contributory to the Klamath River, and I'm here to say that I support dam removal.

Response to Comment IND53-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment IND53-ORAL-2
Sitting in this room, it's really hard to not bite back at a lot of the ignorant comments that were made, especially when people decide to speak on behalf of indigenous people and they themselves aren't even indigenous. But I really feel it's more vital and important that we build bridges in this moment and not walls.

There's more things that are threatened this Klamath River besides these dams. There's a pipeline that's also coming in. And this pipeline is going to threaten the—the safety of this river as well. And the people in this community are going to also be threatened. And so I know that their lands are – are valued in their hearts and they're also going to have to defend their lands against this pipeline. So I think it's more important that we build bridges in this moment.

But the rhetoric, I—I do—I do want to state to the facts since I'm running down here on time. For the record, the hostile environment that is being played out here in Yreka can let it be a testament to this board of how they come up here and they go over their time to exclude the amount of time for other people to speak, other people that may be in favor of dam removal.

And that type of hostility is a going-on hostility of environment that Yreka citizens have continued to play for decades. They don't give a rats ass about the people downriver. And them continuing to talk above and beyond their time is perfect evidence of that.

And for us to continue to live in a society plagued by their—by their balbaric [sic] teachings to keep us in the dark. You know, these teachings of stripping our land and destroying Mother Nature and taking everything and just take, take, take, take, built on their balbaric teaching of traditions, that needs to go as well.

So for the record, I have a minute left. I wanted to state that Fox News said that—that Yreka is 99 percent don't believe in climate change. And so here you have all these people testifying to you to keep these dams, but they don't even understand the predicament of the world that we're living in today, then that climate change is real, that we have caused that, that these rivers can be restored, that it has proven with other dams—or other rivers—other dams that have been removed in Washington and other places. And so we're saying stick to the science, understand the community that they're in. And we've been dealing with 'em for a long time.

Response to Comment IND53-ORAL-2
Please refer to Master Response GEN-2.

Khart, Al

Comment IND1-ORAL-1, Speaker Card
Planned Demolition of DAMS is a CRIME AGAINST ENVIRONMENT AND PEOPLE

STOP KRRC!

Response to Comment IND1-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment IND1-ORAL-2
MR. KHART: Al, A-L, K-H-A-R-T, and I'm a resident of Copco Lake.

I worked in science for more than 20 years, and I think the project is not grounded – grounded correctly. So it's—it requires more feasibility study. I wrote mathematical model and a risk model. And I would like to say that nothing was done to measure the risk of removal of dams.

And topics which I've heard, they are like—they are very similar. It's like somebody wrote the template and there was people who are for removal of dams, spoke in the same manner.

Response to Comment IND1-ORAL-2
The EIR analyzes the potential environmental impacts that could occur across 22 different resource areas in accordance with the CEQA, including the risk of dam failure during reservoir drawdown which is discussed in Volume I Section 3.6.5.3 *Flood Hydrology – Potential Impacts and Mitigation –Risks of Dam Failure* Potential Impact 3.6-6 (page 3-635).

Comment IND1-ORAL-3
So let me say now as a—as a human being from planet Earth and as a resident of Copco Lake, I think 77 years, they stream in Copco Lake and the river every summer. Sometimes, my skin is green, but I haven't had any diseases, so the health issue with dams is not correct. So it looking like we—we don't have this kind of issue.

Second, you say people say that about fires. I was witnessing two fires, and my house survived only because of Copco Lake. Is it amazing? Yes.

And just imagine if Paradise would have Copco Lake. Those—those 86 people probably be alive—alive, you know.

Response to Comment IND1-ORAL-3
Please refer to Master Responses WQ-8 and HAZ-2.

Comment IND1-ORAL-4
And the last point, if you know that – that science—the history of the science is about future. So, historically, dams or Copco Lake dam existed several hundred years ago.

I—I read about archaeological research and they say that this dam was like 8- or 700 years ago and engineers 100 years ago just restored the dam, because it was damaged by earthquake. So lake existed many, many years ago. So American engineers returned back lake which existed before.

So what if we remove dams? And then again, in many years people will decide, hey, it was not actually a good idea. Let's return dams back. It might happen. So I think at least the dam removal project is not grounded very nicely. And I'm against removal of the dams.

Response to Comment IND1-ORAL-4
Please refer to Master Response GEN-2.

Kramer, Richard
Comment IND46-ORAL-1, Speaker Card
FLOOD CONCERNS OF I5 BRIDGE ON KLAMATH CROSSING

Response to Comment IND46-ORAL-1
Thank you for your comment. There are three bridges that cross the Klamath River at the Randolph E. Collier Northbound and Southbound Rest Area along Interstate 5; the northbound and southbound Interstate 5 Bridges, which cross the Klamath River approximately 11 river miles downstream of Iron Gate Dam (Figure IND46-ORAL1-1), and the Klamath River Bridge 2-135, which crosses the Klamath River approximately 11.2 river miles downstream of Iron Gate Dam

(Figure IND46-ORAL1-2). The Interstate 5 Bridges have more than 14 feet of freeboard (i.e., clearance between the lower limit of the bridge superstructure and the river) during an estimated high-water flood elevation (i.e., 50-year or 100-year flood) (Caltrans 2019b). There would be even more freeboard during the approximately 10-year recurrence interval flows (i.e., 13,000 – 15,000 cubic feet per second [cfs], as measured at Iron Gate Dam, from Volume I Section 3.6.2 *Flood Hydrology – Environmental Setting* Table 3.6-11, pages 3-622 to 3-623) that would occur at this location during reservoir drawdown, and therefore, the bridges would not be subject to a substantial risk of damage due to flooding. Similarly, the Klamath River Bridge 2-135 has more than 5 feet of freeboard during an estimated high water flood event and the bridge would not be in danger of flooding during the approximately 10-year recurrence interval flows that would occur at this location (Caltrans 2019c). Please also refer to Volume I Section 3.6.5.1 *Flood Hydrology – Potential Impacts and Mitigation – Flood Hydrology* Potential Impact 3.6-1 (page 3-626 to 3-630) for a discussion of the short-term increases in downstream surface water flows during reservoir drawdown. Potential impacts to bridges downstream of Iron Gate Dam related to altered floodplain inundation conditions following dam removal are discussed in Volume I Section 3.6.5.2 *Flood Hydrology – Potential Impacts and Mitigation – River Floodplain* Potential Impact 3.6-3 (page 3-630 to 3-632).

The bridge at the mouth of the river noted in the comment is presumably the Klamath River Bridge 1-28 and is located 189.2 river miles downstream of Iron Gate Dam in the town of Klamath, California. This bridge replaced the 1926 Douglas Memorial Bridge, which was destroyed in the flood of December 1964 and January 1965, when the Klamath River reached a peak flow of 557,000 cfs (near the town of Klamath (USGS 2018) submerging the town of Klamath under 15 feet of water (DWR 1965). The December 1964 and January 1965 flood was approximately equivalent to a 100-year flood event for the Klamath River, as shown in Volume I Section 3.6 *Flood Hydrology* Table 3.6-11 (pages 3-622 to 3-623). The Proposed Project would not increase river flows during reservoir drawdown to anywhere near a 100-year flood event. Additionally, the new Klamath River Bridge 1-28 is located on a portion of the Klamath River that has a higher span than the original Douglas Memorial Bridge.

Please also refer to Master Response FLD-1.



Figure IND46-ORAL1-1. Klamath River looking downstream at the Interstate 5 Bridges (June 5, 2019).



Figure IND46-ORAL1-2. Klamath River Bridge 2-135 (June 5, 2019).



Figure IND46-ORAL1-3. Looking downstream at the Klamath River from Klamath River Bridge 2-135 (June 5, 2019).

Comment IND46-ORAL-2

MR. KRAMER: Evening. I'm Ryck Kramer, R-Y-C-K, K-R-A-M-E-R.

And this was brought up at one of our POW meetings. Nobody's really addressed it, but it's something that kind of concerns me.

I have no particular expertise in this. I'm an observer. I've lived here for a little over 80 years. I was here during the '55 and the '64 floods. The water at the mouth of the river took out the bridge down there, and I think the water lying there was 70 feet above the bridge.

We have the I-5 artery running directly below these dams. The—and I—and I really think that they are a flood control issue here. If those dams were not there, the possibility of that—the bridge, which is only about 20 feet above the river level right now, it could be taken out and the main artery on the West Coast would be gone.

It would—and I think that would—that's something that I don't think the board or any of the other EIRs have addressed. I think that's something that should be looked at.

Response to Comment IND46-ORAL-2

Please refer to response to comment IND46-ORAL-1.

Comment IND46-ORAL-3

And just a comment. As a native here, third generation, it's incongruous to me that people from the outside come in and tell us how to live our lives, what's good

for us, what's bad for us. The government has a real bad habit of making a one-size-fits-all agenda, and I think that's just not the thing to do.

Thank you so much.

Response to Comment IND46-ORAL-3
Comment noted.

Mackintosh, Don

Comment IND18-ORAL-1
I am a PG&E retiree. I sent 28 years in Power Grid Operations and my job was controlling power generation, transmission, and distribution. It is a fact that Hydro electric generation is the cleanest and cheapest of all generation. The fuel for Hydro generation is water. The water goes in and turns a turbine and comes out as water unchanged and usable. In all other generation the fuel chemically changes state after it is used and it is costly. Wind and solar are not dependable sources of power because it is necessary to have rolling generation on line for back up. I will not go into the many benefits of hydro, but when a power grid collapses and is dead, it takes power to start generation again. Hydro generation is used for this purpose because it can be started instantly and is always available.

California dams have been inspected recently by the Division of Dam Safety. It has been reported that four hydroelectric facilities on the Klamath are in good condition. They are in place and in operation with a history of producing revenue of $40 million plus annually. The cost of producing is plus or minus 8% of the gross revenue.

The National Hydropower Association is forecasting a growth in hydropower. The growth is due to new hydro installations and the upgrading of existing hydro for increased power output. This is done with new turbines and design innovations. There is a new technique called the closed loop pumped storage system that increases efficiency. The existing Hydro units on the Klamath are already efficient and cheap. The turbines and generators are simple and long lasting, typically 50 years.

The Hydro generation from the four dams produces 169 mega watts of power that supplies Siskiyou county, and the southern portion of Oregon, with 70 mw left over that goes south and is sold to PG&E.

The 169 mw of generation that will be destroyed has to be replaced to maintain the electrical grid by building a new generation plant. That alone could cost $4.5 billion. The replacement generation must be designed to fit into the grid and has to be in service before the hydro electric is removed. There has been no mention of a replacement power source. We don't know where it is coming from or what it will be.

Once the dams are breached the release of toxic material downstream begins, and a perfectly good $40 million plus business has been destroyed. It has been said that the complete removal and cleanup of this project could be as high as $7 billion. But that does not include the cost of the new replacement generation of $4.5 billion. So the total of dam removal and replacement generation would be $11.5 billion. The rate payers monthly power bill will probably be double if not triple what it is now. And who will pay for the liability insurance after the dams have been breached?

I believe that Siskiyou County should take possession of the Klamath Hydro facilities and continue pursuing the relicensing in the public interest through an organization such as a public utility district. The money that Pacific Corp (over $200 million) has taken from the rate payers for dam removal should be credited back to the people (Public Utility) for purchase of the Klamath Hydro Facilities. Also, as rate payers of the PUD, we could invest in our local utility company. I know that there is concern about the liability of a public utility but it is my understanding that there is a certain amount of government liability protection for this type of entity.

Our power supply here is unique in that it can function independent from the power grid. The Klamath Hydro dams are positioned so that in a situation of a long term grid outage Siskiyou county can be electrically isolated and generate its own power.

Response to Comment IND18-ORAL-1
Thank you for your comment. The comments regarding hydropower pertain to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (Greenhouse Gas Emissions and Energy). With respect to the comment's concern regarding power rates, please refer to Master Response ENR-1.

With respect to the comment's concern regarding sediment contaminants, please refer to Section 3.2.2.8 *Water Quality – Environmental Setting – Inorganic and Organic Contaminants – Sediment Contaminants* for a general summary of existing data (2006, 2009–2011) characterizing potential contaminants in J.C. Boyle, Copco No. 1, and Iron Gate reservoir sediments. The way in which existing sediment chemistry data were used to assess potential impacts in the EIR is summarized in Section 3.2.4.7 *Water Quality – Environmental Setting – Inorganic and Organic Contaminants*. Further, Section 3.2.5.7 *Water Quality – Potential Impacts and Mitigation – Inorganic and Organic Contaminants* Potential Impact 3.2-13 presents an analysis of possible human exposure to inorganic and organic contaminants due to the release and exposure of reservoir sediment deposits under the Proposed Project. Potential Impact 3.2-14 presents a similar analysis for the Proposed Project, conducted for freshwater and marine aquatic

species. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Comment IND18-ORAL-2

MR. MACKINTOSH: Yes, I'm Don M. Mackintosh, it's M-A-C-K-I-N-T-O-S-H, and we have a ranch in Weed.

But I am a retired PG&E and my—I worked in—let's see—a power grid operations and my job was to control generation, transmission and distribution of, you know, of parts of a—of the grid. And I did that for 28 years.

And this is—this is a sick thing to take out these dams. You know, because I—over the years, you know, we communicated with and operated and controlled, you know, the—these same stations, these same hydro, ah, generation.

And so I did write up a—a report how this is—that I want to turn in—how this is electrically wrong to take out these dams. So it's basically – I have all the—basically, what we're going to – the dam's hydro is the cheapest, cleanest power that there is. It's—it's—the fuel is water. It goes in and it comes out. It turns the turbines and it comes out clean. It's usable. It's—there is—it's—it's a very simple, basic way to make power.It's—it's a power that is produced is 169 megawatts. It's actually lighting these—the lights in this room.

It's—there's so many benefits here. I mean, it's—when the grid goes down, you know, it cannot be started unless you have power as hydro power to start—start the grid up again. So that—this is what's important here.

Another thing about this—these—this hydro is that this community is unique because it's—it's able to be isolated in the case of a grid collapse, which is—it could happen easily these days. And when the grid goes down, it can't be restored for a long time, possibly a year, more actually. But – but this—this Siskiyou County can be electrically isolated, and we can—we can generate our own power here, so it's a—it's a beautiful thing.

And so there's many—but the most about this, you know, this dam removal is that, you know, they don't talk about when you take these dams out, there's 169 megawatts comes out of the grid, so it's got to be reported. It's got to be replaced. That means you have to build another dam to replace what you're taking out here and that's—that can be $4.5 billion right there, then you—and then I've been told—hold on.

I've been told that this removal can be $7 billion just to remove, you know, the dams. So, basically, I'm going to end. So what—the important part of this thing is that this should be part of this impact report, the—the electrical damage that is taking place when you take 'em out. And so that has to be studied, so I'm going to put this in. I'm qualified to do this, you know. So then --

MS. RAGAZZI: Not that one?

MR. MACKINTOSH: This one here. And then I'll follow up with something even more detailed but this is --

MS. RAGAZZI: Thank you.

MR. MACKINTOSH: Yeah. Go ahead and take it.

MS. RAGAZZI: Thank you.

MR. MACKINTOSH: Yeah.

MS. RAGAZZI: I'll take this, too.

MR. MACKINTOSH: So there's one other thing --

MS. RAGAZZI: Don, there's a lot of people to talk tonight.

MR. MACKINTOSH: Okay. All right.

MS. RAGAZZI:Thank you very much.

Response to Comment IND18-ORAL-2
Please refer to response to comment IND18-ORAL-1. Please also refer to Master Response GEN-1.

Meamber, Don

Comment IND19-ORAL-1
Pg. 1 & 8 PacificCorp owned land disposition. Will the identified Project B lands be as stated transferred to CA or OR and as a result harm Siskiyou County property tax revenue? Who might otherwise be a designated 3rd party for public interest purposes?

Response to Comment IND19-ORAL-1
Thank you for your comment. As stated in Volume I Section 2.7.10 *Proposed Project – Land Disposition and Transfer* (page 2-108), the Proposed Project provides that following dam removal the Klamath River Renewal Corporation (KRRC) would transfer Parcel B lands to the states, or to a designated third-party transferee. The lands would thereafter be managed for public interest purposes (e.g., tribal mitigation, river-based recreation, wetland restoration, etc.) (Klamath Hydroelectric Settlement Agreement [KHSA] Section 7.6.4). Pursuant to the KHSA, decisions about the land transfer would occur following dam removal, and

the outcome of who the lands will ultimately be transferred to and what they will be used for is uncertain.

Please note that under CEQA, potential effects from implementing a project that are solely social or economic in nature, such as reductions in property values, loss of property tax revenues, and increases in energy costs, do not constitute an effect (i.e., an impact) to the physical environment. Please also refer to Volume I Section 5.4.1 *Other Required CEQA Discussion and Consideration of Social and Economic Factors – Social and Economic Factors Under CEQA – Consideration of Economic Information for Resources Potentially Affected by Dam Removal* (pages 5-4 to 5-11) which summarizes the results of prior economic studies conducted by the U.S. Department of the Interior (DOI) to characterize potential effects on property value.

Comment IND19-ORAL-2
Pg. 4, no. 1. "Improve the long term water quality conditions…levels of biostimulatory nutrients." How will that be accomplished when those nutrients are coming down the River from Oregon? Shut down all farming, but nutrients are naturally high in the Upper Basin from the area soil and also the enormous flocks of waterfowl over the centuries.

Response to Comment IND19-ORAL-2
Please refer to Section 3.2.5.3 *Water Quality – Potential Impacts and Mitigation – Nutrients* Potential Impact 3.2-8 for the analysis of the long-term alterations in nutrients that would occur in the Klamath River due to the lack of interception and retention by the Lower Klamath Project dams, should they be removed and the reservoirs converted to a free-flowing river. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*. Please also refer to Master Response WQ-1.

Comment IND19-ORAL-3
Pg. 4, no. 2. "Advance the long-term restoration of the natural fish populations in the Klamath Basin…" Poly-chaete worms continue to spread more spores of the C. Shasta and Parvacapsul which attack and kill the smolts. Continued non-natural high flows in the summer enhance the worm populations.

Response to Comment IND19-ORAL-3
Please refer to Master Responses PAP-2, AQF-5, and AQF-6.

Comment IND19-ORAL-4
Pg. 4, no. 3. "Restore…anadromous fish passage in the Klamath Basin…made inaccessible by the Lower Klamath Project dams." Many local old timers, especially descendants of the Shasta Tribe, feel that the natural reefs located at J.C. Boyle or Big Bend, prevented salmon entry into the Upper Basin. Will the Project blast out the reef?

Response to Comment IND19-ORAL-4
As discussed in detail in Section 3.3.5.8 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Habitat*, it appears that there was no "reef" forming a barrier to fish migration at the time that Copco No. 1 Dam was built. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*. Please also refer to Master Response AQF-4.

As indicated in Volume I Section 2.7.1.2 *Proposed Project – Dam and Powerhouse Deconstruction – Copco No. 1 Dam and Powerhouse* (page 2-30), removal of Copco No. 1 Dam would occur to 20 feet below the pre-dam streambed at the dam such that river bed sediment mobilization through natural channel processes does not expose the concrete foundation of the dam and create a fish passage barrier or prevent river bedload movement to occur.

Comment IND19-ORAL-5
Pg. 5, Reservoir Drawdown, "Copco No. 1 Reservoir would be drawn down first…in year 1…Copco No. 2…in May of dam removal year 2." Won't the moving mass of sediment from No. 1 overtop No. 2 dam by the time demolition work begins, only 0.3 mile downstream, and make removal more difficult?

Response to Comment IND19-ORAL-5
Please refer to Volume I Section 2.7.3 *Proposed Project – Reservoir Sediment Deposits and Erosion During Drawdown* (pages 2-60 to 2-69), which discusses the particle trapping efficiency of Copco No. 2 Reservoir during drawdown of the upstream J.C. Boyle and Copco No. 1 reservoirs (page 2-61), and finds that sediments released from the upstream reservoirs during drawdown would not accumulate to a significant degree behind Copco No. 2 Dam.

With regard to the more general topic of potential dam failure, as stated in Volume III Attachment 1 Section 3.6.5.2 *Flood Hydrology, Potential Impacts and Mitigation – Risks of Dam Failure* Potential Impact 3.6-6 (page 3-635), Federal Energy Regulatory Commission (FERC) requires a potential failure modes analysis as part of the license surrender application process.

Comment IND19-ORAL-6
Pg. 8, Downstream Flood Control. I was wondering what is meant by "maintain existing flood protection." What besides our hydro dams is flood protection?

Response to Comment IND19-ORAL-6
Please refer to Volume I Section 2.7.8.4 – *Proposed Project – Other Project Components – Downstream Flood Control* (page 2-95), Section 3.6.5.2 *Flood Hydrology – Potential Impacts and Mitigation – River Floodplain* Potential Impact 3.6-3 (page 3-632), and Volume II Appendix B: *Definite Plan* for a description of how the Proposed Project maintains existing flood protection, as described in the Downstream Flood Control Project Component, which would involve relocating habitable structures located within the altered floodplain following dam removal.

Flood protection is also maintained by flood forecasting as described in the Klamath River Renewal Corporation's (KRRC) proposed *Emergency Response Plan*. Please refer to Volume I Section 2.7.8.11 *Proposed Project – Proposed Project – Other Project Components – Emergency Response* (page 2-101), Potential Impact 3.6-3 (page 3-632), and Volume II Appendix B: *Definite Plan*.

With respect to the potential impacts of the Proposed Project's changes to downstream flood hydrology, as well as the Proposed Project's proposal to reduce or avoid such impacts, please refer to Master Response FLD-1.

Comment IND19-ORAL-7

Pg. 11, Historical Resources and Tribal Cultural Resources. Again, early explorers and tribal descendants tell of the very poor water quality of the summer Klamath flow. This Project will not restore to the wonderful water quality of historic conditions.

Response to Comment IND19-ORAL-7

Please refer to Master Response WQ-1.

Comment IND19-ORAL-8

Pg. 12, Water Quality, suspended sediments. This section addresses the "short-term" release of sediments trapped behind the dams. I borrowed a device about 5 years ago from the USDA locally that measures the PPM of particles suspended in water. Here is what I found: my 6 farm ponds ran about 300 PPM, Shasta River at the USGS Weir near Montague 189, my house well was 297, Montague City treated drinking water 150, Yreka Fall Creek treated drinking water 60, Crystal Geyser bottled water 52, Sunnyside distilled water -0-, the Klamath River at the Klamathon Bridge was 65, and Willow Creek which runs into the Klamath just upstream of the Klamathon Bridge measured 116. Are the dams cleaning the Klamath, probably?

Response to Comment IND19-ORAL-8

Please refer to Master Response WQ-1.

Comment IND19-ORAL-9

Pg. 20, Public Involvement and Agency Consultation. "…the State Water Board has consulted with and/or obtained comments from various Native American Tribes, state and federal public agencies, affected local agencies and stakeholders…" Listed are 4 federal agencies, 5 state agencies, 5 Native Tribes, and Siskiyou County, but not Del Norte Co. where you held a Scoping meetings mentioned on pg. 20. Also not on the list are the citizens of Siskiyou County, like in this room, who have submitted comments at meetings, by mail and online, that voted 79% in opposition to dam removal.

Response to Comment IND19-ORAL-9
The agencies and entities listed include those that specifically requested consultation on the Proposed Project. The State Water Board received comments from the Del Norte County Board of Supervisors on the Lower Klamath Project Draft EIR and these comments are being be considered by the State Water Board prior to finalization of this EIR.

With respect to the Siskiyou County vote, please refer to Master Response GEN-2.

Comment IND19-ORAL-10
MR. MEAMBER: My name is Don Meamber, D-O-N, M-E-A-M-B-E-R.

I have a—I have a respect for the dams, because my uncle was John Boyle, and he—he designed all the dams and was in charge of construction of all of 'em. The first two were built before I was born, the next two while I was in college.

Response to Comment IND19-ORAL-10
Please refer to Master Response GEN-2.

Comment IND19-ORAL-11
What I have is some comments about the – about the EIR Executive Summary. One concern is Pacific-—the PacifiCorp land disposition on page 1 and page 8 concerned that – that they might be turned over to California or Oregon State, or the document states "a third party for public interest purposes." The county—the county receives property taxes from the power company now. And if either of those things happen, it will be lost.

Response to Comment IND19-ORAL-11
Please refer to response to comment IND19-ORAL-1.

Comment IND19-ORAL-12
Page—page 4, No. 1. Improve the long-term water quality conditions/levels of biostimulatory. How will that be accomplished when those—when the nutrients are coming down the river from Oregon? Shut down all farming in Oregon? But the nutrients are naturally high in the Upper Basin from the area, geology, and soil and also enormous flocks of waterfowl spent time for centuries there.

Response to Comment IND19-ORAL-12
Please refer to response to comment IND19-ORAL-2.

Comment IND19-ORAL-13
Page 4, No. 2. Advance the long-term restoration of natural fish populations in the Klamath Basin. The polychaete worm continue to spread spores of ceratomyxa shasta and parvicapsula which attack and kill the smolts. Continued nonnatural high flows in the summer enhance worm populations.

Response to Comment IND19-ORAL-13
Please refer to response to comment IND19-ORAL-3.

Comment IND19-ORAL-14
Page 4, No. 3. Restore anadromous fish passage in the Klamath Basin made accessible—inaccessible by Lower Klamath Project dams. Many local long-timers, especially decedents of the Shasta tribe feel the nat—natural reef located at JC Boyle or Big Bend prevents salmon entry into the Upper Basin. Will the project blast out the reef to change that?

Response to Comment IND19-ORAL-14
Please refer to response to comment IND19-ORAL-4.

Comment IND19-ORAL-15
Page 5. Reservoir drawdown. Copco No. 1 Reservoir would be drawn down first in year one. Copco No. 2 in May of dam removal year number two.

Won't the moving mass of sediment from No. 1 over top dam No. 2—Copco No. 2 by the time the demonstration works? And it's only three-tenths of a mile downstream. Are—will that make it more difficult to remove it?

Response to Comment IND19-ORAL-15
Please refer to response to comment IND19-ORAL-5.

Comment IND19-ORAL-16
Page 8. Downstream flood control. I'm wondering what is meant by "maintain existing flood production." What besides our hydro dams has any value for flood protection?

Response to Comment IND19-ORAL-16
Please refer to response to comment IND19-ORAL-6.

Comment IND19-ORAL-17
Historical resources and tribal cultural resources. Again, early explorers and tribal decendents tell of a very poor water quality of a summer – Klamath flows. This project will not restore the wonderful water quality of historic conditions.

One final quote I want to make. I borrowed a tool from the local USDA to measure particles in the water of—on my property and other streams. And in the Klamath River at Klamathon Bridge was 65. Crystal Geyser bottled water is 52. Montague drinking water was 150. Yreka drinking water was 60. And Bill Schmidt just mentioned earlier about the water being cleaner down—downstream of the dams. Well, that measurement kind of confirms it's cleaner downstream than it is above it—above the dams.

Response to Comment IND19-ORAL-17
Please refer to response to comment IND19-ORAL-7.

Meamber, Sheila and Brett, and Krista Grassi

Comment IND49-ORAL-1
DO NOT TAKE THE DAMS OUT!!!

Response to Comment IND49-ORAL-1
Thank you for your comment. Please also refer to Master Response GEN-1.

Comment IND49-ORAL-2
As someone who was raised on a ranch in the Shasta Valley area, but now reside on the Rogue River in Gold Hill, I think I can speak to the issues more than some who have never lived in the area.

I've hiked, hunted and fished in the Marble Mountains, the Russian Wilderness, Trinity Alps, Willow Creek Mountain, Butte Creek, climbed Mt. Shasta more than once and experienced the beauty that this area has to offer.

I used to fish on the Shasta River until the State closed it for Coho spawning and rearing habitat on my family ranch. We restored the riparian natural conditions for the salmon on our stretch of the Shasta River. My father received awards for his efforts from the North Coast Regional Water Quality Control Board in 2007 and the Klamath River Basin Fisheries Task Force in 1996. The point I'm making is that we believe in conservation efforts for the fish and the streams.

My great, great uncle, JOHN C. BOYLE, was the engineer responsible for building the four Klamath Dams targeted for removal.

Response to Comment IND49-ORAL-2
Please refer to Master Response GEN-2.

Comment IND49-ORAL-3
They are still producing clean energy inexpensively and the dams are still in good condition. The dams are storing the pollution from the Upper Basin and making the Klamath River cleaner than it was before the dams were built.

Response to Comment IND49-ORAL-3
Please refer to Master Response WQ-1.

Comment IND49-ORAL-4
It makes no sense to remove the dams not knowing the final outcome of turning lose all the sediment that is stored behind the dams (20 million yards).

Response to Comment IND49-ORAL-4
Sediment modeling used to estimate sediment erosion, transport, and deposition is described in USBR (2012; see pages 9-18 to 9-32 for the model sensitivity analysis). Please also refer to Master Response GEO-1.

For a discussion of how measurement uncertainty associated with the reservoir sediment deposits is accounted for in the EIR analyses, please refer to response to comment ORG46-8.

Comment IND49-ORAL-5
Historically the fish rarely went past JC Boyle Dam, formerly known as Salt Caves/Big Bend, anyway.

Response to Comment IND49-ORAL-5
Please refer to Master Response AQF-4.

Comment IND49-ORAL-6
Most seem to agree that the cost of such a project will be considerable and one of biggest dam removal projects in the country, if not in the world.

Response to Comment IND49-ORAL-6
Comment noted.

Comment IND49-ORAL-7
If the dams are taken out, the River will still have algae and excessive nutrients to feed the algae, which is why the Regional Water Quality Board would not issue a 401 permit to relicense the dams.

Response to Comment IND49-ORAL-7
Please refer to Master Response PAP-2.

Comment IND49-ORAL-8
If this dam removal project doesn't work out, who is going to be liable? Not the KRRC (a shell corporation)! No amount of money will restore people's livelihoods, increase in electricity rates will occur, people's wells will dry up, homes and business' will be prone to flooding, potential loss of water source for fire protection, property devaluation and all other property owners (farmers and ranchers) affected will be forced to make up for the loss if this "experiment" fails.

Response to Comment IND49-ORAL-8
Please refer to Master Responses ENR-1, GRW-1, FLD-1, and HAZ-2. Please note that under CEQA, potential effects from implementing a project that are solely social or economic in nature, such as reductions in property values, loss of property tax revenues, and increases in energy costs, do not constitute an effect (i.e., an impact) to the physical environment.

Comment IND49-ORAL-9
I was born and raised on a ranch in the Shasta Valley, Siskiyou County, California. My family and grandparents and generations before have a long history there.

My father's great uncle was JOHN C. BOYLE who was the engineer that built the four Klamath Dams that are under consideration for removal.

Response to Comment IND49-ORAL-9
Please refer to Master Response GEN-2.

Comment IND49-ORAL-10
The people in Siskiyou County are under siege and have been for as long as I can remember. There are misguided individuals and well- funded organizations that want to see the dams taken out; most of them don't live in the area and never have. They don't understand or don't care what the economic impact this will have on property owners and others that reside in the area – they have their own agenda.

Response to Comment IND49-ORAL-10
Please refer to Master Response GEN-2.

Comment IND49-ORAL-11
Most rely on faulty science and embrace talking points provided to them by others. A lot of them don't really know why they are in favor of taking out the dams other than they are told taking out the dams will make the water cleaner and make it better for the fish; that returning the river to its "natural state" is a good thing.

Those that believe in taking out the dams believe: (1) that it will enable an abundance of Salmon to migrate further up the Klamath River and (2) that the River will be cleaner. The problem is they don't know that for sure as records going back before the dams were put in indicate that the river water was dirty and warm. After the dams were built and with the passage of time, the River is cleaner than it's ever been. There are also records that dispute that Salmon migrated up past the Moonshine Falls near J.C. Boyle Dam.

Response to Comment IND49-ORAL-11
Please refer to Master Response WQ-1 and Master Response AQF-4.

Comment IND49-ORAL-12
These dams are well maintained and provide hydroelectric power as well as other benefits such as recreational use, flood control, fire protection, habitat benefits for many animals, as well- as scenic appeal. The dams are all inspected annually by the State Dam Safety Agency and have reported they're all in excellent condition.

Response to Comment IND49-ORAL-12
Please refer to Master Responses REC-1, TER-1, FLD-1, and HAZ-2. With respect to the scenic quality of the reservoirs, please refer to Section 3.19.5 *Aesthetics – Potential Impacts and Mitigation* Potential Impact 3.19-1, which discusses the loss of open water vistas under the Proposed Project. Please refer to Volume III Attachment 1 for the final Section 3.19 *Aesthetics*.

Comment IND49-ORAL-13
Taking out the dams would not only be an expensive boondoggle, but destroy the fishery and do the opposite by polluting the River with algae and excessive amounts of nutrients from the bottom of the reservoirs and the Upper Basin.

Response to Comment IND49-ORAL-13
Please refer to Master Responses PAP-1 and AQF-4.

Comment IND49-ORAL-14
THE DAMS NEED TO STAY.

Response to Comment IND49-ORAL-14
Please refer to Master Response GEN-1.

Comment IND49-ORAL-15
MS. MEAMBER: My name is Sheila Meamber, S-H-E-I-L-A, M, as in Mary, E-A-M-B, as in boy, E-R. Good evening.

My husband Don and I own and operate a ranch in the Montague area that has been in our family for generations. My husband's family has a long history here in Siskiyou County. In 1886, his ancestors donated a half section of land to form the town of Montague. The Shasta River runs through our property, and we have an exquisite view of Mount Shasta.

I want to disclose that my husband's great uncle was John C. Boyle who was the engineer who built the four Klamath dams that are now under consideration for being taken out.

Response to Comment IND49-ORAL-15
Please refer to Master Response GEN-2.

Comment IND49-ORAL-16
At this time, I would like to share two letters written by my son and my daughter that were submitted to FERC in October of 2017. They were pertinent then and they are pertinent now.

Response to Comment IND49-ORAL-16
Comment noted.

Comment IND49-ORAL-17
From my son, he writes: "As someone who was raised on a ranch in the Shasta Valley area but now reside on the Rogue River in Gold Hill, I think I can speak to the issues more than some who have never lived in the area. I've hiked, hunted, and fished in the Marble Mountains, the Russian Wilderness, Trinity Alps, Willow Creek Mountain, and Butte Creek, climbed Mount Shasta more than once and experienced the beauty that this area has to offer.

I used to fish on the Shasta River until the state closed it for coho spawning and riparian habitat on my family ranch. We restored the riparian natural conditions for the salmon on our stretch of the Shasta River. My father received awards for his efforts from the North Coast Regional Water Quality Control Board in 2007 and the Klamath River Basin Fishery Task Force in 1996.

The point I'm making is that we believe in conservation efforts for the fish and the streams. My great, great uncle, John C. Boyle was the engineer responsible for building the four Klamath dams targeted for removal. They are still producing clean energy inexpensively and the dams are still in good condition.

Response to Comment IND49-ORAL-17
Please refer to Master Response GEN-2.

Comment IND49-ORAL-18
The dams are storing the pollution from the Upper Basin and making the Klamath River cleaner than it was before the dams were built.

Response to Comment IND49-ORAL-18
Please refer to Master Response WQ-1.

Comment IND49-ORAL-19
It makes no sense to remove the dams not knowing the final outcome of turning loose all the sediment that is stored behind the dams, 20 million yards.

Response to Comment IND49-ORAL-19
Please refer to response to comment IND49-ORAL-4.

Comment IND49-ORAL-20
Historically, the fish rarely went past JC Boyle dam, formerly known as the Salt Caves/Big Bend anyway.

Response to Comment IND49-ORAL-20
Please refer to Master Response AQF-4.

Comment IND49-ORAL-21
Most seem to agree that the cost of such a project would be considerable and one of the biggest dam removal projects in the country, if not in the world.

Response to Comment IND49-ORAL-21
Comment noted.

Comment IND49-ORAL-22
If the dams are taken out, the river will still have algae and excessive nutrients to feed the algae which is why the Regional Water Quality Control Board would not issue a 401 permit to relicense the dams.

Response to Comment IND49-ORAL-22
Please refer to response to comment IND49-ORAL-7.

Comment IND49-ORAL-23
If this dam removal project doesn't work out, who's going to be liable? Not the KRRC, a Shell Corporation. No amount of money will restore people's livelihoods. Increase—increase of electricity rates will occur, people's wells will dry up, homes and businesses will be prone to flooding, potential loss of water source for fire protection, property devaluation and all of the property owners, farmers, and ranchers affected will be forced to make up for the loss if this experiment fails.

Response to Comment IND49-ORAL-23
Please refer to response to comment IND49-ORAL-8.

Comment IND49-ORAL-24
And this is to nidify [sic] Brett Meamber, Gold Hill, Oregon.

I have a second letter, but I will save that for later.

MS. RAGAZZI: Do you want to provide it to us today in writing?

MS. MEAMBER: Yes, it is in writing.

MS. RAGAZZI: Okay. Thank you, Sheila.

MS. MEAMBER: Okay.

Response to Comment IND49-ORAL-24
Comment noted.

Reynolds, Chrissie

Comment IND11-ORAL-1

My name is Chrissie Reynolds, C-H-R-I-S-S-I-E, Reynolds, R-E-Y-N-O-L-D-S.

There isn't a day that this issue of dam removal has not impacted me, my life, my health, and well-being mentally and spiritually and physically over the last almost two decades but most especially over the last four years most dramatically.

I live at Copco Lake. I was, in fact, probably created here. My parents along with my mom's parents bought a small A-frame cabin adjoining my three aunts and two uncles A-frame cabin back in the early 1960s. I was born in 1966. These two original properties were the premier cover properties—properties on the brochure of Copco Lake that showcased the Sportsman's Paradise and an ideal lake getaway with country life abounding.

My family saved and sacrificed to purchase these properties as a somewhat close retreat from the Bay Area hustle and bustle and thought it a great place to bring their kids and families; to teach them how to fish, both river and lake fishing—I'm just going to make this shorter.

Every one of my elder family members was interned in concentration camps after the Presidential Executive Order 9066 in 1942. My family was given a few days to settle their businesses and homes, employment and families, pack and put what they could carry in two suitcases and be ready for transport where they were taken to Topaz, Utah, after being at the Tanforan Race Track. My mom was 13. My dad was 17.

I give this historical background here because I—I feel it's vitally important to my ancestors to honor them and help protect what they worked so hard for—they were interned, they came back, they saved, they sacrificed, they bought property as a retreat for themselves—to help protect what they worked for, to defend against enemies foreign and domestic. These liberties that are self-evident must be protected at all costs. My family fought to defend these principals and I will do no less.

I came up every school break and, 20 years ago, I moved here permanently—over 21 years ago.

Response to Comment IND11-ORAL-1

Thank you for your comment. Please refer to Master Response GEN-2.

Comment IND11-ORAL-2

The smear campaign against the negative health impacts needs to stop. The State Water Resources Board has been a major contributor to the spread of mis- and disinformation about the safety of the reservoirs. I have over the last almost 20 years been to meetings, interviewed local doctors, vets, the county health

department, our county supervisors, and our factual evidence does not support the intimidating and often misleading information your postings have. And in fact to me, your postings have caused more harm than the algae itself.

I was part of the studies conducted, and the amount of money that was spent is shameful. The reports came back inconclusive, and yet more studies are what were called for by the ones who get a paycheck to conduct these studies. The people are the ones that are paying for these studies and the people are the ones who are most affected. And yet the people are being undermined, ignored, disrespected and lied to again and again.

I've been to the above-mentioned sources to discuss the effects of geoengineering and the operations being carried about above our heads every day and the denial is criminal on the health impacts—effects. Now, the powers that are on their way out are finally admitting that they are conducting these experiments beginning this year.

Why? They've been doing it for years; why come out in the open now? And that's how I feel about this process going before the Water Board.

For years, the board is one that I have felt that we needed to defend ourselves form. With their postings claiming the harmful, deadly effects that these toxins might or could have on human and animal health impacts. I know the negative health effects on human and animal life and what it has been to property values, our local economy, the psyche, and human—and human perception.

There's maybe a campaign and a blast about the toxic blue-green algae. You know, it's a natural health supplement that's in direct threat to Big Pharma. Cattle—cattle ranchers here are a big threat to Big Ag, rural sustainable living are the big threat to the ones promoting Agenda 1 [sic]. One could say these were intentional attacks.

Response to Comment IND11-ORAL-2
Please refer to Master Response WQ-7. The information on blue-green algae [cyanobacteria] discussed in the EIR represents the best available data on blue-green algae [cyanobacteria] conditions in the Klamath River and the potential health risks due to interactions with blue-green algae [cyanobacteria] and their associated algal toxins.

The science of blue-green algae [cyanobacteria] and their associated algal toxins (e.g., microcystin), including the ability to measure at very low concentrations, has advanced over the past decade. Moving forward, advances in the science should continue to inform our understanding of the potential health hazards of these species and their algal toxins. As such, the water quality thresholds for algal toxins may continue to be adjusted (e.g., lowered) if new information

indicates potential chronic impacts from low level exposures to these algal toxins over time.

Please also refer to Master Response GEN-2.

Comment IND11-ORAL-3
Our local government elected by the people has told the states and the feds no over and over. A bi-state water compact was signed in 1957 and is being ignored.

Response to Comment IND11-ORAL-3
Volume I *Executive Summary* Table ES-2 (page ES-23) and in Section 2 *Proposed Project* (page 2-21) acknowledges that during the Siskiyou County Advisory Election Vote on November 2, 2010 (Measure G), approximately 79 percent of voters expressed their opinion and voted "No" to dam removal, while 22 percent voted "Yes". The 1957 Klamath River Basin Compact between the states of Oregon and California is also noted in Section 2.6.1. Additionally, please refer to Master Response CEQ-4 for a discussion of the Klamath Compact Agreement.

Comment IND11-ORAL-4
With the drawdowns of the lake, I see the exposed land, I think of the clams and the mussels and other aquatic life that is left to dry out and die off. I see the eagles and the herons, and I'm filled with guilt and shame at our—at my own species and powerlessness as I see the planes dumping toxic payloads over us day and night.

Response to Comment IND11-ORAL-4
Please refer to Section 3.3.5 *Aquatic Resources – Potential Impacts and Mitigation* for a comprehensive analysis of the potential impacts of the Proposed Project on aquatic resources. Additionally please see Potential Impact 3.3-19 for a discussion of impacts to freshwater mussels. Volume III Attachment 1 presents the final Section 3.3 *Aquatic Resources.* Please also refer to Master Response TER-1 for a summary of how the EIR analyzes the effect of removing the Lower Klamath Project reservoirs on wildlife habitat, including raptors other birds.

The comment's assertion that dumping of toxic payloads from planes is occurring in the area is not sufficiently detailed such that the State Water Board can address the concern in this comment response.

Comment IND11-ORAL-5
Can you please explain to me how the aluminum got in the reservoirs that you have i-—identified in the draft document?

My research also showed that the U.S. Military weaponized algae decades ago. Why wouldn't it be logical to conclude that some of these weren't also created by

the very ones who stand to gain? I question the authenticity of the origins of the c. shasta. It isn't in my nature to be confrontational, even negative, but this dam removal issue has turned me into a person who has had to research, go to meetings, be involved, had my eyes opened to the absolute corrupt and evil nature of the operations being done against people every day by their own government.

Response to Comment IND11-ORAL-5
While aluminum is a naturally occurring element in the Earth's crust, the source of elevated aluminum detected in the Klamath River Basin is currently unknown (California State Water Resource Control Board 2017).

Please also refer to Master Response GEN-2.

Comment IND11-ORAL-6
I have met through this process a beautiful Shasta elder named Betty Hall. Her ancestors were Civil War veterans, Civil War veterans buried under these reservoirs. In this process, I was disgusted to hear some official ask her if she could just pick two of the ancestors to mark somehow. Seriously? These veterans were a part of the very beginning of our history as a nation, and this is the disrespect we get from the government official?

This process introduced me to Rex Cozzalio who is one of the most articulate, intelligent, well-spoken men I've ever met. It's been an honor learning from him about his family's history since his ranch is first in line since before and after the dams were put in.

I'm deeply grateful to Richard Marshall and others of the Siskiyou Water Users for their activism and actions. I got—I've gotten to know so many people united and protecting our water, and I am honored and humbled and extremely grateful.

Response to Comment IND11-ORAL-6
As described in Section 3.12 *Historical Resources and Tribal Cultural Resources* the Shasta Nation was among the tribes that requested consultation under Assembly Bill 52 (AB 52) with the State Water Board regarding the Lower Klamath Project. The Shasta Nation met with the State Water Board and the Klamath River Renewal Corporation (KRRC) in a series of confidential consultation meetings within the timeframe of February 2017 through October 2018. Consultation with the Shasta Nation has informed the analysis in the EIR, but concluded after the Shasta Nation and the State Water Board acknowledged that it would not be possible to reach agreement on mitigation measures, despite a good faith effort to do so. Volume III Attachment 1 presents the final Section 3.12 *Historical Resources and Tribal Cultural Resources.* Please also refer to Master Response GEN-2.

Comment IND11-ORAL-7

We want what is best for all life, not just salmon. Of course, we want what benefits the salmon but not at the cost of everything else. For years, we have asked to include offshore effects to salmon such as ocean fishing from international commercial fishermen, ocean degradation, changing water temperatures due to geoengineered weather and, of course, radiation poisoning from Fukushima. Somehow, these questions just never get answered. The blame is always the dams.

The so-called solution is also dam removal. Alternatives have been offered. Objections have been raised. The process just continues to roll on out like 5G. It doesn't seem to matter what the negative health impacts will be to all life.

Dam removal is the be all end all, and it is a complete fraud and will, in fact, destroy life up and down the river for years and in places perhaps forever. I know what it has done to—to me and yet still we fight.

Response to Comment IND11-ORAL-7

Please refer to Master Response GEN-1. With respect to the commenter's concern regarding how the EIR considered ocean conditions for salmonids, please refer to response to comment ORG30-13.

Comment IND11-ORAL-8

This July, I was under mandatory evacuation for the second time in four years. Please wrap your head around that sentence. The day after I walked my daughter in the Fourth of July parade from the R Ranch stables in the little town of Hornbrook, it was on fire. For several years now, we have brought up over and over again the importance of these reservoirs for fire suppression.

For over nine years, I was on the volunteer fire department. My husband was awarded Siskiyou County Firefighter of the Year in 2008. My daughter was just a few months old then. We live literally right next door to the fire station.

My daughter is ten. She has had to be evacuated twice in her life. First, four years ago when she was six and again this summer.

As a mom, this lake has saved my life both times. I need you to understand that at a very basic level. We've gone through so many fires in the past few years and just in the past few months. Paradise being the latest, deadliest, and most horrifying.

Since then, Jon Lopey, our sheriff, wrote an article on the front page of the Siskiyou Daily News outlining what to do in the event of a fire in response to a need to help save lives. In that article, he tells people what specific actions to take. He validated my survival instinct when he told people to go into bodies of water if they can.

I had that in my head just less than six months ago. I was figuring out how to protect my two cats, dog and daughter if the fire came as close as it did four years ago. I was going to take her and the animals down under the bridge and put a fire shelter over our heads and stay there if we needed to.

When the lake was drained as far down as I've ever seen it in December, I realized I would no longer be able to do that if they took the dams out. It's one thing to go and try to be submerged in a large body of water like a lake for the sustained period of time but altogether different in a swift moving river. How is that going to keep us altogether in that scenario?

I was filled with anxiety and post traumatic stress while driving from just around the corner where I live into my job into Yreka which is 40 minutes away. This is my life. All these thoughts that occurred to me while I try to go to work, homeschool my daughter, and just be a wife, mother, and daughter myself.

I've turned into some always-on-guard, hyper vigilant activist trying to make a difference in this upside down world while we—that has become the new normal.

I worked as a waitress in town. And the amount of fire firefighters that I've fed over the past year and talking to them about dam removal, they all comment how insane it is to remove these reservoirs. None of them can say anything publically because they jobs limit them but, personally, all of them have been against it.

They know the difference between fighting fires with a limited water source to an unlimited water source. They know the difference between a few single holding tanks versus a large, open body of water. They know the difference between being able to dip water out of the lake or a swift moving river with fluctuating water levels, bank and slope stability, dusty conditions, wind conditions, et cetera.

There is no way to replace the ability to fight fires without added loss to lives and property without these reservoirs. It's a no-brainer. No science can be spun to say that these reservoirs didn't play an irreplaceable part of the ability of these fire fighters to deal with these catastrophic life-threatening events.

People died. Water is life. Water is protection against loss of life.

As a human being walking on this planet, if you are not affected by the basic understanding of a family's loss due to fire, don't you—and that you would knowingly reduce a person's ability to protect life by lowering their accessibility to water, then I would argue that one is not human, which I think is often the case in processes like this. We go before a board of people who did not know us, who have no idea where we live or how we live, yet are making decision that affect our everyday lives.

Response to Comment IND11-ORAL-8
Please refer to Master Responses HAZ-2 and GEN-2.

Comment IND11-ORAL-9
I finally overcame the pain to begin to read the draft document that is supposed to be a prelude to the definitive word on this process. And, again, the stress and anger and frustration rears up from zero to 60 in nothing flat. I read the part about the roads and I can feel my eye twitching.

Look, there's only one road in and one road out, Ager Beswick. That road is our lifeline literally. It is the road for the school bus, emergency vehicles, ambulances, doctors appointments which, for our elderly community, is huge; kids after-school sports practices, games, cheer, dance and music lessons, shopping and going to and coming home from work.

It is our everything road. It's a 40-minute drive to town. Any delay is unacceptable.

Response to Comment IND11-ORAL-9
Please refer to Volume I Section 3.22.5 *Transportation and Traffic – Potential Impacts and Mitigation* (starting on page 3-1069) for a discussion of transportation-related impacts. As noted in comment ORG47-56, Klamath River Renewal Corporation (KRRC) has committed to addressing all potential traffic conflicts as part of their Final Traffic Management Plan (TMP). KRRC states that they are committed to ensuring that the TMP *"will maintain efficient and safe movement of the vehicles through the construction zone covered by activities in the Definite Plan".* KRRC's also states that the *"Final TMP would be informed by KRRC's contractor's specific measures and methods for construction and input received from relevant local jurisdictions."* The TMP specifically describes a public input process.

Comment IND11-ORAL-10
If the KRRC was serious about being a good neighbor and improving the quality of our lives, it would have chosen to improve Copco Road, a dirt road where it would not impact anyone's life and it would have improved it for everyone by creating a more usable road for—for all. And this is my problem with the whole dam scam by the KRRC and all the stakeholders trying to improve our lives.

Response to Comment IND11-ORAL-10
Please refer to Master Responses GEN-1 and GEN-2. Comments on the Definite Plan should be submitted to the Klamath River Renewal Corporation (KRRC).

Comment IND11-ORAL-11

You don't know us, you don't know who we are, you don't know how we work, you don't know how it will impact us. You don't think of how much of our money you spend. You don't count how many hours, years, and finances we have lost due to this ongoing environmental threat to our very well-being. The arguments are exhaustive. The stresses and stressors have been huge. The toll has been negative to life.

Friends who believe the newspaper, the TV, and the reports all just tell us, "Hey, it's a done deal, get used to it, the dams are coming out."

What effect do you think this has on us? What health impacts do you think it has? What do you think it does to water quality when the river and the lake is lied about, the science spun, the facts denied, the properties devalued, the river—the people ignored, the government betrayal obvious and the disrespect blatant?

We're going through PTSD from the Boles fire, from the Oregon Gulch fire, the Delta fire, the Klamathon fire, the fires downriver, the Paradise fire, and all the other fires from our friends and relatives outside the area in Santa Rosa, Santa Barbara, Malibu, and out of state. Serious life-threatening issues are being faced by the people. And we're having to take time out of our lives and days and nights and meeting after meeting and public comment period after public comment period.

Are you listening? No dam removal. Our sheriff has told you, our supervisors have told you, the residents have told you, the people have told you, "no, no, no dam removal."

It makes me angry. It makes me crazy. It makes me the kind of person I don't like to be having to go through this one more freaking time.

The impacts to my life, to the lives of the fish, the animals, the wildlife, the warm water ecosystem, the birds that come every year, the plant life, all life is impacted by you who are reading this.

We have been told by our governor that these fires are the new normal. It is completely unacceptable to keep putting our men and our women on the front lines in harm's way when they're up geoengineered intentional fires created with directed energy weapons like Athena by Lockheed Martin and other DOD and not yet revealed to the public technologies.

Response to Comment IND11-ORAL-11

Please refer to Master Responses GEN-1, GEN-2, TER-1, and HAZ-2.

Comment IND11-ORAL-12
Historically, the U.S. Military and its corporate benefactors have used weapondry [sic] far in advance of its enemies such as with rifles against the Native Americans, Howitzers against Japanese Swords, biotechnology against an unsuspecting public and with nano particulates and heavy metal toxins and biological agents being sprayed every day, our firefighters need our help in protecting themselves against these new horrific advances in weather warfare as outlined in the military manual Owning the Weather by 2025.

These heroes are our husbands, wives, fathers, mothers, aunts, uncles, grandparents, sons and daughters and nieces and nephews. Fire season is now year round. That is time away from their homes, their families, children while their live-—while they fight all over the state and country and are not there to protect their own home.

Response to Comment IND11-ORAL-12
The comment's assertion that the U.S. military is spraying biological agents, nano particulates, and heavy metal toxins on the public is not sufficiently detailed such that the State Water Board can address the concern in this comment response. Further, this portion of the comment does not focus on the sufficiency of the EIR in identifying and analyzing the possible impacts on the environment and ways in which the significant effects of the project might be avoided or mitigated (CEQA Guidelines section 15204(a)).

Comment IND11-ORAL-13
The Water Board should no longer be complicit in denial of these realities and be doing their job in protecting the water quality by going after the real terrorists who are using these toxins in our everyday environment. Water sampling shows these things are in our environments as well as soil samples. There are lab results from all over the globe showing this but, specifically to California and Siskiyou County, the results are conclusive.

Why hasn't the Water Board addressed any of these public health concerns? Why is denial and suppression the agenda rather than truly fulfilling public safety?

Response to Comment IND11-ORAL-13
Please refer to response to comment IND11-ORAL-12.

Comment IND11-ORAL-14
We know for a fact that there have been several omissions in the draft document as to the exact number of wells sampled, which clearly if there's any incomplete information will lead to an incomplete conclusion.

Response to Comment IND11-ORAL-14
Please refer to Master Response GRW-2.

Comment IND11-ORAL-15
We also know that these reservoirs provide a large natural firebreak that a free-flowing river cannot protect against.

Response to Comment IND11-ORAL-15
Please refer to Master Response HAZ-2.

Comment IND11-ORAL-16
I experience that firsthand in the Oregon Gulch fire as we moved from our home on Mallard Road to my parent's cabin on Ager Beswick on the south side of the lake. The north side was completely engulfed because—but because we were at a wide part of the lake at my parent's cabin, it provided sanctuary for us.

Like I said, we live right next door to the fire station. Station 210 was the incident command center for the Oregon Gulch fire. Theoretically, I should have felt the safest there. Apparatus, fire personnel equipment were all staged right next door, but that fire was outside my living room window. Our front door facing the raging fire. Heavy winds picked up at 10 o'clock that night and there were four humble heroes from Santa Barbara in wildland gear protecting my home. I chose to go to the cabin the next day because it was too terrifyingly close.

At the time, we had four cats, two dogs and my six-year-old daughter and it was too much to try and manage. You need to realize that for people to evacuate what that entails. Maybe it's an epigenetic trigger, but you have to focus on the essentials and what you can carry or keep contained in the event of pets or small children. Flames are coming at you. The trees and the mountains you love are burning alive.

I was thinking of my neighbors who are all over 70 with a few exceptions in their 60s. Phil and I are the younger ones here. Few are able to afford to go to a hotel. Sleeping in a gym or on the fairgrounds with pets and livestock? Come on.

Friends with chickens, goats, horses, sheep and cattle, ducks and dogs are not able to just stand around and just round them up at an instant and do what? Go where? For how long?

People are going to stand. They're going to shelter in place. They're going to fight for their survival. Are you standing with us? Are you protecting the water truthfully?

Response to Comment IND11-ORAL-16
Please refer to Master Responses HAZ-2 and GEN-2.

Comment IND11-ORAL-17
The water quality is bad coming in from Oregon. It leaves cleaner after the reservoirs.

Response to Comment IND11-ORAL-17
Please refer to Master Responses WQ-1 and PAP-1.

Comment IND11-ORAL-18
These reservoirs provide habitat for many species that will simply cease to exist going from a warm water environment to a free-flowing river. The bass, crappie, yellow perch, catfish, bluegill, pumpkinseed, frogs and other amphibians and reptiles, the migratory birds like the osprey, the arctic and Caspian terns, the gulls, the turkey vulture, the white pelicans, the swan, the specks, the mergansers, spoon-billed beak, wood ducks, mallard and sandhill crane are—and large mammals like the bighorn sheep, elk, deer, bear and mountain lion, all of God's creatures that come—have become dependent on this water system.

Yes, many of them were introduced. Most people in America were introduced. It's a fact. It's what makes America what it is. We are a melting pot protected by—we're all supposed to be free. We're supposed to be protected by the Constitution. We're supposed to care for one another.

Response to Comment IND11-ORAL-18
Please refer to Section 3.3.5 *Aquatic Resources - Potential Impacts and Mitigation* for a comprehensive analysis of the potential impacts of the Proposed Project on aquatic resources, including non-native fish in the Lower Klamath Project reservoirs. Volume III Attachment 1 presents the final Section 3.3 *Aquatic Resources*. Please also refer to Master Response TER-1 for a summary of how the EIR analyzes the effect of removing the Lower Klamath Project reservoirs on wildlife habitat, including raptors other birds.

Schmidt, Bill

Comment IND7-ORAL-1, Speaker Card
Do you Have A way to clean the water as well as the Dams?

Response to Comment IND7-ORAL-1
Thank you for your comment. Please refer to Master Responses WQ-1 and PAP-1.

Comment IND7-ORAL-2
MR. SCHMIDT: I'm Bill Schmidt. B-I-L-L, S-C-H-M-I-D-T. I live on the Klamath River.

One of my main things is, okay, the dams were built. Your science says that the water quality above the dams is worse than below the dams because it's natural. Okay. You said you—you reviewed that there's a couple times a year that it

wasn't – it wasn't good. Okay. You can put a snorkel in – in Iron Gate and cool your water and aerate it.

Response to Comment IND7-ORAL-2
Please refer to Master Responses WQ-1 and WQ-2. In addition, multiple technologies have been tested by PacifiCorp to minimize the water quality impacts of the dams, including a powerhouse intake curtain for improving water temperature and turbine venting for improving dissolved oxygen conditions downstream of the dams. To date, available water quality data do not indicate that these technologies can sufficiently improve water quality downstream of the dams to meet water quality objectives. Please refer to Section 3.2.2.2 *Water Quality – Environmental Setting – Water Temperature* and Section 3.2.2.5 *Water Quality – Environmental Setting – Dissolved Oxygen* for further details on these technologies. Volume III Attachment 1 presents the final Section 3.2 *Water Quality*.

Comment IND7-ORAL-3
As far as fish habitat, historically, you have some archaeological finds up in the Upper Klamath. They found fish bones, but they didn't find any fish heads. What does that say? It says it carried the fish for a long ways. They—they probably caught 'em down about the Shasta River, maybe up to where the Iron Gate is, because Iron Gate had—has a natural reef to start with and, above that, the canyon gets narrow, deep, hot and on.

Response to Comment IND7-ORAL-3
Please refer to Master Response AQF-4.

Comment IND7-ORAL-4
So I—if you remove the dams with the sediment, you're going to kill the river for decades. And if you kill it for over three years, then you don't have any salmon that runs at all.

Response to Comment IND7-ORAL-4
Please refer to Master Response AQF-10 and Potential Impacts 3.3-1, 3.3-4, 3.3-7, 3.3-8, and 3.3-9 in Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts.* Substantial declines in the abundance of coho and chinook salmon population are not expected for more than one-year class (i.e., one generation). Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Silva, Veronica

Comment IND61-ORAL-1
MS. SILVA: Okay. Hi. My name is Veronica Silva. That's V-E-R-O-N-I-C-A, S-I-L-V-A.

So the decisions being made in this room tonight do not only stay in Siskiyou County. The Klamath River weaves so many communities inextric-—inextricably together. This is something we know and we see.

In agreement with the findings of the Draft EIR, I am urging California to issue the dam removal permit. The narrative—the myth that we're hearing even in this room that agriculture is pitted against dam removal is simply not true. It's dangerous and it's divisive. Dam removal will not impact irrigation delivery or agriculture. In fact, it benefits the systems that we all rely on.

Removal of the dams would not only improve water quality but would also restore critical native fish populations on which fisheries, tribal communities, all communities and their local economies rely.

Please remove the dams. That is all I have to say.

Response to Comment IND61-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Staats, Jenny

Comment IND29-ORAL-1
MS. STAATS: Hi. My name is Jenny Staats, J-E-N-N-Y, S-T-A-A-T-S.

And I just wanted to talk about some of the potential impacts to dam removal that I see and some impacts that I'm already seeing.

I've been a part of the fight to remove dams for the last 15 years. I was like a kid then. I think some of the folks here would think maybe I still look like a kid now which is awesome. It also means that I have, you know—I have maybe, like, 60 years left to keep on doing this. But I'm not going to need to because I feel like this is a moment where I can be here to celebrate the work that people have done thus far to get us to where we are now.

When I first started this, I was an educator. I'm still an educator now. And one of the impacts that I've seen with the youth I work with is just a really positive self-identity and really positive self-esteem when it comes to issues about the river, when it comes to fighting for the river and fighting for water quality. And that's something that I think is going to happen or continue to happen when these dams come down.

You know, we talk about the impacts to the environment but also the – the social impacts of this have already been so great and – and will be when the dams come down so –

UNIDENTIFIED SPEAKER: Are you not listening to what's going on?

MS. STAATS: So, you know, people try to say that this is like a fish versus farmers issue or like conservative or lefties with progressives, but that's never been what's it about. There's deeper root issues here.

And, you know, having – working with kids and being able to see within their eyes their understandings of what these things really are about. And it's that difference between, like, a paradigm of fear of scarcity and fear in general, an exploitation and power over people versus, like, mutual aide and sharing and a holistic way of looking at community health.

And I live in – I'm a settler in the Karuk tribe and central [phonetic] territory. I'm an EMT with the volunteer fire department. I see people on their worst days in their worst emergencies. I'm who shows up when people are having physical crisis, mental crisis. And from that perspective, I think the impacts are going to be just so far-reaching when we see healthy water and healthy people due to dam removal. This isn't going to kill us all. This is going to – it's going to be saving lives.

And there was a – you know, people speaking about things that were written from the 1850s, and I think it's important to look at who was writing those things at that time and kind of the history that's been expressed was in 1850 when the State of California was being created. That was also when the Act for the protection of Indians which was for – basically, for slavery was happening. And so at this point in time as a settler on the river, I feel really honored to have this opportunity to be a part of making things right again, making things right and healthy for all the people on this river.

So thank you for being here and continuing this work going forward.

Response to Comment IND29-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-2.

Still, Nita

Comment IND41-ORAL-1
Our Father Mother Principle created this earth as well as We the People, and told us to take dominion over the earth and all thereon. Yet you and all of the thousands of agencies which have been created by our government have put us on the bottom of the list and made fish, animals, bugs, birds and the environment more important than We the People.

You have taken our Liberty's, Rights, Freedoms, Lives, Liberties, Properties and Water, as well as our Happiness and trashed them by using and creating laws which remove all that we cherish and with which we are able to function.

You need to wake up and see what you have done and are doing. We voted over 79 % to keep the Dams. We do not want the beauty or usefulness of the

Klamath River destroyed! Keep the Dams in place, they give us clean air, cleaner water, and reservoirs to fight all of the fires! The KRRC was not voted on the do any thing, yet they seem to be part of an unauthorized group usurping, without legal Authority, our Rights.

Response to Comment IND41-ORAL-1
Thank you for your comment. Please refer to Master Responses GEN-1, WQ-1, and HAZ-2.

Comment IND41-ORAL-2
My name is Nita Still, N-I-T-A, S-T-I-L-L.

And I'm just a person that would like to see the dams stay there because it would make the rivers beautiful.

Our father-mother principal created earth as well as we, the people, and told us to take dominion over the earth and all thereon. Yet, you and all of the thousands of agencies which have been created by our government have put us on the bottom of the list and made fish, animals, bugs, birds, and the environment more important than we, the people.

You have taken our liberty, rights, freedoms, rights, liberties, properties, and water as well our happy nation, trashed them by using and creating laws, which remove all that we cherish and with which we also function.

The Endangered Species Act is what—you need to wake up and see what you have done and are doing. We voted over 79 percent to keep the dams. We do not want the beauty or usefulness of the Klamath River destroyed.

Keep the dams in place. They give us clean air, cleaner water, and the reservoirs to fight all of the fires.

The KRRC was not voted on to do anything, yet they seem to be part of an unauthorized group usurping, without legal authority, our rights.

Response to Comment IND41-ORAL-2
Please refer to Master Responses GEN-1, WQ-1, and HAZ-2.

Tibbetts, Isabella

Comment IND27-ORAL-1
MS. TIBBETTS: My name is Isabella Tibbetts, I-S-A-B-E-L-L-A, T-I-B-B-E-T-T-S.

I'm a private citizen and an indigenous woman. I traveled from Southern Oregon in support of the mov—of the removal of these four dams. The lower four Klamath dams blocks hundreds of miles of historic spawning grounds while

creating—for salmon while creating conditions that cause fish diseases and parasites.

The dam reservoirs will host—most—massive blooms of toxic algae each year posing health risks to people and animals who rely on these rivers.

I agree with the Draft EIR of—of the removal of these dams, that is—it is the only alternative that complies with California's Clean Water Law. Removal of these dams will help bring salmon back to the Yurok, Klamath, Karuk, and Hoopa Valley tribes and help restores the coastal fishing industry.

I am here as an ally with all people who are impacted by these dams. Help restore the salmon to our streams. Remove these dams for the people, the water, and the salmon.

Thank you.

Response to Comment IND27-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Utley, Chloe

Comment IND10-ORAL-1
MS. UTLEY: My name is a Chloe Utley. That's C-H-L-O-E, U-T-L-E-Y.

And I am an individual community member living in the Orleans area, and I came here to offer my wholehearted support in the removal of the dams and gratitude for all of the people that worked so hard for so many years. There's the 15 years of the campaign, but then there's the generations and generations of people before that that have lived their lives committed to the health of the rivers.

And I support the removal of the dams and we've come so far that I just want the process to continue. And I also support tribal sovereignty and the efforts of the local tribes to the commitment to restore and maintain the health of the river and their people and the salmon.

And this dam removal is about this community and this place, but it's also about the planet. And this is an action that the rest of the world can look to and really gain inspiration from. So this, I think, ultimately is something that our communities can be so proud to be a part of as our entire planet faces really transformative crisis and change, making a move to remove dams that should never have been built and honor tribal sovereignty on their land is something that is crucial to the survival and the thriving of our species and our planet, so I support it.

And thank you.

Response to Comment IND10-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Warner, Grace

Comment IND25-ORAL-1, Speaker Card
SUPPORT ALL 4 DAMS BEING REMOVED

Response to Comment IND25-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment IND25-ORAL-2
MS. WARNER: Hi. My name is Grace Warner, G-R-A-C-E, W-A-R-N-E-R.

I live in Josephine County, Oregon, and I traveled down here to voice my strong support for the full removal of all four dams. I believe and support the Karuk, Yurok, Klamath and Hoopa Valley tribes in their position that the removal of these dams is what is best for the health of the river, the salmon, and their people.

I also want to express gratitude to all the people who have fought to bring us to this moment and thank you to you all for being here.

Thanks.

Response to Comment IND25-ORAL-2
Comment noted.

2.4.2 Arcata Public Meeting—February 6, 2019

This section presents comments received on the Draft EIR during the Arcata public meeting on February 6, 2019, and the State Water Board's responses to those comments. Oral comments (including written comments submitted at the public meeting) and responses in this section are organized alphabetically by affiliation name, and for individuals, by last name, first name, following the set of commenters with affiliations. To determine whether your comment is associated with another meeting location, please refer to Table 2-3.

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County of Humboldt, Steve Madrone

Comment LA2-ORAL-1, Speaker Card
Humboldt Cty. Supports DAM Removal

Response to Comment LA2-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment LA2-ORAL-2
MR. MADRONE: How's that? Great.

Good to see this big turn out this evening. So, as first speaker, I just want to say that Humboldt County is fully supportive of removing these dams and is in support of the Tribes in that regard.

We recognize that there are going to be short-term impacts from doing this. But the long-term benefits far outweigh all of that. And so I'm just going to keep my comments very brief so others get a chance to speak.

And, you know, we look at all of the various mitigation measures and other things that are recommended. That seems adequate to me to be able to move forward with this project. It's long overdue. It's time to stop the damage or the dam-age, however you want to look at that.

So I am very excited to be here in support of this effort. Appreciate the work of the State Water Board in regards to protecting our water. Clearly our water quality has lots of problems.

Anyway, so clearly removing these dams does provide tremendous long-term benefits to our water quality, both in temperature as well as all the pollutants from the blue algae and other things. So I'm just going to leave it at that at this point. Perhaps I might make some comments later with my time. At this point, I just wanted to say we're fully supportive with the Tribes in our community to make this happen. So let's get started, get it done.

Thank you.

Response to Comment LA2-ORAL-2
Please refer to Master Response GEN-1.

Comment LA2-ORAL-3
MR. MADRONE: It is a full circle that we live in. A circle of community and salmon and everything else.

So you've received a letter from our board, the board of supervisors from Humboldt County. Just mailed, I believe, yesterday and supporting dam removal. And I just want to make it clear that the Humboldt County Board

supported that letter unanimously. And for anybody that knows our board here in Humboldt County, that is no small achievement, right?

So a unanimous decision on our part to move that forward. The supervisor from this district, Supervisor Wilson, wanted to be here tonight. He's at a meeting in freshwater working with that community working on watershed planning and a lot of important things. So lots going on in our community.

I did want to say a couple more things. Thank you for the chance to come up again.

First of all, the draft EIR concludes that the dam removal improves water quality. They got that right. This includes getting rid of the blue-green algae and fish disease problems below the dams. But I agree with Denver Nelson and Felice that this is a beginning. It's a good beginning. We absolutely need to do this. But we have to be looking at these other dams as well.

The draft EIR says that the sediment impacts will be temporary while the long-term benefits are stronger runs of salmon and better water quality. Excellent point.

The draft EIR clarifies that dam removal will not affect irrigated agriculture. It will not affect irrigated agriculture. None of the dams we are removing provide agricultural diversions. And I know you all know that. But that's an important thing because that gets confused in the discussions open upriver. The draft EIR clarifies dam removal will not affect summer river flows that's controlled further upstream, the BOR project.

It's also true that power rates will be lower for the customers with dam removal because keeping the dams with the necessary repairs and building fish ladders costs more than the electricity is worth.

We're seeing the same thing on the Eel River. That will be next.

Response to Comment LA2-ORAL-3
Comment noted.

Comment LA2-ORAL-4
Furthermore, this was a comment about removing the dams removes some water storage for fires. We are certainly having some pretty catastrophic wildfires. But that too can be mitigated with off channel storage. In the Mattole River we've done a lot of work with storage and forbearance.

I think we're all going to be storing our winter rain water very soon here, all of us and forbearing from pumping from our creeks and rivers in the summer time so that the salmon have what they need in the river to survive. So having that

storage is another way to solve a lot of our problems including firefighting supplies.

Response to Comment LA2-ORAL-4
Comment noted.

Comment LA2-ORAL-5
So in sum, the Humboldt County Board of Supervisors and, I believe, many people in our community agree that the key findings of the document, we agree with those key findings and we support the proposed project. It is time for balance and healing. It is time to stop the dam-age, the damage. And it's time to undam the Klamath.

Response to Comment LA2-ORAL-5
Please refer to Master Response GEN-1.

Del Norte Economic Development Corporation, Eli Naffah

Comment ORG11-ORAL-1, Speaker Card
for the economic development of the region & the growth of commercial & recreational salmon fishing

Response to Comment ORG11-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment ORG11-ORAL-2
MR. NAFFAH: Eli, E-L-I, Naffah, N-A-F-F, like Frank, A-H.

I'm here—I am president of the Del Norte Economic Development Corporation. And I used to be city manager in Crescent City.

And we've been trying to grow the local economy. And having lived in southern California before and then also in the Bay Area and then 17 years between Humboldt and Del Norte, we really need to focus on whatever economic opportunities we do have. And the fishing industry is one great opportunity that we could build upon. Crescent City and northern California is the number one harbor—Crescent City's the number one harbor as far as generating the crab fishing. And I think we have a great opportunity, if we can get the Klamath dams removed, so that we can bring the salmon industry back and hopefully have the Crescent City Harbor thrive like it did before.

I see a lot of activity now even with the crab. And I think we can have so much more activity with the salmon. As the Economic Development Corporation, we're always interested in creating jobs between the recreational and the commercial fishing industries. You know, again, building on the businesses and helping those businesses grow and succeed. So our region, unlike some of the benefits that you might have in the metropolitan area, where you can have—you know,

like Silicon Valley and so on, there's limited opportunities that we have here. We need to try to capitalize on those opportunities. And growing the fishing industry would be a huge benefit.

Response to Comment ORG11-ORAL-2
Please refer to Master Response GEN-2.

Environmental Protection Information Center, Native Rights Council, Amber Jamieson

Comment ORG2-ORAL-1, Speaker Card
I support the Klamath Dam Removal Project

Response to Comment ORG2-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment ORG2-ORAL-2
MS. JAMIESON: I'm Amber Jamieson, J-A-M-I-E-S-O-N. And this is my son, Madrone, M-A-D-R-O-N-E.

And I work for the Environmental Protection Information center. And I'm on the board of directors for the Nature Rights Council. And I support the Klamath Dam Removal Project. I want to applaud you for the progress you've made towards decommissioning the dams and also encourage you to act swiftly because our salmon runs are disappearing at an alarming rate.

Today the Fish and Game Commission listed the Salmon River spring Chinook as a candidate species under the California Endangered Species Act. So this means that they're now getting full protections until permanent protection can be put into place and determinations made to do that.

This is very relevant because last year was one of the lowest wild spring Chinook runs in the Klamath River.

As Regina said, you know, when we did the fish counts on the Salmon River, there were only a few hundred left.

So unless we expedite the dam removal process, we're going to miss our chance to restore the Klamath salmon fisheries. And the dams are blocking, you know, the upper basin which is the main habitat for the spring Chinook.

And so, if we don't get these dams out right away, spring Chinook fisheries may not survive. So this is my seven-year-old son, Madrone. He's been fortunate enough to grow up in a family with a fish biologist. My husband (Inaudible.) is at a Fish and Game hearing otherwise, he would be here testifying himself.

But we're on the brink of losing it all. Although he's seen fish spawning in the wild, you know, they might not be there for much longer.

So these fisheries are not only the lifeblood of river communities and the tribes, but we see how they're also a keystone species that holds our rivers, our forests, and the ocean ecosystem I balance.

So for these reasons, I urge you to move as swiftly as possible, within all your capabilities to get these dams off of the Klamath River so that we can begin restoring the salmon fisheries before it's too late.

Thank you for your work.

Response to Comment ORG2-ORAL-2
Please refer to Master Response GEN-1.

Friends of Del Norte, Eileen Cooper

Comment ORG10-ORAL-1
MS. COOPER: Eileen Cooper, E-I-L-E-E-N, C-O-O-P-E-R. I'm vice president of Friends of Del Norte. And we have been following this process for a very long time. And it's exhaustive. We so appreciate all of the hard work that this agency has put into making sure that this analysis addresses what it needs to address here. And we, at this point, feel that we cannot waste another stitch of time.

The salmon need our help.Way back when this process started, I was wondering: Wow, 2020 is so far off. Will the salmon still be here to help them?

And here we are, almost there. And they're waiting. We got lucky. We may not be so lucky in the near future if we don't take this action now. The salmon face longer, dryer summers. We see this happening, and so please do not delay and make this happen. Make this, what could be a dream come true, real.

And we appreciate your great effort. More needs to be done in the future, definitely. But this would be a great stride forward.

Response to Comment ORG10-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Friends of the Eel River, Scott Greacen

Comment ORG19-ORAL-1
MR. GREACEN: My name is Scott Greacen, S-C-O-T-T, G-R-E-A-C-E-N. I'm conservation director for Friends of the Eel River.

We strongly support Klamath dam removal. And I want to echo the urgency that my colleagues have – those guys have expressed.

Response to Comment ORG19-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment ORG19-ORAL-2
I want to pull back a little bit and think about the larger significance of this process. It's really important to learn how to fix our mistakes. We all make 'em. But we've got to learn how to make things better after we make them. And as your work shows, some dams make sense, but some don't. And those that don't make sense should be removed. And this process is really, really important because, to restore fisheries, to do justice, we need to understand what it is we've done wrong and how we've messed things up.

So this is a historic opportunity, not only for the Klamath but, as others have pointed out, for California and for the greater American west. We've got a lot of other dams that need to come out. Not all of them, but some of them. And your work here and all the efforts that have brought this movement to this moment is ongoing to echo in river canyons all over this country.

Response to Comment ORG19-ORAL-2
Please refer to Master Response GEN-2.

Green Party of Humboldt County, Erik Rydberg

Comment ORG50-ORAL-1, Speaker Card
It's time for watershed renewal

Response to Comment ORG50-ORAL-1
Thank you for your comment.

Comment ORG50-ORAL-2
MR. RYDBERG: (Inaudible.) Ashokawna is my watershed which is the Russian River. I just want to second what our young relatives just said about culture, how these things are absolutely dependent on our watersheds that we've had for thousand of years. And also Scott who just recently said this. It's much bigger. Its decades and decades of struggle of local people that are Wiyot or Yurok or Hoopa relatives here. But that struggle, the success of that struggle has ripple effects for communities that have been in similar struggles throughout California.

My family's been a part of fighting for our watershed for decades. The dams warm the springs. The dam destroyed our basket-making materials through the years of the California Indian Basket Weavers Association that my family's been involved with. We had to simply—all of the effects of these dams have just caused such damage to culture, to our animals, our non-human relatives.

So success here—hard fought success here for all these people, our indigenous relatives, will have the kind of ripple effects for other people who are fighting in other watersheds, tributaries of this watershed we're fighting for here.

It's so important that this happen. Especially in this time of climate change, including the reason these dams are here in the name of this industrialized progress that has caused such disaster all over the globe. We're in a time of change, a time of realizing that, you know, progress for profit or for means of producing energy that are becoming irrelevant really compared to other things that are optional. We're in a time where we are going to ned a change, massive change.

And this is one of those things that has such ripple effects in such positive ways for all of our indigenous relatives, for everyone who has made this their home now, who are burying their dead on our indigenous lands, now made it their home, it's going to have positive ripple effects throughout the State of California and serve as an example for the rest of the country and the globe. Because what's happening here is a very human situation that is happening all over the globe.

And we need to collectively, as human beings, realize that the earth—we have no other option. The earth is the only place we have to live. And, you know, fossil fuels. We can't just burn gases and oil and get out of anything. We're going to need our non-human relatives. We're going to need our watersheds. And we're going to need our forests to continue to survive and raise our children and other generations.

Response to Comment ORG50-ORAL-2
Please refer to Master Response GEN-2.

Comment ORG50-ORAL-3
So I beg you to take a look at what's being asked here today—tonight and push forward for the removal of the Klamath dam. Thank you.

Response to Comment ORG50-ORAL-3
Please refer to Master Response GEN-1.

Green Party of Humboldt County, Move to Amend, Kelsey Reedy

Comment ORG13-ORAL-1, Speaker Card
Strongly support the findings of the Water Board staff that the proposed project of complete dam removal is the environmentally superior alternative.

Response to Comment ORG13-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment ORG13-ORAL-2
MS. REEDY: Hello. My name is Kelsey Reedy, K-E-L-S-E-Y, R-E-E-D-Y. And I'm here as the chair of the Green Party of Humboldt County and the coordinator of the Humboldt Move to Amend. And we're here in full support of the removal—the complete removal of the dam. And this is a pretty obvious thing for all of what it is that we stand for. We stand for, you know, the rights of nature. We should be putting the life of water and the life of the creatures that are surviving off of the water ahead of profit.

It is always people over profit; always planet over profit.

And so we fully support the removal.

Response to Comment ORG13-ORAL-2
Please refer to Master Response GEN-1.

Klamath River Renewal Corporation, Dave Meurer

Comment ORG7-ORAL-1
MR. MEURER: Good morning. My name is Dave Meurer, M-E-U-R-E-R. I'm the community liaison for the Klamath River Removal Corporation. I'm speaking on their behalf tonight.

Klamath River Removal Corporation is part of a cooperative effort to reestablish the natural vitality of the Klamath River to support all communities in the basin. KRRC's job is to take ownership of four PacifiCorp dams and to remove those damns, restore formerly inundated lands and implement required mitigation measures in compliance with all applicable federal, state, and local laws and regulations.

KRRC is seeking regulatory permits to accomplish this project including water quality sensor in the State of California.

Response to Comment ORG7-ORAL-1
Thank you for your comment.

Comment ORG7-ORAL-2
The DEIR is an impressive and thorough review of the potential benefits and impacts of removal of the Lower Klamath Project hydroelectric dams on the Klamath River. KRRC commends the water board and staff and your consultant for its work on this analysis. We think there's quite a bit community members and stakeholders to learn from it.

The DEIR shows the proposed project to be environmentally superior compared to the six alternatives to the project that the water board analyzed in terms of both project benefits, negative impacts. The report shows that most potential

impacts from the project are small and short term and can be reduced with mitigation.

It also shows many project effects are beneficial in the short and long term which is an important finding for those who are interested in the long-term health of the Klamath River and community and the ecosystems that depend on it.

The DEIR shows the proposed project protects water quality by restoring the free-flowing conditions of the river and insures volitional fish passage and that the project will be a boom to salmon and steelhead populations. Many of the species expected to recover following dam removal are tribal trust species that are important to the culture and health of some tribes on the Klamath River.

The DEIR also shows an expected increase in recreational and commercial fishing industries.

KRRC is pleased with these findings in the DEIR and looks forward to the final EIR in obtaining other required permits and then implementing the project, including mitigation measures to enhance benefits and reduce adverse impacts.

KRRC will be submitting written comments regarding this DEIR in the near future. We are encouraged that this DEIR brings KRRC one step closer to project approval.

Response to Comment ORG7-ORAL-2
Please refer to Master Response GEN-1.

Pacific Coast Federation of Fishermans Association/HEMA, Dave Bitts

Comment ORG6-ORAL-1, Speaker Card
SUPPORT DAM REMOVAL FOR FISH

Response to Comment ORG6-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment ORG6-ORAL-2
MR. BITTS: I'm up. Okay. Good. That's B-I-T-T-S. I'm a locally-based commercial salmon fisherman. And I'm speaking on behalf of the Pacific Coast Federation of Fishermen's Associations.

We represent commercial salmon fishermen from Crescent City to Santa Barbara. And we are – although most of the fish we catch come from the Sacramento River, we do catch some Klamath fish. We're utterly dependent on large, robust populations of Klamath fish in the ocean in order to get the opportunity to go fishing at all and hopefully to catch a lot of those Sacramento River fish.

We have been working on dam removal for close to 20 years. We've been working side by side with the Tribes and, for the most part, arm and arm with them. And it has been, I think, a very fruitful process for all of us.

Response to Comment ORG6-ORAL-2
Please refer to Master Response GEN-2.

Comment ORG6-ORAL-3
Felice is right. Clearing these dams out is not going to fix everything. But it's probably the single biggest step that can be taken to improve water quality below the dams, obviously to open up habitat above to make life better for fish in the river and make life more abundant, maybe better for all the people on the river. And in the ocean we depend on these fish. I find some irony that we need a water quality certification to take the step that's going to improve the water quality. But I guess that's the way it is.

And four of these things that are listed are nutrients, organic enrichment, (Inaudible.), temperature and blue green algae, this is the single biggest thing that can be done to deal with all of those problems.

Response to Comment ORG6-ORAL-3
Comment noted.

Comment ORG6-ORAL-4
One thing that concerns me quite a lot—I've seen this for the first time in the overview section here—alternative of four-damn removal with no hatcheries.

Now, I think we're all hoping that eventually, no hatcheries will be needed. But it's been my understanding that there is funding in the project proposal to operate the existing hatchery or replacement for it for eight years or thereabouts. And I would hope that we are prepared to evaluate the progress of increased natural runs in the river and adjust the hatchery outflow accordingly until hopefully, eventually, we don't need the hatcheries anymore. If we just shut them down immediately, I think that would be a mistake.

Thank you.

Response to Comment ORG6-ORAL-4
The Lower Klamath Project EIR presents a range of reasonable alternatives to the Proposed Project. Volume I Section 4.1 *[Alternatives Selection/Overview]* (pages 4-1 to 4-15) discusses 17 potential alternatives in relation to the Proposed Project's underlying purpose and objectives, six of which are examined in detail. Of these six alternatives, two involve removal of all four Lower Klamath Project dams, and four involve two or three dams remaining in place. Potential impacts and beneficial effects are identified for each of these alternatives in the EIR and

each will be fully considered by the State Water Board before certifying the EIR (CEQA Guidelines section 15090).

As stated in Volume I Section 4.1.1.1 *[Alternatives Selection/Overview] Alternatives Carried Forward for More Detailed Analysis* (page 4-6), the No Hatchery Alternative emerged from scoping concerns regarding the water source for the Iron Gate Hatchery, and in light of uncertainty regarding whether the Fall Creek Hatchery (FCH) could be timely reopened.

Pacific Coast Federation of Fishermans Association, Regina Chichizola, Malcom Chichizola

Comment ORG17-ORAL-1
MS. CHICHIZOLA: My name is Regina Chichizola, C-H-I-C-H-I-Z-O-L-A, here with Malcolm.

Malcolm, do you want to say anything?

MR. CHICHIZOLA: Save the salmon. That's all I've got.

Response to Comment ORG17-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment ORG17-ORAL-2
MS. CHICHIZOLA: I was here in Yreka yesterday so I'll try to keep it short. But it was a lot harder to concentrate in Yreka because there were a lot of people opposed to dam removal.

Response to Comment ORG17-ORAL-2
Comment noted.

Comment ORG17-ORAL-3
But, as you know, dam removal will create a lot of jobs and help water quality in the Klamath River and help get rid of the fish disease issues that we've been dealing with.

I've been working on dam removal now for 15 years, and I've testified to this board quite a lot. And I wanted to speak to some of the misconceptions that came up yesterday because I have been studying dam removal in the Elwha River and other places. And a lot of times there are a lot of complaints that there's going to be sediment issues and flooding and things of that nature, yesterday, in Yreka. When in reality, these are not flood control dams as you guys know. And these dams create the green algae creating these water quality issues.

But also what happened in the Elwha River is that the sediment that was released created quite a lot of a habitat including new habitat for clams and oysters. And it really helped the fisheries, even beyond the salmon.

So I think it's important that people realize that and also realize that some of the—of that sediment is gravel that needs to move throughout the river and that that gravel movement will really help with the Shasta Fish Disease.

So some of the things being brought up as problems such as the release of the toxic algae or the sediment are actually things that are good and part of a dynamic watershed and dynamic river.

So I wanted to speak to the misconceptions from Yreka last night because it was hard to deal with them while we were there. So thank you for that.

I also wasn't to say I hope that you guys can get this permit done as quickly as possible because the Klamath Salmon and especially the spring Chinook Salmon don't have very long to wait.

Last year I was part of the Salmon River fish dives. And I think there was a few hundred spring Chinook Salmon in the Salmon River which is one of the last wild runs that the spring Chinook have.

And the Spring Chinook are very important to the native people as the first fish that come up the river. And a lot of people don't have a food source for that part of the year without spring salmon. And not having a food source leads to a lot of disease issues, heart disease, diabetes, and things like that that people replace salmon as a healthy food source with unhealthy foods such as commodities.

So spring salmon is especially important here and they don't have long to go. They're really facing extinction right now. So I urge California to move as quickly as possible for dam removal for those reasons and because of the poor quality of the river and also bring the salmon home to the basin to the cold, spring fed creeks which I think is really important in light of climate change.

As we know, salmon are really going to be harmed by climate change. And dam removal is one of the only ways to get salmon to habitat that is going to be spring fed instead of snowmelt fed due to climate change. So that upper basin—the watersheds are a lot different. And that's why it's important to bring them up there too.

So I know that climate change wasn't something that's been brought up in some of the past analysis and now it is. And I think that's really important. And with that, I just wanted—not going to take up all my time because I don't need to. But undam the Klamath. Please, do it quickly and for all the people in the State of

California including the people in Yreka who will get a lot of jobs out of it in the end and a healthy tourism industry.

Thank you.

Response to Comment ORG17-ORAL-3
Comment noted.

Pacific Coast Federation of Fishermans Association, Institute for Fisheries Resources, Vivian Helliwell

Comment ORG21-ORAL-1, Speaker Card
In support of Dam Removal, salmon returning

Response to Comment ORG21-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment ORG21-ORAL-2
MS. HELLIWELL: Hi. My name is Vivian Helliwell, V-I-V-I-A-N, H-E-L-L-I-W-E-L-L. I'm watershed conservation director for Pacific Coast Federation of Fishermen's Associations for which Dave Bitts was just speaking as president.

And our membership relies on a harvestable surplus beyond a sustainable viable population of fish in these rivers. And so after the escapement goals are met, then we need more fish than that in order to have a coastal economy of commercial fishing. We've been shut down in the Klamath for over 20 years. And we rarely have any fishing opportunity on any fish that come through that area so that we avoid catch of Klamath River fish.

Response to Comment ORG21-ORAL-2
Please refer to Master Response GEN-2.

Comment ORG21-ORAL-3
We expect and hope from the evidence that's been presented in these alternatives that the runs will be able to improve because of taking these dams out and accessing the hundreds of miles of habitat above them. And, you know, we have—what? 387 miles of wild and scenic below the dams. A total of 286 miles on the Klamath River so far.

None of these dams would be able to be built today without fish ladders or access for the runs above them. So we're in a new era where we take better care of the fish. They've encountered so much disease when they come back in from the bad water quality that we've been losing incredible opportunity to stimulate the coastal economy and have healthy local fish. Instead, we have fish flown from in Alaska in our market place that people can't even afford to eat. Flying salmon.

Local salmon would really help the health of the local economy and the health of the people who can eat the local salmon. The Klamath River process of decommissioning resonates with the Eel River that frames the Klamath management zone in the ocean. Our third largest river—salmon-producing river in California.

Response to Comment ORG21-ORAL-3
Please refer to Master Response GEN-1.

Comment ORG21-ORAL-4
The State of California has a policy for supporting naturally-sustained runs of salmon. And so now we have dams on the Eel River that are up for relicensing. And Pacific Gas and Electric, PG and E, has decided to orphan their—abandon their license application. And so those damns are going through a similar process that are modeled on the Klamath River next to it.

So again, it would allow fish to go above a dam that was built with no fish ladder. Scott dam, 130 feet tall and produces negligent non-money making amount of electricity. But the water's very important on the other side of the hill and the Russian River.

So there's some negotiation that needs to take place. The Klamath negotiations are an example of how that can be accomplished. And, of course, we need to go through the same FERC process for either auctioning off the process, either relicensing or decommissioning of those dams. They're going to have to have volitional fish passage.

And so we will continue to participate, talking with our neighbors, trying to meet everyone's needs as we have been on the Klamath and try to get those fish back and give them a wider range of opportunity in the upper rivers, especially facing climate change.

Response to Comment ORG21-ORAL-4
Please refer to Master Response GEN-2.

Comment ORG21-ORAL-5
So we look forward to the improvements that we hope that these dam removals will make in the Klamath River. And as Mr. Pace said, we still have work to do on water quality other than this.

So it's an ongoing process. And we're willing to be part of it, happy to be part of it, work with all of our neighbors to make it happen.

Response to Comment ORG21-ORAL-5
Please refer to Master Response GEN-1.

Seventh Generation Fund for Indigenous Peoples, Inc., Carlrey Arroyo

Comment ORG51-ORAL-1, Speaker Card
I stand with the Yurok, Klamath, Hupa, Karuk, & Tolowa people in Dam Removal. The salmon need water flows to increase to continue to live a healthy life. From the Blue Algae to the sediment, it will only get worse if the dams are not removed.

Response to Comment ORG51-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment ORG51-ORAL-2
Sediment - & Flood control dam

New habitat (toxic Algae)

Sea Sashta

Spring shanook (few 100)

First Fish that comes up the River

Pacificore – 20 mil

4/5 dams

Response to Comment ORG51-ORAL-2
Please refer to Master Response GEN-1.

Comment ORG51-ORAL-3
MS. ARROYO: Carlrey Arroyo. I want to say thank you to the Wiyot people for allowing me to be here today. And I also want to thank all of the Klamath and salmon people who have been on the front lines for decades. Thank you all for continuing this fight. And I'm sorry that you have to continuously repeat your trauma and the connection you all have to the salmon over and over and over again.

Thank you all.

Response to Comment ORG51-ORAL-3
Please refer to Master Response GEN-2.

Comment ORG51-ORAL-4
I just want to uplift the voices of all the folks who spoke today. And say that undamming the Klamath will have many benefits long term. I want to thank Regina for clarifying the misconceptions about the sediment that many people have because --

I don't want to hurt anybody's ears.

MS. RAGAZZI: If you step back.

MS. ARROYO: Okay. Cool. I'll just hold it.

Cool. I lost my train of thought. But basically, I support the undamming of the four dams now. And hopefully the fifth one that the person earlier spoke to which should have been included in this DEIR as well. But I stand with all the indigenous people in undamming Klamath and especially the little ones who shouldn't have to come um here and say: Bring the salmon home.

Response to Comment ORG51-ORAL-4
Please refer to Master Response GEN-1.

Yurok Tribe, Frankie Joe Myers

Comment TR7-ORAL-1, Speaker Card
a Lot!

Response to Comment TR7-ORAL-1
Thank you for your comment.

Comment TR7-ORAL-2
MR. MYERS: I am Frankie Myers, F-R-A-N-K-I-E, M-Y-E-R-S.

I'd like to start out by saying thank you to the Wiyot people for allowing us to come and meet in their territory on this matter tonight.

Response to Comment TR7-ORAL-2
Comment noted.

Comment TR7-ORAL-3
I reiterate Chairman James. The Yurok Tribe strongly supports moving forward with the project. We appreciate the water board's effort to thoroughly vet out the project. We feel like it has been done so in a good way, in a good manner. The salmon for us are the soul of our people. It's the heartbeat of where we come from. And in that light, we want to make sure that, whatever we do moving forward is in the best interest of the river and the salmon.

We'd like to thank the board for allowing that to take place, to make sure that this is going to be the best option for the river. And we believe that it is.

We've waited a long time for this. And we've worked many, many hours. We have sacrificed time. Individuals have given their lives to this project. We feel

like we've done the consultation necessary. We've done the signs necessary to move it forward.

And I will, once again, encourage the Board to move forward for the health of the river, for the health of the salmon, for the health of the Yurok people, and for the health of the world in general. We believe that all things are connected, and we are a part of the world. A healthy river is a healthy community. It's a way to bring us back into balance.

And although you may not share my beliefs, you support them. And I want to tell you thank you.

Response to Comment TR7-ORAL-3
Please refer to Master Responses GEN-1 and GEN-2.

Yurok Tribe, Joe James

Comment TR6-ORAL-1
MR. JAMES: Good evening. Joe James, Yurok Tribal Chairman. I want to thank the staff of the State Water Resources Board for their work and their continued work to move forward for the removal of all these dams.

I want to speak on behalf of the tribal government, on behalf of myself, of my children, my ancestors before me.

Response to Comment TR6-ORAL-1
Thank you for your comment.

Comment TR6-ORAL-2
We are looking and delighted for the year of 2021 to walk the river banks of the Klamath River pre-dam removal, to be part of that is what was always out in front of us, being able to walk the banks of the river knowing our river system, our natural resources, our fish.

For the Tribes, it's been a long battle to be on the front lines. And we couldn't have done it without the assistance of our partners, the county, the residents of Humboldt, Del Norte County, the tribes along the Klamath River. This is truly a team effort and what we have been moving forward for It's getting exciting to—knowing that the process is coming near and we actually support and encourage the removal of the four dams immediately.

As I mentioned, we've had a lot of people that worked hard on this—on this project. And it means a lot to us. And the river is our livelihood, our culture. Its our way of life. That's who we are. That's why we are so emotional, so demanding, so straightforward because we know what the river not just provides for the Yurok, what it also provides for the community that will benefit from it.

And I thank you for your time.

And, again, Yurok tribal government strongly encourages you to move forward with this process. At the same time, we are also, on one end, already waiting for the dams to come down.

Thank you for your time.

Response to Comment TR6-ORAL-2
Please refer to Master Responses GEN-1 and GEN-2.

Yurok Tribe, Mike Belchik

Comment TR8-ORAL-1
MR. BELCHIK: Hello. My name is Michael Belchik. That's spelled B-E-L-C-H-I-K.

Pardon my voice. But so anyway I've been working for the Yurok Tribe as a senior water policy analyst for 23 years. And the last 20 of it has been spent trying to get these dams off this river. At its heart, this project is a reservation project. That's what this is about.

Response to Comment TR8-ORAL-1
Thank you for your comment.

Comment TR8-ORAL-2
Water quality's part of it too. But this would be the largest fish restoration project in the history of the world. And it's time to do it. I think personally this is, literally, about the 500th, maybe more, meeting. This is about the 100th public meeting that I've been to. We have PacifiCorp's application, FERC EIS, the (Inaudible.) EIS, and now this EIS which is quite thorough and pretty high quality. But all in all, with the scientific supporting documents, I think we have well over a hundred thousand pages of studies, peer-reviewed studies, and it's time for action now. The salmon need it.

Response to Comment TR8-ORAL-2
Comment noted.

Comment TR8-ORAL-3
First of all, dam removal is effective. When we see what happened on the Condit Dam and Elwha Dam and we started off to get a pattern, especially in the Pacific northwest, where the fish recover much faster in the river, much faster than people give it credit for. It's obviously good for water quality, including the toxic algae. The Klamath River's posted for blue-green algae every year.

As Regina mentioned, one of the most important aspects of this project is being able to get fish to the cold water. We can't get the cold water to the fish with the

dams there. The dams need to come out so that the fish can get to the large cascade springs like J.C. Boyle and up in the Williamson, that springer country. Speaking of springers, this dam removal will open up hundreds of miles of habitat.

And it's an ambitious project. We want to resurrect a lost run of spring salmon on the Upper Klamath River. This will help springers throughout the basin, which have been petitioned to be listed. We're losing them on South Fork Trinity. This geographic and genetic diversity will help the overall runs of the spring salmon.

The fish disease on the Klamath River has reached crisis proportions. We've litigated successfully over it with our partners on the river. And its requiring very large flows to move sediment because sediment—the dams are locked in place. Dam removal is going to free up the sediment movement and take a lot less water to make it healthy, be what it was before. So it's been a long road from when we started off mentioning dam removal early in the meetings, we were literally laughed out of the room. We weren't given serious consideration. (Inaudible.) People have gone there. And I see that now—I've been working on this 24 years. And I see the next generation of young native leaders coming in. And it's time—it's time to take these dams out and manage this as a free-flowing river system.

Response to Comment TR8-ORAL-3
Please refer to Master Responses GEN-1 and GEN-2.

Yurok Tribe, Toby Vanlandingham

Comment TR9-ORAL-1
MR. VANLANDINGHAM: Hello. I'm Toby Vanlandingham, T-O-B-Y, VA-N-L-A-N-D-I-N-G-H-A-M.

I am tribal council member relating the Weitchpec District. I'd like to reiterate what the chair and vice chair said that, naturally, the dam removal is good for everyone. And as someone who's actually had children jump in the river, come out with rashes, I look forward to the day where my grandchildren and great grandchildren will live in a time—think I got that from vice chairman—that they won't know what dams are that are going through our water and way of life.

Response to Comment TR9-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-2.

Comment TR9-ORAL-2
So on behalf of 6,200 Yurok Tribe members, we agree that dams need to come down. And we're appreciative at this point in time where we're almost to that point in life where we can live a better life.

So I'd just like to thank everyone in saying let's get this process started because we're ready. We're more than ready. We've got generations of children that are going to be grateful for the fight that the people that have come before us went through to get this done. And we appreciate the water board for doing their due diligence. So thank you all. So on behalf of 6,200 Yurok Tribe members, we agree that dams need to come down. And we're appreciative at this point in time where we're almost to that point in life where we can live a better life.

So I'd just like to thank everyone in saying let's get this process started because we're ready. We're more than ready. We've got generations of children that are going to be grateful for the fight that the people that have come before us went through to get this done.

And we appreciate the water board for doing their due diligence. So thank you all.

Response to Comment TR9-ORAL-2
Please refer to Master Responses GEN-1 and GEN-2.

Benson, Craig

Comment IND12-ORAL-1, Speaker Card
Support for the project

Response to Comment IND12-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment IND12-ORAL-2, Speaker Card
Concerns: 15.1 Million cu. Yds of sediment may create chronic turbidity exceeding SSC threshold of 100 mg/L over two week period.

Response to Comment IND12-ORAL-2
Please refer to Section 3.2.5.2 *Water Quality – Potential Impacts and Mitigation – Suspended Sediments* Potential Impact 3.2-3for analysis of the increases in suspended sediment concentration (SSC) due to release of reservoir sediment currently trapped behind the Lower Klamath Project dams. Modeling of reservoir sediment transport indicates between 36 and 57 percent of the 15.1 cubic yards of sediment trapped behind J.C. Boyle, Copco No. 1, and Iron Gate dams would erode during drawdown, with the remaining sediments remaining in place and consolidating (drying out and decreasing in thickness) after dam removal (USBR 2012a). Modeling of reservoir sediment transport also indicates SSCs would be expected to resume modeled background levels (i.e., existing conditions) in the long term, regardless of the water year type (i.e., dry, normal, or wet conditions) present during dam removal (USBR 2012a). Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Comment IND12-ORAL-3, Speaker Card
Also incomplete analysis of bedload increase impact on embeddedness of gravel (salmon redds)

Response to Comment IND12-ORAL-3
Please refer to Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-9 regarding the potential impacts of bedload on salmon redds. There would be no significant impact to coho salmon. Please also refer to Master Response GEO-1 and Master Response AQF-7. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*.

Comment IND12-ORAL-4
MR. BENSON: Good evening. What he said.

My name is Craig—is that better? Okay.

My name is Craig Benson, C-R-A-I-G, B-E-N-S-O-N.

I'm a natural resource professional speaking on behalf of myself. I'm a resident in Eureka.

First, I wanted to thank you for making such a robust public process, having it in multiple locations, especially for coming out to the coast and, in particular, being close to the university so that students can experience and witness a robust and meaningful public process.

I am in favor of the actions and preferred alternative. And sometimes in work one has to do a little bit of harm to do an awful lot of good. And I think that's the case with this project. You know, there may be one step backwards. But there is clearly a hundred steps forward. And I, personally, can live with that ratio. And I hope others can as well.

Response to Comment IND12-ORAL-4
Please refer to Master Response GEN-1.

Comment IND12-ORAL-5
It's no surprise to me that one speaker spoke of input on the sediment and turbidity section of the draft EIR. That's an association that, while it is good, could be better in terms of being the academic rigor and being robust in explanation to assuage people's fears about what sediment might do. 15. 1 million cubic yards of sediment behind dams is an awful lot of sediment. I don't want the image of how many thousands of dump trucks that transfers into.

I think that there's—the concerns that I have is that the sediment—that the turbidity spike could easily exceed that 20 percent of background that's called for

in the document at least for a period of time. It seems almost certain to me that that turbidity spike could exceed 100 milligrams per liter over a two-week period, at least in the short term, the first couple of years, 'til that is scoured out, you know, behind the dams.

And that was also the experience of the Elwha river that was referenced earlier. And I just want to be sure that those turbidity spikes don't exceed a fish kill threshold which that's where some of the harm could take place.

Also I didn't see a really robust analysis of the courser sediments and the expected increase in stream beds and, you know, impacting the health of the spawn and travels downstream the dams. And if those could be addresses a little bit better in the draft EIR that might assuage some of those fears.

Response to Comment IND12-ORAL-5
For information on the quantity of sediment stored behind the dams and potential for sediment erosion, transport, and deposition, please refer to Volume I Section 3.11.2.5 *Geology, Soils, and Mineral Resources – Environmental Setting – Reservoir Sediment Storage and Composition* (pages 3-754 to 3-758) and Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 (pages 3-765 to 3-775), which are partially modified in Volume III Attachment 1. Estimates of sediment volumes and deposition are based on sediment modeling described in USBR (2012a). Please also refer to Master Response GEO-1.

Note that Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 has been clarified to discuss reach-averaged sediment deposition or erosion and bed elevation change results of both sets of SRH-1D simulations that were undertaken by the U.S. Bureau of Reclamation (i.e., forty eight 2-year simulations and three 50-year simulations) (USBR 2012a). The clarifying edits do not change the conclusions or significance determinations in Potential Impact 3.11-5. Please refer to Volume III Attachment 1 Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 for the revisions.

Regarding exceedance of the 100 mg/L SSC threshold, please refer to Volume I Section 3.2.5.2 *Water Quality – Potential Impacts and Mitigation – Suspended Sediments* Potential Impact 3.2-3 (pages 3-84 to 3-106). This is a *significant and unavoidable* short-term impact.

Regarding the differences of the Proposed Project from other dam removal projects, please refer to the response to IND15-ORAL-3.

Volume I Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-9 (pages 3-315 to 3-323) discusses the potential impact of bedload on salmon redds. There would be *no*

significant impact to coho salmon. Please also refer Master Responses GEO-1 and AQF-7.

Lincoln, Bernadette

Comment IND5-ORAL-1

MS. LINCOLN: I'm switching with Jene. My name's Bernadette Lincoln. I'm a Tlingit Indian. My family consists of—we represent Tlingit, Crow, Wailaki, Pomo, Yurok, Karuk, and Tamawak in our home.

My children are traditional dancers. My son just became a jump dancer. I'm a very proud mother. Both my kids are bush dancers. We eat traditional food in my house. I used to teach traditional cooking. But now it's only for birthdays because we can't get our hands on it.

I want to thank K'nek'nek' Lowery, if he's still here who said what I wanted to say for my kids: We have no candlefish anymore in the rivers, no freshwater clams.

My daughter's name—just to give you an example of how important the river is to the Yurok people, my daughter's name is Little Frog; my son's name is Canoe Boy. Those are traditional names. And last year, summer rain, and we heard a noise downtown Eureka behind Walmart. And my daughter said, "What is that noise?"

And I said, "What noise are you talking about?"

"That noise. What's that loud noise?"

It was frogs. My Yurok daughter, named Little Frog, didn't know what that noise was.

Remember, I'm a traditional foods person. I teach native cooking. My husband's a linguist. He does language restoration.

Response to Comment IND5-ORAL-1

Thank you for your comment. Please refer to Master Response GEN-2.

Comment IND5-ORAL-2

So bringing back the salmon, bringing back the rivers, bringing them back to life is so important to our culture and in so many ways, not just birthdays.

And so I just plead with you that you talk to your hearts and ask what's the right thing to do and that you vote in favor of taking the dams down.

Response to Comment IND5-ORAL-2

Please refer to Master Responses GEN-1 and GEN-2.

Lowry, K'neK'neK'

Comment IND33-ORAL-1, Speaker Card
I don't see why people invented water pressure energy. There are lots more harmless ones to choose from.

Response to Comment IND33-ORAL-1
Thank you for your comment.

Comment IND33-ORAL-2
MR. LOWRY: I'm K'nek'nek' Lowry. And this is my brother, Boy. My name is K, apostrophe, N-E-K, apostrophe, N-E-K, apostrophe.

We don't need dam power for our power. We have solar power and wind power. If we don't do something quick about these dams: Bye-bye, salmon.

So take action or we're going to suffer a loss of salmon. I and other Yurok children are the future of the tribe. So we can make a change. Salmon is the core of Yurok culture and the food. My family has fished the Klamath River since time (Inaudible.). Walk now.

Response to Comment IND33-ORAL-2
Please refer to Master Responses GEN-1 and GEN-2.

Lowry, Merry

Comment IND39-ORAL-1, Speaker Card
I've been working with Native youth and non-native youth for 20 years and this process gives hope for many youth and their families

Response to Comment IND39-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-2.

Comment IND39-ORAL-2
MS. LOWRY: My name's Merry Kate Lowry, M-E-R-R-Y, K-A-T-E, L-O-W-R-Y. I've been an educator here in Humboldt County for about 20 years working with native and non-native youth and community and families. And when FERC first came here and there were hearings, brought some native youth that were my students. And—and they spoke. And for some of them, that was the first time that they had ever done any public speaking. It was really empowering.

And through the process, I've seen youth, high school, as well as elementary school students understand that their culture was being endangered after the fish kill. And I remember the fish kill and the energy that went through the community and their worry and seeing the process develop, where allies have come together with native communities and the healing has happened from generation and the generation before from genocides.

So these are healing, bringing people together. And there's native youth and non-native youth. Everybody's looking and there's hope. There's hope. And I think that's one of the biggest things that I have seen in this process that's kind of magical. And that, a lot of times, doesn't get into these meetings.

Response to Comment IND39-ORAL-2
Please refer to Master Response GEN-2.

Luckey, Donna

Comment IND20-ORAL-1, Speaker Card
While I'm a new resident (AUG. 2018), I have been aware of the water quality issues, especially for salmon habitat, since 1978. [I was the North Coast Field Representative for the State Coastal Conservancy then.]

Response to Comment IND20-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-2.

Comment IND20-ORAL-2, Speaker Card
I support the removal of the dams.

Response to Comment IND20-ORAL-2
Please refer to Master Response GEN-1.

Martin, Rosada

Comment IND47-ORAL-1, Speaker Card
I've been recreating on the Klamath River (camping, fishing, floating, etc) my whole life.

Response to Comment IND47-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-2.

Comment IND47-ORAL-2, Speaker Card
The survival of the salmon and the overall health of the river is deeply important to me and removal of the dams is critical to this.

Response to Comment IND47-ORAL-2
Please refer to Master Response GEN-1.

Comment IND47-ORAL-3
MS. MARTIN: My name is Rosada Martin, R-O-S-A-D-A, M-A-R-T-I-N. I just wanted to speak up tonight because I was a commercial river guide for about 15 years. And the first time I ran—I floated the Klamath, I was about 10 years old. And I've floated rivers all over California. And it was my livelihood all through my 20s and 30s.

And often the clients would ask me, you know what's the best river to run in California? What would you recommend?

And I would always list off rivers like the Smith, the Cal Salmon, the King, the Merced. And suddenly, it dawned on me that these are all rivers that are free-flowing. And, therefore, the water quality is super high, the fish count is healthy.

And I could never recommend the Klamath and it breaks my heart because all the dams on the river create this poor water quality and the algae and the scum that lives on the side of the river. And the fish are dying. And it just breaks my heart that I can't recommend this river to float and enjoy. And I think the tourism potential is great on this river. If we could improve the water quality and get the fish count up, we could get people coming up here to run this river and fish. And that could, you know, contribute greatly to the economy and the quality of the area.

So it's just another thing to take into account is the potential for tourism. And if you take care of the river, the people will want to come there. And if you take care of the fish, people will want to come there.

Response to Comment IND47-ORAL-3
Please refer to Master Responses GEN-1 and GEN-2.

McCovey, Jene

Comment IND59-ORAL-1
MS. MCCOVEY: (Inaudible.) Jene McCovey.

I was born in 1951 in the big Hoopa Hospital. They took my mom up there when the mouth—from the mouth of the Klamath River. And they asked my father, his sister if they would take me so that they could earn money for the winter because the Klamath at that time, in 1951, there were three canopies there. And we were talking tonight about the underground aquifers that are coming out of the—up out of the Klamath watershed and how it's going to be the water that our fish are going to come to. And we're talking about the—talking about the babies.

So when you talk about the 2002 fishtail, our people were on Pecwan Creek. And we were dancing the dance that we balance the world between good and bad. We borrowed the dance with the medicine from the spirit world. There's a place at the dance ground where the spirits come to dance because they're not in the spirit world; they're with us. The door of this time—we bring all of time together.

So the center man raises the basket upriver to those who have gone on before us and downriver to those who come after us. And then they all soothe the audience which is a present. The creator gave us this job.

And so we were doing our dance. We were doing what we were meant to do. How we left creator's spirit world and come here to be who we are. I came here to be my parent's child. And they gave me away so they could go fish. And at that time, it was the first year of a ten-year plan for the Klamath River. The United States government got this plan going. They did not heed the scientists. They did not listen of what was needing.

So depending on whose story you listen to, the kill was 60,000 adults or 90,000 adults. But what they haven't talked about much was the 300,000 babies that have no place to grow, that when—if you were the eagle flying on top of the mountains, come down, you see this gray snake. And there's this blue ribbon in it. That's the river. There's no habitat. And so from 2019, 2020, 2021, this forum here has a cumulative effect on that moon stock and the quality of water.

There's no q in the law when you compare an (Inaudible.) fish with a potato or alfalfa or cattle. The salmon can only come back to its native stream by creator's design. By our prayers, we make this happen. But the cumulative effect above and beyond this forum has to deal with the quality water. And it's now. It's now.

Response to Comment IND59-ORAL-1
Thank you for your comment. Please refer to Section 3.2 *Water Quality* and Section 3.3 *Aquatic Resources.* More specifically, for analyses of potential short-term impacts on salmonids due to dam removal, please refer to Potential Impacts 3.3-1, 3.3-4, 3.3-7, 3.3-8, 3.3-9, and 3.3-10 of Section 3.3.5 *Aquatic Resources – Potential Impacts and Mitigation.* Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality* and 3.3 *Aquatic Resources*. Please also refer to Master Response GEN-2.

Comment IND59-ORAL-2
I would like to say that our tribal government has the control of the reservation. But we are the keepers of the waters for the fish. So all the water from the mouth of the river on up the river as we all need to be taking care of that. We all need to be responsible, helping our tribal people, our indigenous people continue on with dances, continue on with helping the (Inaudible.)

I think to share with you is we have the audiences and the jump dance. We have the fire where the medicine goes, and you have the dances. Then behind the dances are the spirit world. In—I won't say where it's at. But the dance ground at the lagoon. My lady friend went to the dance and said, "Jene, I saw a thousand spirits."

I said, "Where did you see a thousand spirits? Tell me."

And she says, "Well, you know when we went over the lagoon, there's a big wall. And the dancers are there." She says, "We've been watching the dance." And

one said there was a row of dancers watching behind the dancers. Then there was another row of spirits, and they were watching the audience. Then there was a third row, and she looked back over the lagoon. And there was nothing there.

When the dance started she heard the spirits behind her in the lagoon. And she said there was a thousand spirits.

And so it behooves us that—I think that those spirits are the ones who are coming. And we have to save this place and the moon stock. And I think this is one of the most precious things I could share that, as human beings, here walking on this earth and understanding that we're in connectivity with the trees. For the fires that have burned and the forests that have been logged and the bedrock is inundated with waste. And it needs to be cleaned. And so it's a big job, but this is—a cumulative effect is recognizing that we can't be clear cutting. We can't be cutting our trees. That's our oxygen. We're completing with (Inaudible.).

We have to really take a look at what we're doing and how we're doing it. And these little kids talking about how—it's something I would like to share for them. And it's how we're connected, why our dances are important, and why we were dancing that day, that Sunday before the Monday that the fish kill came in 2002 that our dances have the (Inaudible.) off the big red headdress. And there's a big tall feather that sits on top of it. And it twittles. It's engineered to sit on the—our person's head. And it twitters in the wind.

And so dancers are here, the men in the fire, the spirit is there. And then the audience—the audience looks on the dancers. When they see that, it reminds us that when that salmon's going up the river and his tail fin is up, out. And it twitters. And it reminds us why we pray, why we do it.

The creator has set us to and how it is important. So when the little people go and they watch the elders dance and they see those feathers, they know that that's the heart of their prayer. And its not just for our people; it's for humanity. We are the children of mother Earth. And we're—she's in trouble.

And in 2002, that was the first President Bush. And I wouldn't put it past to destroy what's left of our stream. And we need to be vigilant and know that it could be—it is 1849 again. The mentality that we are battling against is atrocious. And we need to be wise in how we choose our battles.

Response to Comment IND59-ORAL-2
Please refer to Master Response GEN-2.

Mees, Meriel

Comment IND38-ORAL-1, Speaker Card
Undamming the Klamath will improve the health of both salmon and human beings. The harmful effects of the dam have been well documented (see Ron Reed & Kari Norgaard 2010). The rapid ecological recovery of watersheds after dam removal is also well known. I fully support removing the dams

Response to Comment IND38-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment IND38-ORAL-2
MS. MEES: My name is Meriel Melendrez Mees. That's M-E-R-I-E-L, M-E-L-E-N-D-R-E-Z, M-E-E-S. And now my name has taken half of my time. But I wanted to come and contribute my voice to this public process because even though I'm a new resident here, I'm very grateful to be able to live and study on unseeded Wiyot Territory.

I'm a graduate student in the environment and community masters program at HSU And I'm speaking for myself tonight. But our program seeks to find the connections—I mean, actually, just look to destroy the divide between people and nature. And the Klamath undamming process is a really clear example of that.

Response to Comment IND38-ORAL-2
Please refer to Master Response GEN-2.

Comment IND38-ORAL-3
It's well documented the damage that the dams have done to both the salmon and people's health. And I think that we all understand the good that will come from removing these dams. So I simply wanted to lend my voice in support of that.

Response to Comment IND38-ORAL-3
Please refer to Master Response GEN-1.

Nelson, Denver

Comment IND16-ORAL-1
MR. NELSON: D-E-N-V-E-R, N-E-L-S-O-N. It's propitious that I speak after Jene because I was her doctor when she had her accident. I've been—I've lived in Eureka for about 40 years. I've had a place up on the Klamath River for about 30 years because I like to fish there. And I love the river. When I first became interested in the Klamath River, I wasn't interested in dam removal. I was interested in the government not building the Ah Pah Dam. So many of you younger people here, you probably don't even know about the Ah Pah Dam.

But it was going to be 900 feet tall. And it was going to divert any (Inaudible.) of the flow of the Klamath River to the Central Valley. It's still on the books, you know. And if you drive down the Central Valley to southern California you can get an idea. There's a lot more of them than there are of us. And if you sort of follow what's going on in the government, it's possible that that dam diversion could still be built. But it hasn't been built.

Response to Comment IND16-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-2.

Comment IND16-ORAL-2
And so then I've been to hundreds of meetings like this. And I think we've made some progress to get four dams removed. But it's important to keep in mind there are actually seven dams on the Klamath River. Felice, where ever he is, was right that there's dam at Keno that completely blocks the flow above that is the Link Dam which diverts flow of the outflow of the Klamath lake to irrigation district and downriver.

The upper Klamath Lake is probably where all of the toxic products come from. And removing four dams is not going to fix a lot of these problems. So I'm very much in favor of removing the four dams. But I don't think that we should stop there.

Response to Comment IND16-ORAL-2
Please refer to Master Response GEN-1.

Ohman, Scott

Comment IND48-ORAL-1, Speaker Card
For the tribes, commercial & recreational fishermen, rafters, the economic health of our region, the environment, and the wildlife, the removal of these dams is long overdue.

Response to Comment IND48-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment IND48-ORAL-2, Speaker Card
Electricity can be generated elsewhere. Which is a more valuable commodity? Potatoes or Salmon?

Response to Comment IND48-ORAL-2
Comment noted.

Comment IND48-ORAL-3
MR. OHMAN: Hi. My name is Scott Ohman, S-C-O-T-T, O-H-M-A-N. And I'm—unlike many of the people you've heard speak tonight, I am not an engineer. I am not a lawyer. I am not a professional. All I know is I'm 42 years old. I grew

up in Humboldt County. One of my first memories is swimming and rafting with my family on the Klamath and Trinity Rivers. And throughout my life, I've watched these already damaged rivers from my childhood be destroyed by these dams.

Last summer I was up on the Klamath River, launched just below the dam, floated about 40 miles. We thought—it's early July. We brought three different forms of water purification with us. We brought filters. We brought tablets. We brought multiple levels. And we thought that would be sufficient for our needs, that we could take water from the river for our needs over this five-day trip. And we found, immediately upon arrival, that that was not the case. It was already posted, warned by the rangers that this water is not drinkable under any conditions, even boiled.

Additionally, again, early summer, early July, we could see areas of the rivers, slow moving areas, that were just choked. You didn't want to get in the water. Several of us developed rashes throughout the trip.

And I'm going to paraphrase the words of the youngest member of our group who said: How is this possible? How is this allowed? If that was a polluting factory upriver that was killing fish, that was giving people rashes, that was making the water undrinkable, there would be massive lawsuits. That factory would be fined. It would be shut down. We wouldn't be talking about a 20, a 40-year process. We wouldn't be talking about a process that we've been discussing my entire life. It would be taking action immediately.

So I just want to echo what many other people have said, that—and I want to thank everybody who's been in this fight even longer than I've been alive. But the time is now. Let's take down these dams.

Response to Comment IND48-ORAL-3
Please refer to Master Responses GEN-1 and GEN-2.

Paniak, Walter

Comment IND54-ORAL-1
I support removal of the four Klamath dams.

Response to Comment IND54-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment IND54-ORAL-2
The lower four Klamath River dams block hundreds of miles of historic salmon spawning grounds while creating conditions that cause fish disease and parasites in the river. The dams' reservoirs host massive blooms of toxic algae each year, posing health risks to people and pets using the river. The dams are a leading cause of salmon declines in the Klamath Basin. The Water Board's

draft EIR supports what dam removal advocates have said all along—dam removal helps alleviate these conditions.

Response to Comment IND54-ORAL-2
Comment noted.

Comment IND54-ORAL-3
California's draft EIR looks at potential impacts associated with the removal of the lower four Klamath River Dams as compared to a no project alternative, partial dam removal, construction of fish ladders, removal of only three dams, and removal of only two dams. In the end, the Water Board staff finds that, "In looking at the range of benefits and impacts the State Water Board has identified the Proposed Project as the environmentally superior alternative."

Response to Comment IND54-ORAL-3
Comment noted.

Comment IND54-ORAL-4
I agree that the removal of four dams is the only alternative that complies with California's clean water laws. Dam removal will also help bring salmon back to the Yurok, Klamath, Karuk and Hoopa Valley Tribes, and help to restore the North Coast fishing industry and related coastal economy.

Response to Comment IND54-ORAL-4
Comment noted.

Comment IND54-ORAL-5
Dam removal benefits rate payers by saving them money, and local economies by creating dam removal and fishing jobs, and will not impact flows or irrigation deliveries.

The North Coast and Klamath River communities are economically depressed, and much of the area is classified as a food desert. The loss of salmon has widespread health, economic and cultural impacts. In many years there are extremely few, or no, salmon for Tribal people. This has created a situation where the Klamath's native communities have suicide rates that are 12 times the national average and diabetes and heart disease rates that are over three times the national average. Bringing back the salmon will help right this wrong while providing local jobs.

Response to Comment IND54-ORAL-5
Please refer to Master Response GEN-2.

Comment IND54-ORAL-6
Removing the dams would also support California goals as they relate to environmental justice and Tribal consultation.

Response to Comment IND54-ORAL-6
Comment noted.

Comment IND54-ORAL-7
This is why California must act to remove four dams on the Klamath River by issuing a dam removal permit.

Response to Comment IND54-ORAL-7
Comment noted.

Pce, Felice

Comment IND23-ORAL-1, Speaker Card
PacifiCorp must mitigate now; SWRCB should require it as per Hoopa Tribe claims & court victory.

Response to Comment IND23-ORAL-1
Thank you for your comment.

Comment IND23-ORAL-2, Speaker Card
PC must put up more $ if needed

Response to Comment IND23-ORAL-2
Comment noted.

Comment IND23-ORAL-3
MR. PACE: Felice Pace, P-A-C-E. I'm with the local North Group of the Sierra Club, but here I'm speaking for myself. And I'm speaking mostly to the people here because it's important that we use this opportunity to understand—better understand this process.

The world—I've been a climate activist for about 35 years. I've lived 35 years up on the Scott. And now I live in Klamath Glen near the mouth of the river on the Yurok Reservation which I'm grateful to live on and grateful to be able to be here at this meeting on Wiyot land.

Response to Comment IND23-ORAL-3
Please refer to Master Response GEN-2.

Comment IND23-ORAL-4
If the world was perfectly just, PacifiCorp would be responsible for removing the dams which they own which have become nonperforming assets. It's because, if they were relicensed with the requirements that have already been decided on by an administrative law judge due to the work of some great biologists, they would lose an estimated $20 million a year. That's from the California Energy Commission, I believe.

The KHSA is a sweetheart deal for a one percent corporation as a result at tax payer and rate payer expense, rate payers and customers. I'm both. But if they get the dams out, I can live with that. And we should be able to live with it. (Inaudible.) But if more money is needed, it's the stockholders that should step up. They're not contributing anything right now. And that may be the case.

Also delays serve the corporation which gets to continue making money without having to do very much to help salmon. And I'm very hopeful that—Hoopa Tribe just won a lawsuit that I think will help us with that and get more mitigation for water quality and Coho. The water board should require that PacifiCorp do a lot more to help salmon until the dams are actually out.

Response to Comment IND23-ORAL-4
Please refer to Master Response GEN-2.

Comment IND23-ORAL-5
If the Klamath's Renewal Corporation fails – I hope it doesn't—and we have representatives here if you want to meet them later. The Hoopa Tribe will be there to make sure the dams come out. They won that lawsuit. They put a lot of time and money into it. Their recent victory assures that the interim measures will better protect salmon. I hope we'll see that too. And the water board should require that be implemented now.

But folks, if they have the delusion that the dams remove—the removal of four dams – PacifiCorp owns five on the Klamath, by the way—will fix all the Klamath's problems, the Bureau of Reclamation will still control the Klamath flows and will do all they can, as they have in the past, to minimize those flows in order to maximize the delivery of irrigation water to federal irrigators.

Response to Comment IND23-ORAL-5
Please refer to Master Response GEN-2.

Comment IND23-ORAL-6
So if folks have the delusion, they should also rethink the delusion that removing four dams will solve the water quality problems. As you've heard in the very excellent presentation, it will make some substantial help to water quality.

Response to Comment IND23-ORAL-6
Comment noted.

Comment IND23-ORAL-7
However, a fifth PacifiCorp dam, Keno, will be transferred—should have been part of this process by the way. Shouldn't have been deferred to later – will be transferred to reformation and will remain. That deal has been done already but not implemented. It receives—Keno, the next dam up the river, at the top of the

Cascade Canyon, right before it enters the Cascade Canyon from the upper basin in the river that is, it receives the most of the highly polluted federal irrigation water from 200,000 irrigated acres. It has the worst water quality in the whole basin.

That water leaves Keno and flows down the Klamath River. Fixing Klamath water quality requires fixing Keno. And the water board, PacifiCorp, and (Inaudible.) are remiss in not making that happen.

That's all about—that's about all I have to say. Thank you all for coming. Great to see all these young people here for a change. At a lot of these hearings it's just us old folks.

But I have a few copies of this which I'll leave in the back for anybody that wants it. Thank you

Response to Comment IND23-ORAL-7
Please note that Keno Dam is in Oregon. Actions of the Proposed Project in Oregon are described in general terms in the Lower Klamath Project EIR, but the discussion of actions in Oregon are limited to those with the potential to adversely impact the California environment. Oregon's Department of Environmental Quality (ODEQ) issued a separate water quality certification for the Proposed Project that addresses water quality impacts in Oregon, including removal of the J.C. Boyle Dam complex. Federal Energy Regulatory Commission (FERC) and other federal agencies will analyze impacts of the Proposed Project in both states.

Ryerson, Diane

Comment IND17-ORAL-1, Speaker Card
Want the 4 dams removed primarily to promote salmon recovery; salmon are vital to well-being of our indigenous neighbors and I want to support them.

Response to Comment IND17-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment IND17-ORAL-2
I support removal of the four Klamath dams.

Response to Comment IND17-ORAL-2
Please refer to Master Response GEN-1.

Comment IND17-ORAL-3
The lower four Klamath River dams block hundreds of miles of historic salmon spawning grounds while creating conditions that cause fish disease and parasites in the river. The dams' reservoirs host massive blooms of toxic algae each year, posing health risks to people and pets using the river. The dams are

a leading cause of salmon declines in the Klamath Basin. The Water Board's draft EIR supports what dam removal advocates have said all along—dam removal helps alleviate these conditions.

Response to Comment IND17-ORAL-3
Comment noted.

Comment IND17-ORAL-4
California's draft EIR looks at potential impacts associated with the removal of the lower four Klamath River Dams as compared to a no project alternative, partial dam removal, construction of fish ladders, removal of only three dams, and removal of only two dams. In the end, the Water Board staff finds that, "In looking at the range of benefits and impacts the State Water Board has identified the Proposed Project as the environmentally superior alternative."

Response to Comment IND17-ORAL-4
Comment noted.

Comment IND17-ORAL-5
I agree that removal of four dams is the only alternative that complies with California's clean water laws. Dam removal will also help bring salmon back to the Yurok, Klamath, Karuk and Hoopa Valley Tribes, and help to restores the North Coast fishing industry and related coastal economy.

Response to Comment IND17-ORAL-5
Comment noted.

Comment IND17-ORAL-6
Dam removal benefits rate payers by saving them money, and local economies by creating dam removal and fishing jobs, and will not impact flows or irrigation deliveries.

The North Coast and Klamath River communities are economically depressed, and much of the area is classified as a food desert. The loss of salmon has widespread health, economic and cultural impacts. In many years there are extremely few, or no, salmon for Tribal people. This has created a situation where the Klamath's native communities have suicide rates that are 12 times the national average and diabetes and heart disease rates that are over three times the national average. Bringing back the salmon will help right this wrong while providing local jobs.

Response to Comment IND17-ORAL-6
Please refer to Master Response GEN-2.

Comment IND17-ORAL-7
Removing the dams would also support California goals as they relate to environmental justice and Tribal consultation.

Response to Comment IND17-ORAL-7
Comment noted.

Comment IND17-ORAL-8
This is why California must act to remove four dams on the Klamath River by issuing a dam removal permit.

Response to Comment IND17-ORAL-8
Comment noted.

Silvaggio, Anthony

Comment IND13-ORAL-1, Speaker Card
I want to state my support for the Full Removal of the lower four Klamath River dams. The draft environmental impact report, the TRIBES, and fisheries experts all agree that this is in the best interest of the River. The Dams need to be Removed now! We need to act swiftly as the fisheries are on the verge of collapse

Response to Comment IND13-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Wagenaur, Brian

Comment IND14-ORAL-1, Speaker Card
It is well past time for the dams to come down to revitalize the Klamath's salmon run, as the Yurok tribe and other tribal Nations rely on it for their cultural lifeways. And also as a high quality Nutritiun source which has been stolen from them. Bringing the river back to free-flowing conditions will benefit the many, not just a select few.

Response to Comment IND14-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

2.4.3 Orleans Public Meeting—February 7, 2019

This section presents comments received on the Draft EIR during the Orleans public meeting on February 7, 2019, and the State Water Board's responses to those comments. Oral comments (including written comments submitted at the public meeting) and responses in this section are organized alphabetically by affiliation name, and for individuals, by last name, first name, following the set of commenters with affiliations. To determine whether your comment is associated with another meeting location, please refer to Table 2-3.

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Karuk Tribe, Craig Tucker

Comment TR12-ORAL-1

MR. TUCKER: My name's Craig Tucker, C-R-A-I-G, T-U-C-K-E-R, a consultant for the Karuk. I just—couple things. I want to really thank the staff from the—from the water board.

Response to Comment TR12-ORAL-1

Thank you for your comment.

Comment TR12-ORAL-2

Think you guys are given this really enormous task to put these documents together as quickly as possible. I'm really impressed that you guys were able to do this. And I think, for the most part, you really nailed it.

The Karuk Tribe agrees with the fundamental conclusions that the watter board makes, that full project removal is the best way to improve water quality and fisheries on the Klamath. And that's what this document concludes. And so we support that and appreciate the hard work that went in from you guys and the folks that work with you for you to get there. So just share. I don't know. I'll talk for them.

Response to Comment TR12-ORAL-2
Please refer to Master Response GEN-1.

Comment TR12-ORAL-3
And I want people here to know that, you know, a lot of folks here have been to this—feel like you've been to this same meeting all over again. We've had these same kinds of meetings around PacifiCorp's attempts to get any license and negotiated a settlement that was going to go through congress. So we had another round of EIR, EISs from that. So this is like round three on the EIR, EIS process for dam removal. And, you know, there's going to be another round because once we get through this with the state, I presume we'll have an EIS from FERC that will also have hearings.

So I know it feels like you've been getting up and getting down and issuing these same emotional heartfelt talking points again and again and again, folks. 2

But we're going to do it until these dams are out, right?

So I just want to say thanks. We will have comments that we'll file in writing. I think most of the concerns we have are more cosmetic than anything else. For example, we don't think we own rights to foremost expert on Karuk (Inaudible.). We'll provide some other sources for that.

But for the most part, we really are proud of the document that you guys produced. And we stand behind it.

Response to Comment TR12-ORAL-3
Comment noted.

Karuk Tribe, Kathy McCovey

Comment TR10-ORAL-1
Lifelong Resident + Land owner on the Klamath River, member of Karuk Tribe. Worked for USDA Forest Service for 40 years.

Discuss Water Quality & Salmon Impacts on me

Response to Comment TR10-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-2.

Comment TR10-ORAL-2

MS. MCCOVEY: My name is Kathy McCovey. My name is Kathy McCovey, K-A-T-H-Y, M-C-C-O-V-E-Y. I was born and raised on the Klamath River, Happy Camp. But my people come from Somes Bar Village of (Inaudible). I fished with my grandfather all my life on the fall dip net fishing, remember eating many salmon. My first memory is eating salmon. And I'm currently taking a fire refresher class. So thank you for letting me go first. I'll say this real quick.

I'm a lifelong resident of the Klamath River for 61 years. I own property in Happy Camp and—in the town of Happy Camp and on Indian Creek. And I also own property at Johnson's 50—50 acres through which the Klamath River in its entirety flows.

Response to Comment TR10-ORAL-2

Please refer to Master Response GEN-2.

Comment TR10-ORAL-3

I support the removal of the four dams on the Klamath River. The Klamath River water quality has deteriorated to the point that fish die yearly. And I cannot go into the river from July to November. Then, I hope the rains come to flush the river out so that I can enter the river and the animals can enter the rivers. Even my dogs, I keep my dogs out of the river that time of year.

Response to Comment TR10-ORAL-3

Please refer to Master Response GEN-1.

Comment TR10-ORAL-4

I just turned 61 yeas old. I got sick last February. I went from weighing 155 pounds to weighing 117 pounds. My stomach hurt and I could not eat. I learned I was getting sick from beef and beef by-products from food from the store. I switched my diet. I learned that salmon, with its omega and its oils, that it could help cure me. I started eating it, and it did.

The elders say that's what happens. I got older. I ate fish—I mean, I ate beef. All my life, I ate the white man's food. And now I can't eat it anymore.

You know, our people said a long time ago, the older people said when the white people came they brought the white man's food. The younger boys—the younger boys and the younger people, they ate it and the middle-aged people. But the old people wouldn't eat it. They didn't like that white man's food. Then, after a while, everybody started eating white man's food. And the elder people said: They're going to get sick. What's going to happen to our people? Oh, what will happen to our people?

And it's coming true. It is really coming true. When I switched to salmon, I started gaining weight back. I could eat anything. Now, I'm 125 pounds. I'm shooting for 135. That's my strongest weight. But it's because of salmon.

I went downriver and I asked the Yuroks for salmon because I was sick. And they gave me salmon. I got salmon for eight months.

And what I mean to say, sometimes in this rural area salmon is the only food that the older people who are limited in income can get here on the river that is fresh and nutritious. As Orleans, Happy Camp, Weitchpec, Pecwan and Hoopa are considered food deserts. We live in a land for thousands of years where our people excelled and lived and were healthy. And we have one of the strongest ceremonial centers on this earth.

But now, we don't have food. We don't even sell meat down in Orleans. Hoopa doesn't even have a store. We need our salmon to come up our river to insure that we will continue to survive as Karuk people as we have for thousands of years.

Thank you for your time. I have to go to fire training.

Response to Comment TR10-ORAL-4
Please refer to Master Response GEN-2.

Karuk Tribe, Josh Saxon

Comment TR11-ORAL-1
MR. SAXON: A little taller than Kathy. J-O-S-H, S-A-X-O-N, executive director of the Karuk Tribe. And I—first of all, I know Kathy's gone now. But that's a pretty powerful message. And I would echo those comments as well.

Response to Comment TR11-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-2.

Comment TR11-ORAL-2
But also I would like to point out that mitigation in particular, you know, from the tribe's perspective, the single biggest mitigation for fish for the Klamath River system is dam removal. And we can sure try to do other things in the process of dam removal to alleviate impacts. But in the greater scheme of things, dam removal is the number one reason why we have the degradation of water quality and the impacts to our fishery on the Klamath River.

The other one I would like to make is in terms of fisheries' restoration. I think a lot of our energy moving in that direction has been largely impacted by, not only funding, but there's a sense that we need to do more and more in terms of pre-imposed dam removal. And from our perspective the more involved the Karuk Tribe is in that process, I think the better our data will be in terms of how we can

continue to monitor and alleviate restoration concerns, both pre-dam removal, during dam removal, and after dam removal.

Response to Comment TR11-ORAL-2
Please refer to Master Response GEN-1.

Karuk Tribe, Leaf Hillman

Comment TR13-ORAL-1
MR. HILLMAN: My name is Leaf Hillman, L-E-A-F, H-I-L-L-M-A-N.

I'm the director of natural resources and environmental policy for Karuk Tribe and a resident of this valley. And I will speak both in my professional capacity as well as my personal capacity.

Well, I have been involved in this project for—since before it became a project, for many years now. I understand the process of where we're at now and the draft EIR. And I encourage folks to move forward expeditiously to, at long last, accomplish what many of us believe is the most important work of our lifetimes in terms of reversing the many impacts and degradations that this basin has suffered over the years from any number of sources.

Response to Comment TR13-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-2.

Comment TR13-ORAL-2
Dam removal is the single most important thing that we can do in our lifetimes to promote the cause of healing and restoration in this basin. I encourage folks to say this is about the—continue to hear some of the same things that have been repeated over the years about we need to do more studies. I would propose that the time for studying has past and the time to remove the dams is upon us and that we need to stay focused on the task at hand which is removing dams on the Klamath River.

There will be those who want to create issues with—for the sake of dragging the process out. I don't know. This is probably—I'm note sure what year it was now. But somewheres in—around 2006 or something like that, it doesn't seem that long ago. But it's been a couple of years ago. And at that time, we had a—a hearing similar to this over across the river over at the tribal office over there. And we had—a lot of our elders were there at that time and a lot of folks who have since—are no longer with us today. And I was a much younger man at that time.

And my auntie said, "I want to go to this meeting because I want to tell the government what they have to do to do the right thing." And she couldn't hear very good. And she was blind. And at that time, she had broken her hip and she couldn't walk. But she still wanted to go to the hearing. And she wanted to look

at the people who were there from FERC who were there conducting this hearing.

And there was a table like this seated. And because she's blind and she couldn't hear very good, she asked me to sit her down in front of the table so she could kind of see shadows because she wanted to be able to hear them and kind of see what she could see.

It was frequently uncomfortable. I packed her into the building and I put a chair right in front of the table and set her in front of the FERC people that were there conducting this hearing.

I asked her if she wanted to speak. And you know how people who can't hear kind of speak a little loud at times. And so I whispered in her ear. I said, "Do you want to speak?"

And she said, "You damn right I want to speak."

I said, "What do you want to tell them?"

And she said, I want to tell them to go to hell.

Of course, the whole room heard her. And so—but she insisted on speaking and giving testimony. And when she gave her formal testimony she said, "I'm 86 years old. And if someone would give me some dynamite, I would float into that dam and blow it up. Because I've lived my life."

And that would be a fitting thing to do because she felt like she would be contributing and her life would have been worthwhile if she could blow up the dams.

Turns out—and I tell you that story because, of course, she's no longer with us today. But a lot of people who testified at that hearing with a great deal of passion and have seen a lot of things on this river over the years felt as strongly as she did.

We have a new generation now. Younger people who—who have never known really. You know, it's like—I've only been alive for 50 some odd years. And in my lifetime, a lot of younger people here today can't remember the things that I've seen in my lifetime on this river. Each generation, we lose more.

And each generation likes to say we want to leave things better than we found it for the next generation. We all aspire this for our children, that we leave them something that may be better than the way we found it. We want to provide them with a better life and more opportunities than we've had. And I fear that we're going the opposite way at this point. And I think the last couple of generations of

people have suffered under the burden of wanting to provide better opportunities and a better life for our people, for our kids, and not being able to do that. Not for the lack of trying.

Response to Comment TR13-ORAL-2
Please refer to Master Response GEN-2.

Comment TR13-ORAL-3
But the dams on the Klamath River are a scourge to our communities. And short of removing these dams, we can't fix the problems that are—we have on the Klamath. But with removing dams on the Klamath River, we have an opportunity, for the first time in a couple generations, to leave a better world than we came into.

I was born right across the river from this place, a few years ago. And I've never left this community. This is the community that I was born and raised in and am connected to. And I am in the process of—I won't say I'm ever done raising my kids. But I have children in the range—my youngest one is 14. Oldest one is 39, something like that.

And every one of those kids in between, each of those kids have a little different experience with the Klamath River than the one before them. And that experience is common and that's—each successive kid knows a little bit less about the Klamath River because they have—there's less of it to enjoy and to help sustain in a physical sense and a spiritual sense.

We are salmon people. We're connected to this place, this river, the fish. Spring Chinook Salmon listing, we've petitioned for that listing, not because we think that there's a law of Endangered Species Act that's going to save them. We think the last ditch effort to try to do something. It's not a silver bullet. But if we don't do something, it's the cascading effects of these dams, it's cumulating rapidly. And so I encourage folks to keep your eye on the ball and let's remove the dams on the Klamath River. And let's restore the Klamath River to some semblance—let's give it a chance.

If we do nothing to restore the Klamath Basin besides remove dams, well, that's something. Because giving the fish and the system an opportunity to heal itself, which—turns out it's better equipped to heal itself than we'll ever be to restore it.

So just allowing it to recover, it will do that. Fish will recolonize the upper basin whether we do anything or not. All we've got to do is get these dams out of the way and let the fish figure it out.

Response to Comment TR13-ORAL-3
Please refer to Master Responses GEN-1 and GEN-2.

Karuk Tribe, Sinead Talley

Comment TR14-ORAL-1

My name is Sinead Talley, S-I-N-E-A-D, last name, T-A-L-L-E-Y. I'm an Orleans community member; lived here for most of my life. I'm of the generation that Leaf was speaking about that has never seen a time without dams on the Klamath River. And I guess I hadn't thought about preparing any remarks for what I was going to say. But I can only speak to my own experience. And that's as a person who entered the work force here. And I grew up in the community.

My first job was at the Mid Klamath Watershed Council here in town as a stewardship intern which quickly fell into interest in becoming a fisheries technician a couple years later. So I did seasonal work for six summers along the Klamath before entering my current job now as grants agreements coordinator at the Department of Natural Resources.

So I've been working in and along the river in some capacity for most of my life for the last decade. And I guess all I can really say is that I've seen grown-ups seeing the work that people have been doing to get dams removed. And that's been really impactful not only on my development but in the work I have done in and along the river where, especially during the years that I was a fisheries technician with some of the worst years of California droughts that—you know, going—we were taking crews out, not only with, you know, air quality masks on for some of—or to get rid of some of the smoke impacts but also going down into the river basin and trying to count fish where there are no fish, trying to—I can remember there were times where we couldn't even make our crews get into the water because the quality was so poor. It smelled like propane in and around any time you got near the water and that's been more and more routine each year.

Response to Comment TR14-ORAL-1

Thank you for your comment. Please refer to Master Response GEN-2.

Comment TR14-ORAL-2

The fact that there's still opposition to dam removal after so much evidence has clearly delineated the very real impacts this is having, not only on the salmon that we rely on—I'm standing here today with fish underneath my nails and my breath probably smells terrible because I am, fortunately, still able to eat fish and salmon here along the river. I don't know that's going to continue.

Last year—in 2018, I believe, was the second lowest count ever recorded of Spring Chinook in the Salmon River during the Salmon River dives. If I'm not mistaken it was somewhere around 115 fish returning from what used to be a run of hundreds of thousands. And we're a primary source of food for a cut of people.

So like I said, I have—I don't know where I'm going with this except to say that this is absolutely imperative that this not be postponed any longer. Because as—I've been grateful to work and learn from many people in this room who have taught me a lot about living along the river and what that means and how to engage and contribute in a meaningful way.

So that's what I'm trying to do right now, as much as my voice is shaking. And I'm not sure what I'm exactly trying to say, but—yeah. If—I can't understand why this would be delayed any longer. And, as much as it's humanly possible to continue to push for a dam removal, I think that's what we all have a responsibility as human beings to do, especially in light of the fact that climate change is increasingly impacting our populations of all fish and wildlife and beings that live along this river already.

So yeah, I don't have a lot more to say than that. And I hope that some of the people that we were waiting on to hear from today are also able to speak to this because I know there's people who have dedicated their lives to this work. And that's not for nothing. Or it shouldn't be at least, because even—I remember when I was working for the Mid Klamath Watershed Council, we would actually survey, not only from—not only mid Klamath tributaries. But we actually traveled, at least a couple times a season, all the way to Iron Gate.

And to see how impactful that is, even just to see this huge unnatural structure blocking this entire river system and to know downstream, being someone who lives downstream of that, what kind of impact that's having on our people.

I mean, to see—even just to see—going out into the field and have that—come back not seeing fish day after day, even though you're going a thousand feet up every week that you're expected to go, that's demoralizing. It's absolutely devastating. It was to myself in my own mental health when I worked there. I can't tell you how impactful that was on my depression and anxiety about the state of the world that we live in which seems to be increasingly worse by the day.

But—so yeah. Anything that we can do to mitigate those impacts is absolutely essential. And I would—I would urge anyone who is in a position to do something about that to take a step forward and to make that a priority.

Response to Comment TR14-ORAL-2
Please refer to Master Responses GEN-1 and GEN-2.

Klamath Justice Coalition, Dana Colegrove

Comment ORG5-ORAL-1
MS. COLEGROVE: Hi. Dana Colegrove, D-A-N-A, C-O-L-E-G-R-O-V-E.

I'm here to say we need to remove the dams. Please do the permitting process as fast as you can because time is running out. You guys, the first time they said dam removal: Oh, yeah, 2012.

Oh, yea, 2012.

Now, it's 2020. And now, it's 2021. Now is it even going to be dam removal? I see you guys have a list: Well, maybe we'll take out one, maybe we'll take out two, maybe we'll take out none. That's not acceptable.

Thank you.

Response to Comment ORG5-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Klamath River Renewal Corporation, Dave Meurer

Comment ORG8-ORAL-1
MR. MEURER: Good afternoon. My name is Dave Meurer. I'm the community liaison for the Klamath River Renewal Corporation, speaking on their behalf today.

Klamath River Renewal Corporation is part of a cooperative effort to reestablish the natural vitality of the Klamath River to support all communities in the basin.

KRRC's job is to take ownership of four PacifiCorp dams and remove these dams, restore formerly inundated lands and implement required mitigation measures in compliance with all applicable federal, state, and local laws.

KRRC is seeking regulatory permits to accomplish this project including the water quality certification by the State of California.

Response to Comment ORG8-ORAL-1
Thank you for your comment.

Comment ORG8-ORAL-2
The DEIR is an impressive and thorough review of the potential benefits and impacts of removal of the Lower Klamath Project hydroelectric dams on the Klamath River.

KRRC commends the water board staff and their consultant for its work on this analysis. Think there's quite a bit for community members and stakeholders to learn from.

The DEIR shows the proposed project to be environmentally superior compared to the six alternatives to the project that the water board analyzed in both terms of project benefits and negative impacts. The report shows that most potential

impacts from the project are small and short term and can be reduced with mitigation. It also shows many project effects are beneficial in the short and long term which is an important finding for those who are interested in the long-term health of the Klamath River and the community and to the ecosystems that depend on it.

Response to Comment ORG8-ORAL-2
Comment noted.

Comment ORG8-ORAL-3
The DEIR shows the proposed project protects water quality by restoring the free-flowing condition of the river and insures volitional fish passage and that the project will be a boom to salmon and steelhead populations. Many of the species expected to recover following dam removal are tribal trust species that are important to the culture and health of some tribes on the Klamath River.

The DEIR also shows an expected increase in recreational and commercial fishing industries.

Response to Comment ORG8-ORAL-3
Comment noted.

Comment ORG8-ORAL-4
KRRC is pleased with these findings in the DEIR and looks forward to the final EIR in obtaining other required permits and then implementing the project, including mitigation measures to enhance benefits and reduce adverse impacts.

KRRC will be submitting written comments regarding the DEIR in the near future. We are encouraged that this DEIR brings KRRC one step closer to project approval.

Response to Comment ORG8-ORAL-4
Comment noted.

Mid Klamath Watershed Council, Mitzi Wickman

Comment ORG15-ORAL-1
I support dam removal on the Klamath River.

Response to Comment ORG15-ORAL-1
Thank you for your comment. Please also refer to Master Response GEN-1.

Chichizola, Regina

Comment IND43-ORAL-1
MS. CHICHIZOLA: Well, there's a story that I haven't told yet that I thought that I should.

MS. RAGAZZI: So state your name.

MS. CHICHIZOLA: Regina Chichizola, C-H-I-C-H-I-Z-O-L-A.

Last summer, because the river was in such bad shape and there were no spring salmon, we actually had to go—to beg tribal members from the Yurok tribe to catch fish from the ocean to donate them to the first salmon ceremonies for the Karuk Tribe. And no one was able to catch any.

So then we had to beg fishermen to donate some salmon for the first salmon ceremonies (Inaudible.). And people were going to charge a bunch of money because they couldn't find any free salmon either. Finally they were able to catch them. But it took, like, three separate people driving to the coast and putting four salmon from one cooler to another to get salmon to the first salmon ceremonies for the Karuk Tribe this year, which I just think is something that is really intense and hard.

And it was a lot of drama for people to even, like, ask each other and to, like, face the fact that they had to ask commercial fishermen. I mean, these are salmon fishermen that were begging commercial fishermen to get salmon to the first salmon ceremonies. And it was just really a lot of work and really heartbreaking. And it was so that four salmon could be cooked for ceremonies and everyone could get like a bite, a couple bites of fish.

Response to Comment IND43-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-2.

Comment IND43-ORAL-2
So anyway, I have talked a lot at these hearings. It's just something I hope never happens again once you get these dams down. And I hope that the permits can be issued quickly so that they can start to recover fast.

But we're also buying time for these guys.

And I have wanted to tell that story for a while so you guys just really understood how much work it is to just even try to do the most basic things because you can't have a first salmon ceremony without any salmon.

So anyway—so please take the dams down, and that is it. And I still think you guys should leave if they're not here, since they're taking so long.

Response to Comment IND43-ORAL-2
Please refer to Master Response GEN-1.

Dosch, Stefan

Comment IND50-ORAL-1
I support the removal of these dams and the return of the Klamath to a healthy habitat for fish and people alike. This is a long time coming, please continue with this dam removal.

Response to Comment IND50-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment IND50-ORAL-2
MR. DOSCH: Hi. My name's Stefan Dosch, S-T-E-F-A-N, D-O-S-C-H. And I wasn't going to speak today. But I just wanted to speak to the comments that have been brought up about silt. And a fisheries biologist at the Yreka hearings—I'm kind of using this as a moment to speak to everybody, not just the board things about that.

Response to Comment IND50-ORAL-2
Comment noted.

Comment IND50-ORAL-3
And it was pointed out that EIR describes that the amount of silt that's going to be released in this project is actually within the accepted fluctuation in silt. This is an incredibly silt moving river.

So the fish survived a period of unregulated hydraulic mining where people were just washing mountains into the river. And the fish survived that. And so I think that this is the point that I think you guys can take away is that you should have a good timeline that really shows that the plan is for it all to happen in winter months and in January and times when the high flow is going to take care of that.

So I think that's been—I don't know. It's been considered a lot in the process. But I do understand that it hasn't gotten across to everybody, you know, the right way because maybe there's a better way to talk about things which show timelines and this and that or comparisons and stuff.

Response to Comment IND50-ORAL-3
Comment noted. Please refer to Volume III Attachment 1 Section 2.7 *Proposed Project* Figure 2.7-1 that shows the timing of reservoir drawdown between January and March, which is also the period of greatest sediment transport (see Section 3.2.5 *Water Quality – Potential Impacts and Mitigation* Potential Impact 3.2-3), along with the distribution and life-history timing of aquatic species in the Klamath Basin.

Comment IND50-ORAL-4
Other than that, I just want to say that I support the --

I talked at the Yreka hearing. So I didn't know if I was supposed to use time twice.

MS. RAGAZZI: You're welcome to do that.

MR. DOSCH: All right. Well, then yeah. I go out on the Klamath and Salmon Rivers counting salmon carcasses with the kids. And they're really hopeful that this will happen. That's what gives them hope for the future.

So thanks. And keep doing it for them and for everybody who's alive here and—yeah. Especially the fish that can't come in here and tell you what they're experiencing because they're the ones who know. And we just get to see and think we know this and that.

So just share. I don't know. I'll talk for them.

Response to Comment IND50-ORAL-4
Please refer to Master Responses GEN-1 and GEN-2.

Eckert, David

Comment IND15-ORAL-1, Speaker Card
Drawdown + mitigation measures

Response to Comment IND15-ORAL-1
Thank you for your comment.

Comment IND15-ORAL-2
I'm David Eckert, E-C-K-E-R-T. I'm in favor of the dam removals but I have some fears about the mitigations involved in water quality control.

Response to Comment IND15-ORAL-2
Please refer to Master Response GEN-1.

Comment IND15-ORAL-3
In 1969, they blew up Sweasey Dam on the Mad River and they lost an entire run of salmon that year due to the siltation of the lower Mad River and also all the holes filling in with silt and sand. And also smothered the fish because their gills filled up with the silt. And on the Elwha River in the Olympic Peninsula where they just removed a dam, it actually created a new delta in the Puget Sound. And the amount of silt involved was incredible. And I fear the loss of one or two seasons of fish when we talk about the silt removal from behind the dams. A cubic yard is three by three by three. That's about a pickup load of silt.

Can you imagine your pickup couple feet deep in silt? Now picture 15 million pickup trucks of silt being dumbed into the Klamath River.

And what doesn't get washed out the bottom, they propose using mining techniques of hydraulically mining the silt into the river and some of the four reaches. And I think it needs a closer look than mechanical removal with excavators or hydraulic dredging to remove as much silt from that reservoirs before the dam removal so we don't lose two or three runs.

In the '64 flood, a great deal of the hydrological aspects of the river were changed with the movement of gravel parts. And it's taken over 50 years. And the changes have just started to mediate where there's bedrock showing again.

And I think we should keep in mind not to sacrifice and potentially eliminate salmon with two or three runs being eliminated because of the silt being washed down the river as to the beneficial properties of having the temperature and dams removed for the spawning.

Response to Comment IND15-ORAL-3

The dams proposed to be removed are located at the transition of the upper and lower portions of the Klamath Basin; natural sediment production per unit area in the volcanic Upper Klamath Basin is relatively low, and natural sediment production in the Middle and Lower Klamath Basin is relatively high. This means that the release of reservoir sediment during dam removal under the Proposed Project would occur in a geographic area that normally experiences high sediment loads during winter storms, thus lessening the potential impacts compared with dam removal projects that have occurred in river basins that experience relatively lower natural sediment production. One aspect of the Proposed Project that is different from many other dam removal projects is that the reservoir sediments have a high water content (approximately 80 percent by volume) and the majority of sediments stored behind the reservoirs are fine-grained (clays and silts), while the channel bed downstream of the dams is predominantly coarse (e.g., cobbles and larger) (Stillwater Sciences 2008). Sediment modeling was undertaken to assess the potential impacts of the release of this sediment (Stillwater Sciences 2008; USBR 2012a). The results were used in developing Potential Impact 3.11-5 (pages 3-765 to 3-775) in Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation*, and Potential Impacts 3.3-1, 3.3-4, 3.3-7, 3.3-8, and 3.3-9 in Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts.* Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources*. Please also refer to Master Response GEO-1 and Master Response AQF-10. Substantial declines in the abundance of coho and chinook salmon populations are not expected for more than one year class (i.e., one generation).

Note that Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 has been clarified to discuss reach-averaged sediment deposition or erosion and bed elevation change results of both sets of SRH-1D simulations that were undertaken by the U.S. Bureau of

Reclamation (i.e., forty eight 2-year simulations and three 50-year simulations) (USBR 2012a). The clarifying edits do not change the conclusions or significance determinations in Potential Impact 3.11-5. Please refer to Volume III Attachment 1 Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 for the revisions.

As described in Section 3.2.5.2 *Water Quality – Potential Impacts and Mitigation – Suspended Sediments* Potential Impact 3.2-3, mechanical dredging of reservoir sediments is not feasible. Sediment jetting is proposed by the Klamath River Renewal Corporation (KRRC) as a way to support targeted erosion of the reservoir sediments during the drawdown process and maximize subsequent transport of the eroded sediments to the ocean. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

The 1964 flood was the largest discharge event in the 1963−2015 period of record for the Klamath River downstream of Iron Gate Dam, with a maximum flow of 25,000 cubic feet per second (cfs) and a recurrence interval close to 50 years. The water flow during reservoir drawdown would be approximately 14,912 cfs, which is equivalent to a 10-year recurrence interval flood (for a slightly longer period of record 1961–2016). The conditions associated with drawdown of the Lower Klamath Project are not expected to be analogous to the 1964 flood. During drawdown of the Lower Klamath Project reservoirs, there would be lower water flow and the river would be maintained within the existing channel, such that there would not be high-intensity rainfall-induced hillslope and channel erosive processes, as occurred during the 1964 flood.

Comment IND15-ORAL-4

MR. ECKERT: David Eckert, E-C-K-E-R-T. Sorry. I'm not a very good public speaker. I don't follow my notes enough, and I left one thing out. Another concern under the mitigation process is the drawdown rates. You're speaking about one to two feet per day on the drawdown. And many of those geological areas are hydrologically connected to the lake itself. And you've got to be very careful to drawdown slow enough so that the ground water around the lake and the soils that are supported by the lake have a chance to drain out. Otherwise, you're going to have some very large landslides and kick up that number of dirt and silt ending up having to be dealt with at a later date.

Response to Comment IND15-ORAL-4

For explanations of reservoir drawdown periods, rates, and sediment discharge, please refer to Volume I Section 2.7.2 *Proposed Project – Proposed Project – Reservoir Drawdown* (pages 2-54 to 2-60), Volume I Section 2.7.3 *Proposed Project – Proposed Project – Reservoir Sediment Deposits and Erosion During Drawdown* (pages 2-60 to 2-69), Section 3.2.4.2 *Water Quality – Impact Analysis and Approach – Suspended Sediments*, and to the Definite Plan (Appendix B to Volume I). Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Regarding the potential for landslides to occur during drawdown, please refer to Potential Impact 3.11-3 (pages 3-761 to 3-765) in Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation,* and to Master Response GEO-2.

Englert, Lissa

Comment IND35-ORAL-1, Speaker Card
PLEASE, LETS DO THIS NOW. I LIVE AT THE CONFLUENCE OF THE SALMON + KLAMATH. I HAVE LIVED HERE 20 YEARS AND IN THIS SHORT PERIOD OF TIME I HAVE WATCHED THIS RIVER DIE AND WITNESSED THE NEAR EXTINCTION OF THE SALMON SPECIES. I SUPPORT THE REMOVAL OF THE DAMS!!!

Response to Comment IND35-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Kertzman, Eileen

Comment IND21-ORAL-1, Speaker Card
I support the dams coming down. I believe the Klamath River will become healthy again once the dams are opened and the salmon will stand a chance to recover and be free of disease.

Response to Comment IND21-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Kinney, Isaac

Comment IND26-ORAL-1, Speaker Card
Please find and implement most expeditions & safe ways

Response to Comment IND26-ORAL-1
Thank you for your comment.

Comment IND26-ORAL-2
MR. KINNY: Isaac Kinny. I want to say thank you to the Karuk people and the Karuk Tribe Council for cultivating this relationship to have this comment period here today.

Again, I'm Isaac Kinny. I live in the village of Weitchpec. I'm from the village of Weitchpec (Inaudible.)

Response to Comment IND26-ORAL-2
Comment noted.

Comment IND26-ORAL-3
I want to really echo a lot of what the previous speakers have said. Complex issues need to be dealt with. And, again, understanding that indigenous people have the best solutions to a lot of the issues we're dealing with. Not just keeping us at the table but actually empowering indigenous communities to be the decision makers. That's a big part of our thinking. The opportunity's here. There are many challenges.

Response to Comment IND26-ORAL-3
Comment noted.

Comment IND26-ORAL-4
Again, we're talking about—I think that's—the silt comment is really important to take into effect of the safety of not just the people implementing this transfer and of this taking down of the dam but the safety of the fish and the other ecosystem that these dams have really impacted and detrimented for years.

So again, to understand, there's regional solutions that have to happen, making sure the investments of economic development are also in the communities making sure that we're not creating systems of dependency for maintenance and the work after the dams are done.

Response to Comment IND26-ORAL-4
For information on fine sediment erosion, transport, and deposition, please refer to Potential Impact 3.2-3 in Section 3.2.5.2 *Water Quality – Potential Impacts and Mitigation – Suspended Sediments*, Potential Impact 3.11-5 (pages 3-765 to 3-775) in Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation*, and Master Response GEO-1. Although there would be a *significant and unavoidable* short-term increase of turbidity, there would be no significant fine sediment deposition. Therefore, mitigation is not required for fine sediment in the long term. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Regarding the safety of dam removal workers, please refer to Volume II *Appendix B: Definite Plan* – Section 3 *FERC Compliance and Dam Safety.*

Comment IND26-ORAL-5
Ownership of the land once the dams are coming down and the maintenance agreements have to go to the indigenous people of that land. It cannot stay in the US government's ownership anymore unless its under that tribal trust jurisdiction. That has to be key, I think, to the long-term planning of what we're talking about.

Response to Comment IND26-ORAL-5
Comment noted.

Comment IND26-ORAL-6

The big opportunity is to have that capital, especially from the other private sectors, right? PacifiCorp, our main stakeholders, right, in this whole project. We all need to make sure that we take that responsibility and not let anyone just walk away and say: Okay. I'm good. Ya'll take care of it now.

Because that is happening far too much. It's happening far too much. The agreements are being trampled on and tread on far too much. The urgency is now. Everybody sees it. We're all voting for it.

As the federal agency, you have a stake as well. Just like us as the community to voice what we need, the government and the agencies have the responsibility to respond. We have to make sure that these—our relatives that cannot speak are continued to be on our minds when we're implementing all of our projects. Let's not create this climate change BS where we're just researching and we're not implementing. That's unacceptable as well.

We have to make sure that, if we're really going to look at the next generation—my kids have three kids that, right now, again, have many challenges that we have to—they're going to have to come up with. Let's make sure to give them the proper foundation to work from it.

And what does that mean?

It means changing who owns the land, the rights to this freshwater, right? We're only using—one percent of the world's water is only freshwater. That's why it's so valuable. That's why it's worth more than gold. We need to protect these systems that have been in place for millions of years. Let's protect the regenerative systems that have been here, for we cannot dominate them with things like dams.

And that's a big, big reason why I'm here today is to talk for the youth because I feel I'm still working on what we need to really do, for myself, right?

For me, I've made sure to prioritize. These are the things that we need to prioritize are the regenerative systems. Because systems will set us free. But, as we see, under the capitalistic system, we are not free. We're having to come and beg for land that was taken, water that was taken. This is freshwater.

Our rate of desalinating saltwater is not sustainable for the population that lives on this earth. So we must protect this freshwater. And we must all do what we can. We have no other choice for the urgency to be done fast and be done—I shouldn't say fast—in the best way that's fast and being able to be done in a safe way for the people and for the species that live within this ecosystem.

We have to be—think relative here and take all of our resources, all of our ideas have to come to the top. It's going to be not just public sector, but the private sector. And that investment has to happen. Because the ways that things have been managed so far are not working. We have to throw that book out.

We need to make sure that any of the frameworks, again, are not just used to suppress indigenous people and people who do not have that capital right now, but to lift them up and create equity in the human beings. Because the type of money that we're seeing is not going to be the type of money we're going to see in 15 years, in 20 years. It's going to be a lot more relational economics. And water's one of the biggest things people are going to try and commodify. But you can't do it.

You've been trying to commodify the land, the water, and the air for far too long. Those are not regenerative systems.

So that's why I want to really make sure to understand, too, how this goes into the other public comments that I've done because this is too much. Let's get to work. We have to do this. And again show us the whole timeline, not just your perspective. Again, the federal agencies are just one piece of this whole thing. Traditional, ecological knowledge has to be protected as well. Do not just take the knowledge and use it for your own betterment. Make sure the indigenous people that have taught us all these things, to where governments are made from, that they're paid back.

How do you do that?

Starts with land ownership.Starts with actual sovereignty and nation building between the U.S. government and the federally recognized tribes and the state recognized tribes and the locally recognized tribes. For these are the communities that have continued to be pushed down.

We have to continue to work together. And so that's what I want to say.

Response to Comment IND26-ORAL-6
Comment noted. Please note that the California State Water Board is not a federal agency.

Myers, Jesse

Comment IND30-ORAL-1, Speaker Card
Keep Dam Removal on Track

Response to Comment IND30-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment IND30-ORAL-2
MR. MYERS: Good afternoon. Jesse Myers, M-Y-E-R-S, J-E-S-S-E.

I'm grateful and proud to call this my home here in Orleans, the community. I operate a wood shop utilizing the sustainable approach on resource materials producing all kinds of wood stuff. Raising a family utilizing cultural ideals to pry food for my children and my community. And I feel this gives good connection to the land. I also volunteer with the OVFD to further my commitment to safety and the well being of people in this town.

Response to Comment IND30-ORAL-2
Please refer to Master Response GEN-2.

Comment IND30-ORAL-3
I come here today, taking off some time from work—to voice my support for the full removal of four dams. Over the past 20 years, I've bonded with this river and these people in this town and connected to this river through fishing, swimming, boating, rafting, playing, enjoying it. This gives me a sense of flowing connection to live that I'm very grateful for.

Seeing the quality of the water and the health of this river system deteriorate over the past 20 years, it's sad. Fear of toxic algae affecting my children and dogs separates me from this life-giving source at times of the year.

So I ask: Keep dam removal on track; grant the permits; draft the certificates of water quality; remove the dams. And we will renew the health of the river which will renew the health of the people. Thank you.

Response to Comment IND30-ORAL-3
Comment noted.

Reise, Blythe

Comment IND8-ORAL-1, Speaker Card
As the owner for 26 year of a fishing/recreation business I have seen the decline of the fishery (salmon & steelhead) and have experienced summer algae levels in the river that have hurt my business

Response to Comment IND8-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-2.

Comment IND8-ORAL-2, Speaker Card
I am in favor of dam removal as the only viable remedy for the water quality issues & the fishery

Response to Comment IND8-ORAL-2
Please refer to Master Response GEN-1.

Comment IND8-ORAL-3
MS. REIS: Hi. My name is Blythe Reis. I am the owner of a fishing and recreation business here on the Klamath River in Orleans. I've spoken at a few other removal hearings, but I wanted to go on the record as saying that, as a business owner for the last 26 years, I've seen a lot of changes. When I came into the fishing—the cabin business, the fishing was fair, not great. It had already gone into decline. But then I saw it go into really serious decline over the years. And I lost a bunch my business that way. Where now they're all going to Alaska and British Columbia.

So we decided to embark on trying to focus on a summer recreational business. And we're very successful at that actually. But recently the algae in the river has begun to affect that business as our alternative.

Response to Comment IND8-ORAL-3
Please refer to Master Response GEN-2.

Comment IND8-ORAL-4
And so I feel hit by—from both sides. And I think that dam removal is a really good option for the future. I don't think the status quo is going to work, period, in the long run and even now.

And even though I feel that it might hurt my business in the short term, maybe the first year or two, I feel like our generation needs to take some hits to secure the long-term future of both the fishery and the Klamath River as a living, breathing being.

I guess that's it. All right.

Response to Comment IND8-ORAL-4
Please refer to Master Response GEN-1.

Robbi, Marc

Comment IND36-ORAL-1, Speaker Card
Issue the permit – Take the dams down

Response to Comment IND36-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment IND36-ORAL-2
MR. ROBBI: Hi. I'm Marc Robbi, R-O-B-B-I. I'm a long-time resident, property and business owner here in Orleans. We have an organic farm and nursery business.

Response to Comment IND36-ORAL-2
Comment noted.

Comment IND36-ORAL-3
I would like to thank you once again for coming out to hear our comments on dam removal. I urge you to okay the current permit proposal and keep the dam removal process going as fast as possible.

Response to Comment IND36-ORAL-3
Comment noted. Please also refer to Master Response GEN-1.

Comment IND36-ORAL-4
As I've stated before in previous hearings over the years, these dams are causing terrible damage to our river's health and salmon and all of us who cherish and depend on them.

Loss of salmon is particularly hard on the health of our native community. The continued existence of these salmon-killing dams is truly an act of genocide and suppression of their culture.

Response to Comment IND36-ORAL-4
Comment noted.

Comment IND36-ORAL-5
The awful water quality exasperated by the dams also has a direct negative impact on my family, not allowing us to swim in the polluted waters that flow right past our home. We haven't fished for salmon for several years now due to the extremely low returns. The joy of watching my son reel in a big salmon has been taken away as well as the health and nutrition they used to supply.

Response to Comment IND36-ORAL-5
Please refer to Master Response GEN-2.

Comment IND36-ORAL-6
These are big takings from us. They impact the quality of our life, our property values, our freedom to life and liberty as given to us under the constitution.

Response to Comment IND36-ORAL-6
Comment noted.

Comment IND36-ORAL-7
We want the dams removed quickly so these (Inaudible.) Further, I would like to talk about the other positive impacts dam removal will have on the entire community of the Klamath basin.

Removing the dams will create jobs and have a very positive impact on the region's economy, both in the actual dam removal and also in the many remediation efforts that are and will take place. Already members of this community have been employed to secure seed sources for revegetating the removal area.

As the owners of a native plant nursery, we rarely grow and sell plants for reclamation projects. We see this as a large economic opportunity this project will bring.

The future of mankind is dependent on reclaiming and repairing the damage we have done to our only home, the earth. Our economy is now dependent on the emerging restoration economy. We must repair the damage done, restore our natural system before it is too late and give jobs to our rural people when doing this important work.

Please, do everything in your power to insure this dam removal project continues and moves forward at top speed.

Response to Comment IND36-ORAL-7
Comment noted.

Short, Barbara

Comment IND4-ORAL-1, Speaker Card
Re longitudinal water quality & fisheries decline/depth of run

Response to Comment IND4-ORAL-1
Thank you for your comment.

Comment IND4-ORAL-2, Speaker Card
Re Due Diligence, sufficient evidence. Dams must come down now no more delay.

Response to Comment IND4-ORAL-2
Please refer to Master Response GEN-1.

Comment IND4-ORAL-3
MS. SHORT: Hi. My name is Barbara Short, S-H-O-R-T. I'm the principal at the school here. I apologize for not being able to come over earlier, but I was subbing for a teacher and so I had a lot of students.

In 1979, I worked for California Department of Fish and Game upriver—the Klamath all the way up to Iron Gate. I did rotations at the dam site. At that time, which was 40 years ago, the professionals in the field were discussing already the decline in the Klamath fisheries as related to lack of access for fish passage and water quality, 40 years ago.

In the time since then, I personally witnessed the steady decline of water quality and decrease in fish with a spike around 20 years ago and then another spike around 15 years ago and then another spike around ten years ago. And the decline has been measured repeatedly. The fish run, I don't believe we can call the fish run declining. It's pretty much gone. So anything from here forward is recovery.

The run of my youth was minimal compared to the run of my elders. And that run is gone. There's almost no evidence of fish in our rivers. It's heartbreaking.

I have been writing letters and testifying at these hearings for probably 20 years. Fifteen years ago I had a junior high class here. I was a teacher at that time. And, you know, we had the big fish kill. But we were still seeing these recurring juvenile kills. We have juvenile kills every year. And the kids notice it because they play by the river.

So we devoted a whole half year project-based learning to studying the health of our river system. And this involved examining different species, including indicator species. This involved writing to Siskiyou County and the—oh, the county in Oregon just over the line is—I'm failing on the name.

But we got crop records. We got water records. And these kids tracked across reports. And we created a picture of increasing extraction of water from the river system co-occurring with spikes in alfalfa and things that 30 years before had not been grown or were grown in minute levels compared to that time when we examined the records and looking at the growth of algae and whatnot in the river.

They wrote letters to fisheries' biologists at OSU to discuss this problem. The internet was still not really functional here. We had to be old school. And we were the group that broke the news locally around (Inaudible.) Shasta which they adjusted that name.

And all of the research the kids did really pointed to how this cycle was supported by the poor water quality related to the dams. And it was very empowering and powerful for them to feel like: We understand the problem; now this is something we can address.

They all wrote letters to the hearing boards. Many of them are professionals who testified today because they are grown up now and have been motivated to work in natural resources.

I am disheartened that conversations of concern from 40 years ago and at least two decades of data gathering, specific to the issues surrounding the dams, which are twofold—I mean, water quality, fish passage. And the decline here of

our water and other dependent species beyond the salmon has only steepened. It's heartbreaking.

And I work in this system. I understand regulations and due diligence very well. I believe you all and who you represent have spent inordinate amounts of time making sure everybody was heard examining and cross-examining all of the scientific evidence, taking into account the economic impacts on the people above the dams. And we need to stop now and make the correct decision which is to bring down the dams because the ultimate responsibility is to the health of the river system.

I understand the pain of the people above the dams with their perceived economic loss. When I worked for Fish and Game and even for a few years beyond that, we had numerous fishing lodges in Orleans. There were, like, six of them. There were two or three in Somes Bar. There were many in Happy Camp, Syad (phon.).

This river would be choked with drift boats during tourist season. You couldn't find a turnout to pull over because every turnout had a Winnebago with people who stayed for a few weeks or a month. And that brought a lot of economy in here. It created a sense of health, there was some flow.

As far as native families, everybody's smoke house was full all the time. Rotation after rotation. We ate salmon a lot. We had salmon burgers. We had salmon steaks. We had, you know, barbecued salmon. We had dried salmon, smoked salmon.

The loss of the fish and the water quality, we can't have dogs and kids in the river at certain periods in the summer. This is unconscionable. And I find this absolutely heartbreaking that this has been allowed to go on when the evidence has been here for almost four decades.

Response to Comment IND4-ORAL-3
Please refer to Master Response GEN-2.

Comment IND4-ORAL-4
So thank you for coming here and listening to everybody once again. Because I've been doing—I've done this many times. And I hope that we can finally move forward. I have had 2020 in my brain for a long time. I will be very disappointed if we aren't physically moving ahead. And that's one year from now. We need to physically move ahead now.

So thank you very much for all of the due diligence. And let's go get those dams down.

Response to Comment IND4-ORAL-4
Please also refer to Master Response GEN-1.

Stender, Laura

Comment IND34-ORAL-1, Speaker Card
I support the removal of the Klamath Dams

Response to Comment IND34-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Stoats, Stormy

Comment IND52-ORAL-1, Speaker Card
I am in support of the removal of Klamath dams. Thank you for helping us get this far in the process.

Response to Comment IND52-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

2.4.4 Sacramento Public Meeting—February 15, 2019

This section presents comments received on the Draft EIR during the Sacramento public meeting on February 15, 2019, and the State Water Board's responses to those comments. Oral comments (including written comments submitted at the public meeting) and responses in this section are organized alphabetically by affiliation name, and for individuals, by last name, first name, following the set of commenters with affiliations. To determine whether your comment is associated with another meeting location, please refer to Table 2-3.

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Auburn Dam Council, Ken Payne

Comment ORG22-ORAL-1, Speaker Card
PROCESS, IT SEEMS THAT THIS EIR IS PREMATURE + OUT OF SEQUENCE TO THE PROCESS.

Response to Comment ORG22-ORAL-1
Thank you for your comment. Please refer to EIR Section 1 *Introduction* (pages 1-1 to 1-8) for a description of the authorization, purpose, and use of the Lower Klamath Project EIR, an overview of the EIR scope and content, a discussion of the EIR process, and a description of public involvement and agency consultation in preparing the Draft EIR.

Comment ORG22-ORAL-2
MR. PAYNE: Yes. Ken Payne, K-e-n P-a-y-n-e. I guess it is an understatement to say that's a tough act to follow. And I'm sort of speechless after hearing from Ms. Bacigalupi.

I used to work in this building on the 11th floor for the Department of Toxic Substances Control. And at that time I was working in Resource Recovering. Since that time I've worked in Permitting and even before that Site Mitigation. But we had a process for everything. There was a process for permitting. There was a process for recycling hazardous waste. There's a process for site cleanup. Several different processes for site cleanup. But it's my understanding that the process for this EIR and for this project has not been followed.

Response to Comment ORG22-ORAL-2
Please refer to response to comment ORG22-ORAL-1.

Comment ORG22-ORAL-3
First of all, it's my understanding that in order for this project to go forward, FERC has to agree to transfer the license to KRRC, which it hasn't done. FERC would also have to decide to remove the dams, which it hasn't done. So the Water Board is really analyzing an incomplete (unintelligible)process.

If FERC decides to remove the dams then there would have to be a new environmental impact statement done. The last one was done in 2012 and it's—it would be—it would have to be updated.

The other part of my understanding is that since the 2012 Environmental Impact Statement was never acted upon by the FERC, Federal Energy Regulatory Commission, there was never a record of decision, then the CEQA process is really—cannot be based on that Environmental Impact Study since it was never really adopted. It's really not—in a sense, not legalized because there was no record of decision.

Anyhow, that's my exertion to the Board today, that there's a process to follow for every project, for every permit, for every site cleanup, and for everything else. For every recyclable material there's a process to follow. And so the process has to be followed, otherwise you can never get to the end.

So I think it's a little bit cart before the horse right now and things should probably hold off until-- until everything—the rest of the process catches up.

Response to Comment ORG22-ORAL-3
Please refer to Master Response CEQ-2.

The Lower Klamath Project EIR is a separate document from the 2012 KHSA EIS/EIR and it has undergone a separate process from that prior environmental review. Please refer to Volume I Section 2.6.4 *Proposed Project – Project Background – Prior/Related Environmental Reviews* (pages 2-24 to 2-25) for a discussion of why the State Water Board determined it should develop a separate EIR, rather than adopting one of the existing environmental reviews of the Klamath Hydroelectric Project (KHP).

Klamath River Renewal Corporation, Matt Cox

Comment ORG23-ORAL-1
MR. COX: Thank you. My name is Matt Cox, M-a-t-t C-o-x. I'm the communications director for the Klamath River Renewal Corporation. I'm speaking on their behalf.

Klamath River Renewal Corporation is part of a cooperative effort to reestablish the natural vitality of the Klamath River for all communities in the basin. KRRC's job is to take ownership of the four PacifiCorp dams then remove these dams, restore formerly inundated dams and implement required mitigation measures in compliance with all applicable federal, state and local laws.

KRRC is seeking regulatory permits to accomplish this project including water quality certification by the State of California.

The DEIR is an impressive and thorough review of the potential benefits and impacts of removal of the Lower Klamath Project hydroelectric dams on the Klamath River. KRRC commends Water Board staff and your consultants for its work on this analysis, and we think there is quite a bit for community members and stakeholders to learn from it.

The DEIR shows the proposed project to be environmentally superior compared to the six alternatives to the project that the Water Board analyzed in terms of both project benefits and negative impacts.

The report shows that most potential impacts from the project are small and short term, and can be reduced with mitigation.

It also shows many project effects are beneficial in the short and long term which is an important finding for those who are interested in the long-term health of the Klamath River and the communities and ecosystems that depend on it. The DEIR shows the proposed project protects water quality by restoring the free-flowing condition of the river and ensures volitional fish passage and that the project will be a boom to salmon and steelhead populations.

Many of the species expected to recover following dam removal are tribal trust species that are important to the culture and health of some tribes on the Klamath River.

The DEIR also shows an expected increase in recreational and commercial fishing industries. KRRC is pleased with these findings in the DEIR and looks forward to continued work with regulators and communities to finalize the EIR and other permits and then implement the project including mitigation measures to enhance benefits and reduce adverse impacts.

KRRC will be submitting written comments regarding that DEIR in the near future. We are encouraged that this DEIR brings KRRC one step closer to project approval.

Response to Comment ORG23-ORAL-1
Thank you for your comment.

Trout Unlimited, Samuel Sedillo

Comment ORG24-ORAL-1, Speaker Card
Thank you for taking a hard look at removing the dams to restore the river.

Response to Comment ORG24-ORAL-1
Thank you for your comment.

Comment ORG24-ORAL-2, Speaker Card
Klamath R is our org #1 priority. We believe that removing the dams is key to restoring salmon/steelhead runs.

Response to Comment ORG24-ORAL-2
Please refer to Master Response GEN-1.

Comment ORG24-ORAL-3
MR. SEDILLO: Hi. My name's Samuel Sedillo, and that's spelled S-a-m-u-e-l S-e-d-i-l-l-o, and I'm here representing Trout Unlimited.

I work here in California as the public lands coordinator. And the Klamath River is our organization's number one priority. And ourselves along with many of the sportsmen and women and guides that use the river believe that dam removal is

the key to restoring salmon and steelhead runs up along the Klamath. We believe that a collaborative plan is the key to addressing the concerns of those regarding utility and the concerns of those regarding the fish. We believe that any dam removal should follow the clean water rule moving forward.

And lastly, we really appreciate the State Water Board taking a hard look at dam removal to restoring the river. And with that I'd just like to say thank you for having us here and having the meeting.

Response to Comment ORG24-ORAL-3
Please refer to Master Response GEN-1.

Yurok Tribe, Joelene McCovey

Comment TR15-ORAL-1
MS. McCOVEY: Okay. (Unintelligible.) Hello, my name is Jolene McCovey. I am a Yurok woman from the Village of Srey-gon. My last name is spelled M-c-C-o-v-e-y.

So the Yurok people have lived along the Klamath River since time and memorial; it is an integral part of our culture, our spirituality and our food source. I'm so thankful for all of the things that this river has provided for my people. Since time beginning—well that's bad—but I'm also aware and observed the detrimental impacts of the dams. Our water flows are too low. The river is too warm. This allows algae and disease to flourish which is making our fish sick. It is killing them. Our traditional spawning grounds are inaccessible, right? So these are very, very negative impacts.

Traditional knowledge and cultural wisdom tell us that in order for our river to be healthy once begin, it needs to be restored into its original being; the form that it was before these dams were imposed, right? In order to do that the dams need to come down. This is our relief.

Response to Comment TR15-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-2.

Comment TR15-ORAL-2
The scientific studies that have been performed and conducted support Yurok belief that dam removal is the most efficient and best way to restore a healthy river. But removing these dams our water flows will be stronger. The water will be colder. Disease will be flushed. Algae will not grow as easily. Our fish will be healthier; they will be stronger; their spawning grounds will be accessible once again. Our spring coho salmon will return. This will feed our people. It will nourish our spiritual. It will support our culture.

This is immensely important to me. This is important for my children. This is important for my children's children. Fighting for this is important and for all those

who came before and fought for me to be in this place to speak today. I support dam removal. I support being a good steward of the land. And I support Yurok people reclaiming what is ours.

Response to Comment TR15-ORAL-2
Please refer to Master Response GEN-1.

Yurok Tribe, Melissa Eidmar

Comment TR16-ORAL-1
Yurok member, urban Indian, family relies on salmon and Klamath is an important space for our people.

Response to Comment TR16-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-2.

Comment TR16-ORAL-2
Dams have caused harm for too long and need to be removed so our people and our river can begin healing.

Response to Comment TR16-ORAL-2
Please refer to Master Response GEN-1.

Comment TR16-ORAL-3
MS. EIDMAN: I'm Melissa Eidman. My last name is spelled E-i-d-m-a-n. I'm here to talk really briefly. I think that both Virginia and Jolene gave excellent stories here for you to hear.

I'm coming from an urban Indian perspective. I was born and raised here in Sacramento but my home has always been on my reservation. My mom took me home always. We always played in the river. That place is so special to my heart. And our family has had ties to this river for generations, generations that go longer than my memory go. And the salmon have been a primary source of food for—for many of my family members.

And I just wanted to say really briefly that these dams have caused so much harm and disease for so long. And it's time that they are removed so that both our people and our river can heal. That's our role in this world as world keepers and world makers and balancing of the world, were (unintelligible) people, we're world renewal people. We don't just pray for our world. We pray for the whole world. Even those that are opposing this. Even those that want the dams to stay. We are praying for them. We are praying for their people. We's praying them as well. It doesn't have to be a battle at odds. We all should be working on this together.

Response to Comment TR16-ORAL-3
Please refer to Master Response GEN-2.

Bacigalupi, Debbie

Comment IND55-ORAL-1

NEW SPEAKER: Hi. My name is Debbie Bacigalupi, D-e-b-b-i-e B-a-c-i-g-a-l-u-p-i. And I'd like to start off by saying I've been to many meetings now over the decades from when USGS was holding public comment meetings in the town of Yreka to some meetings here in this very room where we sat in a big circle with cooperating agencies, cooperating federalists. And it has been really maddening to just hear all the questions, the concerns, the "if," "well maybe," "perhaps." For the largest dam destruction project in worldwide history, it would seem to me that we should be certain.

The DEIR also shows an expected increase in recreational and commercial fishing industries. KRRC is pleased with these findings in the DEIR and looks forward to continued work with regulators and communities to finalize the EIR and other permits and then implement the project including mitigation measures to enhance benefits and reduce adverse impacts.

KRRC will be submitting written comments regarding that DEIR in the near future. We are encouraged that this DEIR brings KRRC one step closer to project approval.

Response to Comment IND55-ORAL-1

Thank you for your comment.

Comment IND55-ORAL-2

I've interviewed over the years and not be using words like "well maybe," "it could." For example with the sediment, there is over 20 million cubic yards of sediment. That's like, if you laid it out flat, it's like 12,500 miles, half way around the earth of pollutants that would wash out to sea. Over 60 plus years is the estimate.

And even the EIR, the original EIR and EISs admit this. The original peer reviews admit this. In fact, they even stated—and I read these because I had to provide public comment, it's hours and hours of reading. We have spent our time, our energy, our own money traveling to different conference—or different meetings throughout the state, and I'm sure we can go even beyond to Washington, D.C., which people have to try and say wait a minute, we're missing so many pieces in this big puzzle.

So why are we—why are we on this agenda to destroy dams instead of get down to the truth. There are so many conflicting stories even within the original peer reviews. And so my concern is that we're not using common sense, base solutions, evidence-based solutions.

Response to Comment IND55-ORAL-2
The quantitative uncertainty of the stored sediment behind the Lower Klamath Project dams has been accounted for, as explained in ORG46-8. For information on sediment erosion, transport, and deposition following dam removal, please refer to Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-5 (pages 3-765 to 3-775) and Master Response GEO-1. The EIR, including the analyses of stored sediment and sediment erosion, transport, and deposition, is based on technical modeling (USBR 2012a) and scientific analysis. Information regarding the sediment transport modeling is consistently presented in the EIR and is clarified and amplified in Master Response GEO-1 in response to public comments.

Comment IND55-ORAL-3
As an aside, I got my master's in evidence-based theory. And I can tell you, I can use any kind of evidence for any kind of outcome I want. And—but, you know, I believe that the people deserve the truth.

And with this project it is so huge and it's going to impact so many people. My request for—you know, is that we slow down and we really, really look at all evidence not just a focused evidence.

Response to Comment IND55-ORAL-3
Under the California Environmental Quality Act (CEQA), evidence is used in the following way:

If there is substantial evidence, in light of the whole record before the lead agency, that the project may have a significant effect on the environment, an environmental impact report shall be prepared (Pub. Res. Code, § 21080, subd. (d)).

Substantial evidence includes fact, a reasonable assumption predicated upon fact, or expert opinion supported by fact (Pub. Res. Code, § 21080, subd. (e)(1)).

Substantial evidence is not argument, speculation, unsubstantiated opinion or narrative, evidence that is clearly inaccurate or erroneous, or evidence of social or economic impacts that do not contribute to, or are not caused by, physical impacts on the environment (Pub. Res. Code, § 21080 (e)(2)).

The purpose of an environmental impact report is to provide public agencies and the public in general with detailed information about the effect which a proposed project is likely to have on the environment; to list ways in which the significant effects of such a project might be minimized; and to indicate alternatives to such a project (Pub. Res. Code, § 21061).

As stated in Volume I Section 1.1 *Introduction – Authorization, Purpose, and Use of EIR* (page 1-1), the State Water Board is the Lead Agency responsible for

complying with the CEQA for the Lower Klamath Project License Surrender (Proposed Project). This environmental impact report (EIR) was prepared in conformance with CEQA.

Comment IND55-ORAL-4

I have a couple of examples. And I'm glad somebody brought up climate change. Something that I really like to do is see and hear things for myself, that's why I'm here; I'm not from Sacramento. I'm from just below the Oregon border, just below the Klamath River. But I like to go to meetings and conferences all over so that I can hear for myself what's going on.

I've flown over the Klamath. I've interviewed all—a bunch of different tribal members including the Karuk who have said off camera that when—if and when those dams come out they fear a future of flooding again. Which means in the past before the dams were in there was flooding.

Response to Comment IND55-ORAL-4

Please refer to Master Responses FLD-1 and GEN-2.

Comment IND55-ORAL-5

I've interviewed Fish and Game employees who work at the Iron Gate hatchery just last year—I got all these things on camera and on video—and the Fish and Game Wildlife employees who are waiting to retire, the only reason they are not saying anything is because they have a retirement pension waiting. They don't want to get fired. But what they said—so when I was asking them about the different fish runs—there is one fish run that is completely protected so it has very few fish compared to the other fish runs.

So the fish runs—if you haven't been to the fish hatchery, you should go and investigate it for yourself and talk to the employees who work there. So the Fish and Game employees who are waiting to retire but don't want to say anything because they don't want to get fired because they don't want to miss out on their retirement would tell you—if they think that you're not for dam removal, let me tell you that—the truth. And what they see. These guys have worked at this hatchery—this is their career.

So I asked them—okay, so there's this fish run that has tons of fish labeled, "Chinook." Actually, there's a couple. And then you see all these nets and it says "coho." And my question to them was, "Why are there so few coho?"

And he said, well—first of all, I said, "Why the netting?"

And he said, "Because these are fragile fish compared to the Chinook."

So I said, "If they are fragile fish, why is there so many fewer fish in this tank than there are in the Chinook tanks?"

And he said, "Because we are required to keep the fish count low."

"Why?"

And his answer was, "Because it's all about dam removal."

So if we keep the fish count low, the coho, then we have a low number of returning fish and therefore we can keep the number low and therefore say this is required. We need to get these dams destroyed because there's too few fish.

Go interview. I don't mean to sound—I'm nervous—I don't mean to sound mean, but go interview them. Go interview them.

Response to Comment IND55-ORAL-5
Section 3.3.5.6 *Aquatic Resources – Potential Impacts and Mitigation – Fish Hatcheries* and Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* Potential Impact 3.3-9 provides a detailed analysis of the effect of ending hatchery production for coho salmon after eight years under the Proposed Project. Based on available information, it is anticipated that benefits from dam removal and cessation of hatchery operations would increase adult returns by more than the loss of hatchery progeny. Please refer to Volume III Attachment 1 for final Section 3.3 *Aquatic Resources*.

Further, under existing conditions and the Proposed Project, all production of coho salmon is constrained by a Hatchery Genetic Management Plan (HGMP) for the Iron Gate Hatchery (CDFW and PacifiCorp 2014), which redefined the operation of this hatchery from a mitigation hatchery to one now operated to protect and conserve the genetic resources of the Upper Klamath population unit of the Southern Oregon/Northern California Coast (SONCC) coho salmon Evolutionarily Significant Unit (ESU). Included in the HGMP are defined monitoring and evaluation activities to evaluate effects of the hatchery activities on the abundance, productivity, spatial structure, and diversity of the SONCC coho salmon and the magnitude or relative impact of the hatchery program on other actions that influence SONCC coho salmon.

Comment IND55-ORAL-6
In March of 2015, there's a Mary Nichols, California Air Resource Board. She testified in Washington, D.C. on a topic called Carbon Dioxide Emission Rules. And in the questioning it was talking about greenhouse gases and is California meeting theirs. And she agreed with one of the congressmen that if we included the Klamath River, the hydroelectric energy, the clean, green, renewable energy dams that provide drought control, fire control, fire suppression, irrigation, recreations—and it's just a gorgeous river, I have spent over 20 years on that—on and around that river—she admitted that California right now would be meeting if not exceeding our greenhouse gas emissions goals if we included the

Klamath and hydro in our renewable energy mix. So why are we destroying them?

Response to Comment IND55-ORAL-6
This comment pertains to a portion of the Draft EIR that was recirculated on December 21, 2019. Please refer to the recirculated document (*Greenhouse Gas Emissions and Energy*).

Comment IND55-ORAL-7
I just got back from the most recent United Nations Framework Convention on Climate Change Conference in Poland. I was in a panel discussion with Cathy Woollums, the senior vice president of and the chief sustainability officer of Berkshire Hathaway, another Warren Buffet—just like PacifiCorp, another Warren Buffet company.

And in the panel discussion question part I asked her about the Klamath. And I corrected her on a statement. And this is a public—this was a public panel discussion—and I corrected her on a statement where she said that their—their customers across the board are receiving—are paying lower rates. And I corrected her and I said that is not true. Because in the Klamath area we are being charged, PacifiCorp, owned by Warren Buffet, we rate payers are being charged for dam destruction, which is to me just disgusting.

Response to Comment IND55-ORAL-7
Please refer to Master Response ENR-1.

Comment IND55-ORAL-8
It's—it's—it's disgusting that there are over almost 80 percent of the voting population in Yreka voted to retain those dams, keep them. And this also happened in the—in southern Oregon in Klamath Falls. They voted overwhelmingly, people who live with and are impacted immediately by those dams, voted overwhelmingly we want to keep our clean, green, renewable energy.

Response to Comment IND55-ORAL-8
Please refer to Master Response GEN-1.

Comment IND55-ORAL-9
And then, you know, we haven't even looked at the truck and haul. So if we are going to go through with the largest dam destruction in worldwide history, wouldn't it make sense to see if there is even habitat suitable to sustain the coho salmon. Those studies have not been done. So that to me common-sense-wise seems like a very, very good first step in this whole thing.

Response to Comment IND55-ORAL-9
Please refer to Volume I Section 4.4 *Alternatives – Continued Operations with Fish Passage Alternative* (page 4-99) for the analysis of continued operations with fish passage, including trap and haul.

Comment IND55-ORAL-10
I look outside and—oh, and you know, I love it. I did—I was born in Mt. Shasta but raised here in Sacramento and one of my favorite nutritional stores is Elliott's. And I love Elliott's. It's got, like, the best food. I love my raw milk. I love my, you know, clean food. And it's so fun to see in that refrigerator blue-green algae from the Klamath as a health supplement for human beings. So—and that comes from the Klamath River.

Response to Comment IND55-ORAL-10
Please refer to Master Response GEN-2.

Comment IND55-ORAL-11
Lastly, I want to say that, you know, pulling up to the EPA building today in Sacramento, California, I was saddened to see across the street a bunch of tents and tarps of our homeless problem. And it would seem to me that we have bigger issues than – on – in California than a project, a worldwide project that has been nothing but in all these meetings if you continue to go to them with the experts, the experts cannot answer the questions. They say "maybe." They will use words like, "Well, perhaps if we take out the dams." "Well, how much is it going to cost?" "Well, we're not sure." "What are you going to do with the sediment?" "Well, we think." All these uncertain, not positive, not complete answers.

But there are homeless people out there right now just across the street from this EPA – this government building, and it seems to me that cooperative federalists have more urgent, life-saving matters than destroying dams that are in almost perfect condition and that people question, question, question the political agenda behind it.

Response to Comment IND55-ORAL-11
Please refer to Master Responses GEN-1 and GEN-2.

Comment IND55-ORAL-12
And so, this—these dams are, for those who don't live up there like we do, they are 24/7 reliable energy dams. They provide over nine hours of flood control. If there is going to be a flood, people are given over nine hours to get out of there. You take out those dams and just like Jody Wadell said of the Karuk tribe, "If those dams come out we don't know if we'll be able to survive, because we've had floods in the past that have destroyed towns down river from Iron Gate."

Response to Comment IND55-ORAL-12
Please refer to Master Responses GEN-1 and GEN-2.

Comment IND55-ORAL-13
And one more thing—sorry—Rex Casalia phonetic) is a rancher who's lived on the Klamath just below the Iron Gate dam his entire life. That means before the Iron Gate dam went in, which is where the hatchery is, which is where the Fish and Game employees would tell you this is nothing but a political agenda. Rex Casalia remembers as a child growing up walking across the river and his feet didn't get wet. So—and this is many times throughout the year, throughout the years.

So, if it's all about coho and giving them more habitat to swim upstream, before the dams were in the coho would need wings to fly upstream in certain years. So is this really about protecting the coho? Because let me tell you, they wouldn't make it upstream. Or is this another agenda? Because for so much uncertainty, it seems like this is an agenda. It's not based on science. It's not based on fact. It's based on feelings.

Thank you for letting me share.

Response to Comment IND55-ORAL-13
Please refer to Master Responses GEN-2 and AQF-4.

Feher, Rick

Comment IND57-ORAL-1
MR. FEHER: (Unintelligible.) F-e-h-e-r.

The last speaker seemed to be part of the process and I can find faults in the process and I respect that the process is—the process seems to be that the public can comment in CEQA proceedings. The comments and answers are required to be provided but I—I want to—and can I ask a question of Parker, because he's been involved in this for a long time.

Was it accurate that FERC was not a party to the agreement?

Response to Comment IND57-ORAL-1
Thank you for your comment.

Comment IND57-ORAL-2
MS. RAGAZZI: So we're not responding to comments today. So it's fine for you to ask –

MR. FEHER: So the process wins then, I guess. So if the process wins I will just say something supportive of dam removal, of the river and the long view, the long-term vision.

Big concrete obstructions, river people who I know, a brother who is in the river reporting along with his observations speaking with Fish and Game—the fish runs are in trouble and it's critical. And that means that I agree with Thomas which is the first speaker that, you know, that occurs there's a process that must be followed. That seems to be a fall-back position when wanted to do something like build a freeway or something in the 1950's. Of course that's going backward in time. We're not there.

We have completely different set of procedures, very much different. (Unintelligible.) But there is an emergency like after let's—let's say after (unintelligible) thought that certain freeways need for people to move. Well, this needs to be restored on an emergency basis (unintelligible). With populations declining year after year and over the long-term there may be some variation. But it's not a happy situation for people. The possibility that the river can be restored at (unintelligible) project in Oregon—Washington State, excuse me, that the gill rot removal was—books that I've read quite successful in the—for instance (unintelligible)

I anticipated writing something. I'm usually better doing that, submitting comments in writing and I anticipate (unintelligible) and procedural issues. And I hope you don't get drowned in procedural issues (unintelligible) with the agreement.

Response to Comment IND57-ORAL-2
Please refer to Master Response GEN-1.

Hendrick, Veronica

Comment IND450-ORAL-1
MS. HEDRICK: (Unintelligible.) Virginia Hedrick. (Unintelligible.)

I want to thank my niece for her words, sharing about the importance and the cultural significance of the Klamath River.

I live here in the Sacramento Valley and I have for over a decade. I'm raising five children here. I was born and raised on the Yurok reservation. I am the youngest of ten.

Everyone else lives back home within the Klamath basin and on ancestral territory, and what I've learned as a Sacramento resident is that all of these things are connected, right? So for our Sacramento River to be healthy, water is diverted from the Trinity River. The Trinity River is a major tributary to the Klamath River. So if the Klamath River is not doing well, the Sacramento River won't do well.

And as indigenous people we've long understood the connection of water and life, and forest and trees and, you know. Right now we hear stories and we know about, you know, cap and trade and exchanging one health for another health. And I think when we talk about Klamath dam removal we have to talk about it in that scope, that it's not just everyone down river from those dams. The rivers and the water basins are so widely connected that here in the Sacramento Valley and the rest of California we have to think about those impacts to who we are.

And, you know, I always encourage where ever people are to think about where the water is coming from that you're drinking. If you're buying a bottle of water from the store, where was it bottled? Is it tap water? Is it spring water? Who's losing for you to be able to have that bottle of water? You go into a restaurant here in Sacramento—I talk to Sacramento residence here and they don't know. They don't know that the Trinity River water is diverted to the Sacramento River. They don't even know where the headwaters of the Sacramento River is or the Feather River.

So my children are also Midu and they are from the headwaters of the Feather River. And people don't know that. They don't know that the Feather River is a tributary to our basin here or what the impacts of those dams are and to this valley.

I spent a number of years living in Los Angeles and well understand what the people of the Owen Valley are giving up for the Los Angeles water. For that dust pool that is created in the Owens Valley is so that Los Angeles can have water.

And I know in the scope of it seems like it doesn't make sense of it, why we're talking about this, but as Indian people we well understand that. And my family, we have a story that my namesake Queen James has shared with us, my great, great aunt, that there was a time where people were polluting the river and we had a lot of illegal dumps happening and they were flowing into the river and the river was full of trash. And she went down to the river, and the river spirit came out of the water and spoke to her and warned her that if you keep treating the river this way and you have me dammed in seven places, if you keep treating the river this way I will go and so will the people.

And I think for many people we have thought that meant Yurok people, that Yurok people would go. But what I want to tell the people in this room and people who are listening is that it's not a literal interpretation. It's all people. Human life will go without water. We will all go.

Response to Comment IND450-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-2.

Comment IND450-ORAL-2
And I think, you know, we're having these large, political discussions at the national level about global warming and impacts to the environment. And we have an opportunity in California to do the right thing. We have an opportunity to engage in one of the largest dam removals to restore health. Not only for Indian people but for all people upstream and downstream, that these kind of upstream changes have the opportunity to make widespread impact.

Response to Comment IND450-ORAL-2
Please refer to Master Response GEN-1.

Comment IND450-ORAL-3
Many people don't care if we have fish to eat. They don't care about indigenous people on the Klamath River. I just heard a public comment around a cannabis grow on the Klamath River and people calling it their ancestral territory and saying they've been there since 1973. People don't care. That's something I've understood. That people don't always care about indigenous people and our rights. But you should care about yourself. We should care about who we are and the children that you're raising and the water that they might have access to or not have access to.

I took my child recently on a field trip to the Nimbus Dam here. And we talked about the life cycle of fish, and they talked about, you know, the spawning grounds and we watched them do this man-made spawning in front of them.

But what they didn't talk about is why. Why it's occurred this way. Or the 600 miles of spawning ground in the Folsom area and the basin that are no longer accessible to fish. Why we have a fish hatchery. Why we have manipulated our planet in this gross, gross way. And the mis-education to our youth and our young people, and have to pull my son aside and say this is what's happening here. This is a man-made interplay because they built a dam and cut off spawning ground to fish who have been here long before us.

We have a fish in our river, the sturgeon, who's prehistoric, pre-dates the human as we know it today that has—dates back to an earlier time when spirits walked among us.

Response to Comment IND450-ORAL-3
Please refer to Master Response GEN-2.

Comment IND450-ORAL-4
So who we think we are in this small frame right now, we talk about Klamath dam removal. And many of you are showing up to a job and, you know, you're policy analysts, and you have the impact of one thing. And today when we ask you that we want to give comment I want to appreciate and respect that you turn these back on, that you made time for this space. That that's important. And that you

as an individual play a role in this, that you're hearing a story today. And what our old Indian people tell us is stories have power. So when you hear this story you have to do something about it. You have a personal responsibility.

And so I want to appreciate that you took that personal responsibility, you heard our words, you put it back on. For this reporter here who is a storyteller in his own right, in a way that Indian people have been doing since the beginning of time, that that's his responsibility is to share these stories and to communicate with people in a way in which we live, and behave, and care-take this land, that we all as humans have that responsibility.

It's not about who gets what and who needs water and who needs food. We all need it. It's our responsibility to care-take this world. It's our responsibility to care-take the Klamath River even if you live six hours away. Even if you may not realize the impact it has to you and to the people who come after you and the generations that you will never meet and that we'll never see, the impacts, the decisions we make today will have for generations to come.

In 2002 we had a mass fish kill on the Klamath River. At the time my grandmother was in her late 70's, early 80's. And from her porch, from our porch we could smell death. A smell I hope none of you in this room ever have to smell, or fear, or know what that feels like to smell death in your home. And she was immediately triggered back to this time, does this mean the river's going? Where we as people, as humans, not as Yurok people exactly, but as humans, will this world as we know it, is it changing?

We didn't know about gill rot the day we saw these fish washing up on our shore. We didn't know what it was caused. We didn't know that it was water flow right away. We didn't know all the scientific things that would come out of it, or that our scientists at Yurok tribe and Karuk tribe and Hupa tribe, all the science that would come out of it. My grandma didn't know it at that time, but she knew something was wrong and that this was one of the most horrific things she had seen.

And let me tell you, she went to boarding school. She moved over 13 hours from her home and went to boarding school. And yet this fish kill was one of the most horrific things she had seen.

It's not about our personal impact, what it means to us. It's about a global impact. It's about the impact to this people and the world. And we have to as stewards of this land—whether you choose to be or not, you're a steward of this land—we have to do the right thing in this case. We have to.

And I know there was people here earlier that supported keeping the dams up and maintaining the dams. And maybe their families have livelihoods based on water that's held on the upper basin. We know that the federal government

removed people to the upper Klamath basin and they have farms there and they feel like they have that trust responsibility. And again, I just want to say it's not about that. It's not about the politics. It's not about who wins and who loses. It's about us as human people being good stewards of this land.

So, again, I just want to thank you for reopening this, for taking the time, for hearing my story, for hearing the story that came before me, the stories that come after me, for the many people in this room who we don't see who are here with us. The old ones who wish they could be here and will watch this dam removal. That's what's important.

When we talk about Indian people, a lot of us think about, like, oh, 500 years ago. In California it's recent memory. It wasn't 500 years ago for us. California became a state in 1852. It's recent memory for us. My grandmother's mom. So my great grandmother was born in a time when non-Indian people first came.

And I'm taking a lot of time because I know—I know there's not a huge line. That's recent memory. And I'm young; I'm in my 30's. I'm young. And I'm telling you about my great, great grandmother. It's recent memory.

And I'm hoping that my children who span the ages from 18 to two will live to see a time when the Klamath dams are gone and that their children will only hear about these things in story. And the people in the Sacramento Valley and upriver from us and downriver—that's how we as Yurok people orient ourselves in the world—that we'll all feel the positive impact from that. And that the people who are now supporting/maintaining the dams will also benefit from that.

Response to Comment IND450-ORAL-4
Please refer to Master Response GEN-2.

Jones, Marva

Comment IND56-ORAL-1
MS JONES: (Unintelligible.) Marva Jones. I'm (unintelligible.) And I come here to speak on behalf of dam removal.

It is our only choice. We know that we're killing the river right now with the diseases going on there and the blue-green algae that's affecting the river. I mean, we can't even swim in the river. And it's affecting our fish family as we all know. And Oregon is already on board and has approved the petition to go forward. And I'm just here to support dam removal. And just like Thomas said, it's a direct link of the healthiness of our health. And it's a direct link of our wellness. So obviously we need to restore the river. (Unintelligible.)

Response to Comment IND56-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Joseph, Thomas

Comment IND58-ORAL-1, Speaker Card
Take Down the Dams

Response to Comment IND58-ORAL-1
Thank you for your comment. Please refer to Master Response GEN-1.

Comment IND58-ORAL-2
NEW SPEAKER: Thank you. My name is Thomas Joseph. First name T-h-o-m-a-s, last name, J-o-s-e-p-h, and I'm here as a Hupa tribal member on the Trinity River, which is the largest contributory to the Klamath. And I'm here to support all methods and measures to dam removal.

This is the second presentation that I attended and, you know, I support dam removal. And you guys have outlined the necessities of it and why we do need to move forward.

Response to Comment IND58-ORAL-2
Please refer to Master Response GEN-1.

Comment IND58-ORAL-3
But I also want to recognize that the Klamath River is a living entity, that she breathes, that she knows how to communicate, and have relationships, and that she—she has a spirit. And all of your documentation has failed to recognize that.

And the State of California has failed in their neglect of recognizing the relationship of Mother Earth and the land that they live on, and it has caused grave turmoil not just here locally by the destruction of our local rainforest, and our rivers, and our streams, and our water quality and air quality, but it has caused tremendous travesties worldwide. And it's at the fault of us. It's at the fault of this state. It's at the fault of the citizens. And that we need to change that path not just for the protection of the Klamath River, you know. She's been locked up for a long time.

We reflect our environment. California had a problem with locking up its citizens after it had a problem with locking up its rivers. We will always reflect our environment. But the more that we continue to abuse her and disrespect her the more pain our communities will feel.

And we know that people of color will probably be the primary bearers of those effects of climate change. But it's going to effect all of us.

And these dams need to come down so we can start to recognize how we can rebuild this relationship, that we can start to understand and have a greater understanding on how we can live in a non-destructive manner. We need to not

just do this for northern California, but we need to set a precedence. We need to show the world and the citizens of California that things have to change.

And I guarantee, when we see the Klamath River run free, we will see the power of her restoration and the example that she'll give our communities to how to restore our communities back to livable standards, how to be in community with each other, how to be in relationship with each other. She's waiting to give us that example.

Response to Comment IND58-ORAL-3
Please refer to Master Response GEN-2.

Comment IND58-ORAL-4
So I urge you to move forward. I hope that these tactics of delay aren't continued. We were promised 2020. Now we're promised 2021. The State has a long history of delay tactics. We need to move forward promptly, not just for the restoration of the Klamath River, but for all of us.

Response to Comment IND58-ORAL-4
Comment noted.

2.5 Written Comments and Responses – Recirculated Portions of the Draft EIR

This section presents written comments received on the recirculated portions of the Draft EIR and the State Water Board's responses to those comments. For comments that do not pertain to the environmental analyses presented in the portions of the recirculated Draft EIR, please refer to Master Response R-1. Written comments and responses in this section are organized by comment affiliation type. To determine which affiliation your comment is associated with, please refer to Table 2-4 or Table 2-5.

Table of Written Comments and Responses

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2.5.1 Local Agencies

This section presents written comments received on the recirculated portions of the Draft EIR from local agencies and the State Water Board's responses to those comments. Written comments and responses in this section are organized alphabetically by agency name. To determine whether your comment is associated with an affiliation type other than local agencies, please refer to Table 2-4 or Table 2-5.

Table of Written Local Agency Comments and Responses

County of Siskiyou, Paul S. Weiland.....2-1742

County of Siskiyou, Paul S. Weiland

Comment RE-8-1

We are writing on behalf of Siskiyou County ("County") to express our significant concerns regarding the Recirculated Portions of the Draft Environmental Impact Report ("Recirculated DEIR") for the Lower Klamath Project License Surrender ("Project") prepared by the California State Water Resources Control Board ("State Board") pursuant to the California Environmental Quality Act, Cal. Pub. Res. Code, § 21000 et seq. ("CEQA"). The County's full range of concerns is included in SWCA's "Comments on the Lower Klamath Project Draft Environmental Impact Report – Recirculated Sections," attached hereto as Exhibit A, and the County's "Comments re Draft Environmental Impact report for the Lower Klamath Project License Surrender, Federal Energy Regulatory Commission Project No. 14803," attached hereto as Exhibit B.

Response to Comment RE-8-1
Thank you for your comment.

For responses to comments provided by Siskiyou County on the Draft EIR please refer to Volume III Section 2.3.2 *Public Comments and Responses – Written Comments and Responses – Local Agencies – County of Siskiyou, Ashley J. Remilllard* and Volume III Attachment 1. Please refer to the response to comments RE-8-1 to RE-8-14 for a response to the comments submitted on the Recirculated Draft EIR by Siskiyou County (dated February 6, 2020).

Comment RE-8-2
As the State Board is aware, the Klamath River Renewal Corporation ("KRRC") and PacifiCorp have submitted applications to the Federal Energy Regulatory Commission ("FERC") for hydropower license transfer and surrender to decommission and remove four lower Klamath River dams—three of which are located within Siskiyou County. On multiple occasions, the County has expressed its concerns regarding the potential impacts of dam removal on imperiled species, water quality, and the overall health of the Klamath River ecosystem, as well as other environmental and societal impacts, including air quality, climate change, cultural resources, hazardous materials, and traffic impacts, in addition to socioeconomic impacts on the local community. See, e.g., PacifiCorp, 162 FERC ¶ 61,236 at ¶ 28 (Mar. 15, 2018). The County therefore has a strong vested interest in ensuring that the public is appropriately and lawfully informed of the Project's entire range of consequences.

Response to Comment RE-8-2
Comment noted.

For responses to comments provided by Siskiyou County on the Draft EIR please refer to Volume III Section 2.3.2 *Public Comments and Responses – Written Comments and Responses – Local Agencies – County of Siskiyou, Ashley J. Remilllard* and Volume III Attachment 1. Please refer to the response to comments RE-8-1 to RE-8-14 for a response to the comments submitted on the Recirculated Draft EIR by Siskiyou County (dated February 6, 2020).

Please note that under CEQA, potential effects from implementing a project, such as reductions in property values, loss of property tax revenues, and increases in energy costs, that are solely social or economic in nature, do not constitute an effect (i.e., an impact) to the physical environment (see also Volume I Section 5.4 *Other Required CEQA Discussion and Consideration of Social and Economic Factors – Social and Economic Factors Under CEQA*).

Comment RE-8-3
On February 26, 2019, the County submitted comments to the State Board, attached hereto as Exhibit B, detailing the County's serious concerns regarding the Draft Environmental Impact Report for the Lower Klamath Project ("DEIR").

As explained in the County's prior comments, the DEIR failed to satisfy the requirements of CEQA and its implementing guidelines, 14 Cal. Code Regs. §§ 15000 et seq. ("CEQA Guidelines"), and thereby failed to provide the public with an adequate assessment of the significant environmental effects associated with implementation of the Project. In response to the vast array of public comments, on December 21, 2019, the State Board chose to recirculate only the Air Quality and Greenhouse Gas Emissions sections of the DEIR. Virtually none of the County's previously submitted concerns were addressed in the narrowly focused Recirculated DEIR. We therefore incorporate the County's prior comment letter (Exhibit B) here in its entirety.

Response to Comment RE-8-3
The comment refers to the prior comments submitted by Siskiyou County on the Draft EIR (dated February 26, 2019) and states that very few of the County's comments were addressed in the Recirculated Draft EIR. Please refer to Master Response R-1.

For responses to comments provided by Siskiyou County on the Draft EIR please refer to Volume III Section 2.3.2 *Public Comments and Responses – Written Comments and Responses – Local Agencies – County of Siskiyou, Ashley J. Remilllard* and Volume III Attachment 1. Please refer to the response to comments RE-8-1 to RE-8-14 for a response to the comments submitted on the Recirculated Draft EIR by Siskiyou County (dated February 6, 2020).

Comment RE-8-4
While the County appreciates the State Board's efforts to address the DEIR's shortfalls regarding its analysis of the Project's potential impacts on air quality and greenhouse gas emissions, the Recirculated DEIR remains inadequate. As set forth in SWCA's technical comments (Exhibit A), which the County fully incorporates herein, the Recirculated DEIR warrants additional revisions in order to sufficiently comply with CEQA Guidelines.

Response to Comment RE-8-4
Comment noted.

Please refer to the response to comments RE-8-8 to RE-8-14 for a response to the technical comments provided by SWCA Environmental Consultants.

Comment RE-8-5
In addition to the comments presented by SWCA regarding the air quality and greenhouse gas emissions analyses, the County adds that its ongoing concern regarding the issue of concrete waste disposal remains unaddressed in the Recirculated DEIR. This is especially concerning in light of the potential presence of unnaturally occurring asbestos that may have been intentionally placed in the dams for strengthening purposes. According to the Siskiyou County Demolition Ordinance's requirements for dam removal, all components

and structures associated with the dam must be completely removed and reclaimed to conditions that existed prior to dam construction. Siskiyou County Code Title 10, Chapter 13 (adopted Oct. 1, 2019). Additionally, the County requires that all dam components be recycled to the maximum extent practicable, and that all materials are sampled and analyzed for adverse contamination and dealt with appropriately. Id. The Recirculated DEIR does not adequately discuss how the presence of asbestos will be addressed during demolition activities, and the County thus cannot knowledgably comment on whether the demolition plans violate the Siskiyou County Demolition Ordinance.

Response to Comment RE-8-5

The comment states that the County's concerns about concrete waste disposal remain unaddressed in the Recirculated Draft EIR. The comment states this is concerning because there is the potential that asbestos may have been placed in the dams for strengthening purposes. The comment also makes reference to the Siskiyou County Demolition Ordinance's requirements for dam removal (adopted October 1, 2019), which requires the following: 1) that all components and structures associated with the dam must be completely removed and reclaimed to conditions that existed prior to dam construction; 2) that all dam components be recycled to the maximum extent practicable; and 3) that all materials are sampled and analyzed for adverse contamination and dealt with appropriately. The comment concludes that the Recirculated Draft EIR does not adequately discuss how the presence of asbestos will be addressed during demolition activities and, therefore, the County cannot properly comment on whether the demolition plans will violate the Siskiyou County Demolition Ordinance.

Please refer to Recirculated Draft EIR Section 3.9.5 *Air Quality – Potential Impacts and Mitigation* Potential Impact 3.9-4 for a discussion of the handling of asbestos-containing materials during deconstruction activity. As stated in the discussion for Potential Impact 3.9-4 (page RE-3-42), "Asbestos-related work (i.e., abatement and disposal of asbestos containing materials) will be performed by Klamath River Renewal Corporation (KRRC) and its representatives in compliance with, as relevant, local, state, and federal regulations including California Division of Occupational Safety and those implemented by the Siskiyou County Air Pollution Control District (SCAPCD) (KRRC 2019e). Compliance with applicable regulations related to the handling of hazardous materials is included as Mitigation Measure HZ-1 *Hazardous Materials Management* in Section 3.21 *Hazards and Hazardous Materials*." Please refer to Volume III Attachment 1 Section 3.21.5 *Hazards and Hazardous Materials – Potential Impacts and Mitigation* for the final Mitigation Measure HZ-1.

Please refer to Master Response CEQ-2 for a discussion of federal preemption and the applicability of local regulations to the Proposed Project.

Comment RE-8-6

Moreover, the County has heard through the KRRC's contractors that certain proposed bridge improvements are being stricken from the 2018 Definite Plan to save costs. It is unclear what other cost-saving modifications are being made to the plan, which makes intelligently commenting on the Project infeasible. Given the lack of a technical and financial feasibility determination, as well as the recent changes to the Project and the pendency of information, the current state of the Project can in no way be deemed stable. As such, the DEIR and its recirculated portions remain inadequate for failure to sufficiently define the Project. The State Board's decision to proceed with environmental review prior to KRRC having a stable project plan approved by FERC is thwarting CEQA's goals by precluding informed public and agency participation and will be an impediment to the State Board's informed decision-making. The CEQA analysis should therefore not be undertaken until the point at which the Project becomes stable.

Response to Comment RE-8-6

The Draft EIR prepared by the State Water Board for the Lower Klamath Project License Surrender provides a clear, sufficiently detailed project description to adequately analyze and disclose the environmental impacts of the Proposed Project as well as a comparison of the impacts of the Project Alternatives. Minor changes that do not result in a change in the physical environment, such as potential changes in the proposed bridge improvements, do not impede public disclosure of any environmental impacts.

Comment RE-8-7

For the foregoing reasons, and as further discussed in detail in Exhibits A and B, the County requests that the State Board revise the Recirculated DEIR to address the County's unresolved concerns. Please do not hesitate to contact us with questions.

Response to Comment RE-8-7

Comment noted.

Comment RE-8-8

1. *It is recommended that more robust sampling of the dams be conducted to ensure protectiveness of human health. Aggregate materials are locally sourced and are unlikely to include naturally occurring asbestos, but it is unclear if asbestos containing material may have been purposefully added to the dam for structural integrity during construction. Though it is generally accepted to take chip samples of the concrete rather than a core sample, the thickness of the concrete dam in this case would likely require core samples to definitively determine that the structure does not have varying asbestos content. During construction of the dam, the construction schedule may have varied and there could be different ingredient aggregate used on the dam construction throughout the process. Core samples would be a more robust sampling method to ensure that health impacts do not occur. Additionally,*

from reading through the recirculated EIR, it is not entirely clear what method was used to take the samples from the dam (what type of samples were taken from the dams and how many), so this should be explained in greater detail for the benefit of the reader.

Response to Comment RE-8-8

The comment recommends that more robust sampling of the dams be conducted to ensure protectiveness of human health in relation to the potential for asbestos to have been added to dam concrete. The comment states that although it is common to take chip samples of concrete, the thickness of the dams would likely require core samples to definitively determine whether asbestos is present. The comment also states that core samples would be a more robust sampling method to ensure that health impacts do not occur. The comment concludes that it is not clear in the Recirculated Draft EIR what sampling method was used (i.e., what type of samples were taken and how many), so greater detail should be provided for the benefit of the reader.

As the commenter notes, locally-sourced aggregate materials utilized to construct the dams were unlikely to include naturally occurring asbestos and so it is unlikely that naturally occurring asbestos would be present in the dam. This assessment is supported by sampling of the concrete structures associated with the Lower Klamath Project. In order to determine if naturally occurring asbestos was present in concrete structures associated with the Lower Klamath Project, a preliminary screen for asbestos was conducted through bulk concrete samples sourced from accessible concrete at each of the dam developments. These samples were collected in accordance with the Polarized Light Microscopy (PLM) California Air Resources Board (CARB) 435 Method. This method is used to determine the asbestos content of serpentine aggregate, or naturally occurring asbestos, in concrete. The CARB 435 PLM method is a conservative analytical method that would have also identified added asbestos in addition to naturally occurring asbestos (R. M. Manley, LLC, pers. comm., March 2020).

Concrete samples were crushed using a mill to produce a material of which the majority is less than 200 Tyler mesh (0.75 microns). The California Air Resources Board defines naturally occurring asbestos as having >0.25% asbestos by PLM point count. The analytical results were reported in percent asbestos as derived from a 400 PLM point-counting technique, which yields a detection limit of 0.25%. The testing did not detect asbestos at this level (R. M. Manley, LLC, pers. comm., March 2020).As discussed in the response to comment RE-8-5 and in the Recirculated Draft EIR, in the unlikely event that previously unidentified asbestos-containing materials are encountered during demolition activities, they will be handled in accordance with relevant legal requirements. If naturally occurring asbestos is encountered either during bedrock-disturbing activities, or in concrete during demolition activities, Klamath River Renewal Corporation (KRRC) or its representatives will handle the naturally occurring asbestos in accordance with, as relevant, the federal

Environmental Protection Agency's (EPA's) fact sheet, Naturally Occurring Asbestos: Approaches for Reducing Exposure (March 2008) and the Guide to Normal Demolition Practices Under the Asbestos NESHAP (September 1992) (see Recirculated Draft EIR Section 3.9.5 Air Quality – Potential Impacts and Mitigation Potential Impact 3.9-4). The Recirculated Draft EIR also explains that detectable asbestos above 0.1 percent was identified in several materials in the non-dam structures proposed for demolition (e.g., surfacing materials, thermal system insulation, and miscellaneous materials) and describes that asbestos-related work will be performed by KRRC and its representatives in compliance with relevant local, state and federal regulations to reduce potential impacts to workers and other sensitive receptors (see Recirculated Draft EIR Section 3.9.5 Air Quality – Potential Impacts and Mitigation Potential Impact 3.9-4 and Volume III Attachment 1 Section 3.21.5 Hazards and Hazardous Materials – Potential Impacts and Mitigation Mitigation Measure HZ-1).

Comment RE-8-9

2. *It is recommended that there be a more explicit explanation of the basis for selecting a particular mitigation measure in accordance with CEQA Guidelines 15126.4(a)(1)(B). It may provide more context to explain why the chosen mitigation measures were agreed upon while others that were deemed feasible, but will not be implemented, were not selected.*

Response to Comment RE-8-9

The comment refers to Appendix N *Air Emissions Modeling for the Lower Klamath Project* and Appendix O *Greenhouse Gas and Energy Modeling for the Lower Klamath Project* from the Recirculated Draft EIR and recommends that there be a more explicit explanation of the basis for selecting a particular mitigation measure. The comment does not identify specific mitigation measures.

Please refer to Master Response CEQ-2 as it relates to the authority of the State Water Board, federal preemption, and the feasibility of the recommended mitigation measures discussed in the Recirculated Draft EIR. In addition, the following discussion provides additional explanation of the basis for selecting the mitigation measures to reduce impacts from the Proposed Project's construction activity.

As discussed in Recirculated Draft EIR Section 3.9 *Air Quality* and Appendix N *Air Emissions Modeling for the Lower Klamath Project*, the Proposed Project's construction activity would exceed the Siskiyou County Air Pollution Control District's thresholds of significance for particulate matter that is 10 micrometers or less in diameter (PM_{10}) and nitrogen (NO_X). The Air Quality (AQ) Mitigation Measures chosen for the Proposed Project's construction activity are consistent with measures that are recommended by air district's throughout the state (e.g., Sacramento Metropolitan Air Quality Management District [SMAQMD], South Coast Air Quality Management District [SCAQMD], Bay Area Air Quality

Management District [BAAQMD], San Joaquin Valley Air Pollution Control District [SVAPCD], etc.) to provide substantial reductions in the emissions of PM_{10} and NO_X. These are also mitigation measures that Klamath River Renewal Corporation (KRRC) and their contractor have determined can be feasibly implemented for the Proposed Project considering the nature of the project (i.e., dam removal), the proposed construction techniques, and the site conditions specific to the Lower Klamath Project facilities. As a result of implementation of the dust control measures in Mitigation Measures AQ-4 and AQ-5, PM_{10} emissions will be reduced to less than significant. Although the exhaust control measures in Mitigation Measures AQ-1 through AQ-3 have the potential to result in substantial reductions in the emissions of NO_X, due to the uncertainty identified in Recirculated Draft EIR Section 3.9 *Air Quality* (page RE-3-27), emissions of NO_X would remain significant and unavoidable. Although there are other mitigation measures recommended in Appendix N that could further reduce emissions of PM_{10} and NO_X from the Proposed Project, implementation of these measures would not reduce NO_X to a less than significant level.

As discussed in Recirculated DEIR Section 3.10 *Greenhouse Gas Emissions and Energy*, the Proposed Project's construction activity would exceed the no net increase threshold for greenhouse gas (GHG) emissions. The GHG Mitigation Measure (GHG-1) was selected for the Proposed Project's construction activity as it would require the purchase of carbon offsets to fully offset construction-related GHG emissions and reduce impacts to less than significant. As discussed in Recirculated Draft EIR Section 3.10.5 *Greenhouse Gas Emissions and Energy – Potential Impacts and Mitigation* (page RE-3-82), Mitigation Measures AQ-1 through AQ-3 are likely to also provide small GHG emission benefits. The explanation for not purchasing carbon offsets as mitigation for GHG emissions from the exposure of reservoir sediments to aerobic conditions and from the natural functioning of restored riverine, wetland, and terrestrial habitats (i.e., the natural 'fast carbon cycle'), is provided in Recirculated Draft EIR Section 3.10.5 *Greenhouse Gas Emissions and Energy – Potential Impacts and Mitigation* (pages RE-3-89 to RE-3-90 and RE-3-93 to RE-3-94). Please also refer to Volume III Section 2.3.2 *Public Comments and Responses – Written Comments and Responses –Organizations – Klamath River Renewal Corporation, James G. Moose* for the comments submitted by Remy, Moose, Manley LLP on behalf of KRRC (dated February 6, 2020) as it relates to the reasoning for KRRC not agreeing to purchase carbon offsets for GHG emissions generated by the natural 'fast carbon cycle'.

Comment RE-8-10

3. *In the table titled "Construction Activity (grading and earthmoving) for the proposed project……" (RE-A-16), the D6 Dozer Quantity for Copco 1 and 2 are 0.7 and 0.3 respectively. We can assume that the equipment is allocated between the two sites (since the sum of the equipment add up to a whole number of Copco 1 and 2), but it is recommended that an explanation of the methodology is added because it is not immediately clear to a reviewer. This*

issue with Copco No. 1 and 2 occurs in multiple tables throughout Appendix A of N/O. Please add footnotes to tables wherever this occurs. This will explain the methodology as it is not intuitive why the equipment quantity would not be a whole number.

Response to Comment RE-8-10

The comment requests additional explanation be added to Appendix N *Air Emissions Modeling for the Lower Klamath Project* and Appendix O *Greenhouse Gas and Energy Modeling for the Lower Klamath Project* of the Recirculated Draft EIR to describe how equipment quantities were split between Copco 1 and Copco 2. Based on the comment provided, Appendix N Attachment A was revised to clarify the methodology for allocating equipment use between Copco No. 1 and Copco No. 2. Please refer to Volume III Attachment 2 Appendix N Attachment A for these revisions.

Comment RE-8-11

4. *To calculate maximum short-term emission rates from fugitive dust from roads, KRRC should not use "natural mitigation." From AP-42 Chapter 13.2.1: "Equation 1 may be extrapolated to average uncontrolled conditions (but including natural mitigation) under the simplifying assumption that annual (or other long-term) average emissions are inversely proportional to the frequency of measurable (> 0.254 mm [0.01 inch]) precipitation by application of a precipitation correction term. The precipitation correction term can be applied on a daily or an hourly basis". This is meant to be applied over a long-term averaging period to determine average annual or other long-term emissions. The reference to daily or hourly basis is in terms of the precipitation data available and does not imply that the "natural mitigation" can be used to calculate daily or hourly emissions. The same concept applies to 13.2.2. "Unpaved Road Calculation". KRRC should either recalculate or make it clear that the maximum daily emission rate is variable, and an average annual emission rate is used to represent emissions from this source.*

Response to Comment RE-8-11

The comment states that the "natural mitigation" adjustment factor (Equation 2 of Chapter 13.2.2 Unpaved Roads in the Environmental Protection Agency's [EPA's] AP-42 documentation) should not have been used to estimate maximum daily dust emissions from aggregate movement or vehicle travel on unpaved/paved roads.

The documentation for quantifying dust emissions on page 13.2.2-6 of EPA's AP-42 (USEPA 1995) explains that the natural mitigation (i.e., natural soil moisture) adjustment can be used to extrapolate emissions to annual averages. However, it also explains that site-specific information is preferred rather than default parameters. As shown on page RE-A-125 of Attachment A of the Recirculated Draft EIR, local moisture data (i.e., days/year of precipitation), based on

California Emissions Estimator Model defaults for Siskiyou County, were used in the modeling to adjust the dust emission factors to the local conditions. In addition, it should be noted that because the dust emission factor was based on annual average precipitation data, it is possible that daily and annual variations in rain could affect soil moisture content, and therefore dust emissions. For example, days or years with more precipitation and higher soil moisture content would result in less fugitive dust, while the opposite scenario is also possible.

As explained in Section N.3 of Appendix N, multiple phases of construction were overlapped to obtain maximum daily emissions and all modeling was based on conservative assumptions of daily construction activity. Peak construction activity assumptions are shown in Table RE-N-4 of the Recirculated Draft EIR. Overall, the methods, assumptions, and model inputs used to quantify dust emissions are well documented within Appendix N and associated Attachment A and are consistent with industry standards. No revisions are necessary.

Comment RE-8-12

5. *On page RE-A-126, the references to various sections of AP-42 are incorrect. All say 13.2.4 which is the reference to aggregate storage piles. Also, table header 1 "aggregate storage piles" is repeated on each page. This is misleading since what is being calculated are fugitive dust emissions from multiple sources including aggregate storage piles, unpaved and paved roads, and bulldozing.*

Response to Comment RE-8-12

The comment states that incorrect references were cited on page RE-A-126 of Attachment A in Appendix N of the Recirculated Draft EIR and that the header of the table is repeated on each page. Based on the comments provided, the header of the table on page RE-A-124 was revised to clarify what is being calculated and include references to footnotes 2 to 6. In addition, footnotes 2 to 5 on page RE-A-126 have been revised to provide the correct chapter numbers. Please refer to Volume III Attachment 2 Appendix N Attachment A for these revisions.

Comment RE-8-13

6. *Add "Diesel fuel Usage" above last three columns of table on page RE-A-165, RE-A-177, RE-A-200 so units are clear.*

Response to Comment RE-8-13

The comment requests that "Diesel Fuel Usage" be added to several table headings in Attachment A of Appendix N of the Recirculated Draft EIR, for additional clarity. The table heading "Diesel Fuel Usage" was added to the last three columns of the table on page RE-A-165, RE-A-177, and RE-A-200 as requested. Please refer to Volume III Attachment 2 Appendix N Attachment A for these revisions.

Comment RE-8-14

7. *It is recommended that the State Water Board discuss more substantively impacts related to windblown dust emissions from the exposed sediments on the reservoir banks and explain whether the moisture content of the exposed banks would be sufficient to limit windblown dust, and what, if any mitigation would be applied. Considering the size of the reservoir basins that would be exposed post-drawdown, it should also be discussed whether windblown dust emissions as well as fugitive dust from construction activities may contribute to cumulatively considerable effects. For instance, Owens Lake and Salton Sea have been experiencing large-scale dust/air pollution events, so it should be discussed to what degree the dust from the proposed project may be similar to these events.*

Response to Comment RE-8-14

Please refer to Master Response R-2 for a discussion of the potential for windblown dust and associated windblown dust related contaminates to be generated after drawdown of the reservoirs. As discussed in Master Response R-2, it is not anticipated that the Proposed Project will have a significant impact on windblown dust from the Project reservoirs.

As discussed in Recirculated Draft EIR Section 3.9 *Air Quality*, the Proposed Project's construction activity would exceed the Siskiyou County Air Pollution Control District's thresholds of significance for particulate matter that is 10 micrometers or less in diameter (PM_{10}). As a result of implementation of the dust control measures in Mitigation Measures AQ-4 and AQ-5, PM_{10} emissions will be reduced to less than significant. As discussed in Recirculated Draft EIR Section 3.9.5 *Air Quality – Potential Impacts and Mitigation* (pages RE-3-29 to RE-3-30), although there is the potential for short-term impacts from windblown dust not accounted for in the particulate matter emissions estimates, it is not anticipated that the additional emissions from windblown dust would result in a change to the significance determinations. As discussed in the Recirculated Draft EIR and Master Response R-2, this is due to the physical properties of the reservoir sediments, seasonally wet conditions during reservoir drawdown, and implementation of the restoration plan following reservoir drawdown).

Potential cumulative impacts from windblown dust are not anticipated to occur primarily due to the following:

1. no other construction projects that would have the potential to generate windblown dust have been identified in the project area;
2. any other construction projects that could potentially occur at the same time as the Proposed Project would have to comply with similar fugitive dust requirements and mitigation measures; and
3. any potential windblown dust generated would be a localized effect and would not be expected to contribute to a cumulative impact.

As discussed in Recirculated Draft EIR Section 3.24.9 *Air Quality Cumulative Effects* (pages RE-3-111 to RE-3-113), non-project activity types within the air quality Area of Analysis (i.e., areas within the Limits of Work and Siskiyou County as a whole) include forest and wildfire management projects, wildfires, and industrial development projects. The air quality cumulative effects discussion concludes that particulate matter emissions from the Proposed Project, which includes fugitive dust from construction and windblown dust, would not result in significant cumulative impacts in combination with the other non-project activities. The explanation for this determination is provided on pages RE-3-111 to RE-3-113 of Recirculated Draft EIR Section 3.24.9 *Air Quality Cumulative Effects*.

2.5.2 Native American Tribes

This section presents written comments received on the recirculated portions of the Draft EIR from Native American Tribes and the State Water Board's responses to those comments. Written comments and responses in this section are organized alphabetically by tribe name. To determine whether your comment is associated with an affiliation type other than Native American Tribes, please refer to Table 2-4 or Table 2-5.

Table of Written Native American Tribes Comments and Responses

Yurok Tribe, Joseph L. James 2-1753

Yurok Tribe, Joseph L. James

Comment RE-2-1

The Tribe is committed to advocating for dam removal in the most environmentally safe way possible and supports mitigation measures that will limit any environmental harms associated with dam removal. While there may be some short-term negative environmental impacts; overall, the removal of these dams will have huge environmental benefits for the species, people, and tribes relying on a healthy Klamath River.

Response to Comment RE-2-1

Thank you for submitting comments on the Recirculated Sections of the Draft EIR. This comment expresses the opinion that the impacts of the project are outweighed by the benefits. Comment noted.

Comment RE-2-2

The Tribe provides the following specific comments related to the Recirculated Portions of the Draft Environmental Impact Report for the Lower Klamath Project License Surrender ("RPDEIR"). First, the impacts listed in the RPDEIR regarding the air quality associated with NOx and PM10 emissions from pre-construction, dam removal, and restoration work are highly conservative assumptions. While these emissions are of concern, the mitigation measures listed in the RPDEIR will significantly reduce the harms to air quality and the Klamath River Renewal

Corporation ("KRRC") has committed to these measures to minimize these emissions.

Response to Comment RE-2-2
The comment states that the impact determinations in Recirculated Draft EIR Section 3.9 *Air Quality* associated with nitrogen (NOx) and particulate matter that is 10 micrometers or less in diameter (PM10) are conservative and that the mitigation measures listed in the Recirculated Sections of the Draft EIR will significantly reduce impacts. Comment noted.

Comment RE-2-3
Second, the RPDEIR finds the Project will cause a significant increase in greenhouse gas (GHG) emissions based on the legal analysis that a net increase in GHG is potentially significant. While this is true and every public agency and private entity should aggressively work to limit GHG emissions, the overall environmental benefit from dam removal must be considered in this Project. A healthy Klamath River will restore the ecosystem of the basin and allow for natural processes to return. Restoring the health of the environment will have many known and unknown benefits to serve as carbon sinks to help reduce GHG emissions and strengthen the area's climate crisis resiliency for future generations.

Response to Comment RE-2-3
The comment provides explanation of the commenter's opinion that the environmental benefits of the project will outweigh the potentially significant increase in greenhouse gas (GHG) emissions. Comment noted.

Comment RE-2-4
The Tribe is supportive of the mitigation measure of purchasing carbon offsets for the GHG emission resulting from the construction equipment needed for dam removal. However, we do not support the purchase of carbon offsets to remediate GHG emissions resulting from dewatering the reservoirs and restoring natural riverine processes. Furthermore, we request that any purchase of carbon offsets be done locally, if possible, to ensure the local communities impacted by GHG emissions receive benefits associated with this mitigation measure.

Response to Comment RE-2-4
The comment relates to the purchase of carbon offsets to reduce greenhouse gas (GHG) emissions impacts from the Proposed Project and requests that the purchase of offsets be done locally. Comment noted. Air quality does not fall within the scope of the State Water Board's water quality certification authority, and thus the State Water Board cannot ensure implementation of mitigation measures aimed at reducing air quality impacts.

2.5.3 Organizations

This section presents written comments received on the recirculated portions of the Draft EIR from organizations and the State Water Board's responses to those comments. Written comments and responses in this section are organized alphabetically by organization name. To determine whether your comment is associated with an affiliation type other than organizations, please refer to Table 2-4 or Table 2-5.

Table of Written Comments and Responses from Organizations

Fly Fishers International, C. Mark Rockwell 2-1755

Klamath River Renewal Corporation, James G. Moose 2-1756

Native Fish Society, Kevin P. Bundy 2-1771

Native Fish Society, Mark Sherwood 2-1786

Sierra Club, John Livingston 2-1787

Siskiyou County Water Users Association, Rex Cozzalio 2-1789

Fly Fishers International, C. Mark Rockwell

Comment RE-12-1

The Northern California Council, Fly Fishers International (NCCFFI), a party to and signer of the Klamath Hydroelectric Settlement Agreement (KHSA) of April 2016, hereby submits comments in support of KRRC on the above referenced Recirculated Portions of the Draft EIR for the Lower Klamath Project License Surrender (RPDEIR).

- *The RPDEIR uses highly conservative assumptions to estimate NOx emissions from construction equipment. KRRC is committed to measures that will minimize these NOx emissions. (These measures will be proposed as conditions for license surrender.) NCCFFI supports the KRRC's mitigation which will fully protect public health.*
- *The RPDEIR proposes to find that the project will cause a significant increase in greenhouse gas (GHG) emissions. It uses a legal threshold that any net increase in GHG emissions is potentially significant. KRRC has committed to obtain carbon offsets for GHG emissions resulting from construction equipment. NCCFFI supports this commitment which will fully offset construction-related GHG emissions.*
- *The RPDEIR proposes to find that dewatering reservoirs and restoring natural riverine processes will also cause significant GHG emissions. KRRC will not offset these emissions. It would not be good public policy to spend public funds for carbon offsets for natural riverine processes. NCCFFI supports the State Water Board's finding in the FEIR that GHG*

emissions associated with natural riverine processes are not an adverse impact.

Response to Comment RE-12-1
Thank you for submitting comments on the Recirculated Sections of the Draft EIR. The comment states that the Recirculated Draft EIR uses highly conservative assumptions to estimate nitrogen (NOx) emissions from construction equipment and expresses support for the mitigation measures proposed by Klamath River Renewal Corporation (KRRC), which the commenter believes will be protective of public health. The comment states that the Recirculated Draft EIR finds that greenhouse gas (GHG) emissions will be significant based on a no net increase threshold. The comment expresses support for KRRC's commitment to fully offset GHG emissions from construction equipment through the purchase of carbon offsets. The comment states that the Recirculated Draft EIR finds that dewatering and restoring the reservoirs to natural riverine processes will cause significant GHG emissions. The comment states that it would not be good public policy to spend public funds to mitigate this impact. The comment expresses support for the finding that GHG emissions associated with natural riverine processes are not an adverse impact. Comment noted.

Klamath River Renewal Corporation, James G. Moose

Comment RE-11-1
Please accept the following comments from the Klamath River Renewal Corporation (KRRC) on the above-referenced environmental document, in which the State Water Resources Control Board (State Water Board) has recirculated revisions to limited portions of the original Draft Environmental Impact Report (EIR) for the Lower Klamath Project License Surrender project (Project). As you know, KRRC is the applicant for the proposed water quality certification addressed therein. Although KRRC does have comments on the new document, KRRC supports the State Water Board's current intention of completing and certifying a Final EIR by no later than April 1, 2020, as set forth in correspondence last July to the Federal Energy Regulatory Commission (FERC). KRRC does not believe its limited comments will affect the Board's ability to meet that deadline.

As you know, KRRC seeks this certification in connection with its larger effort before FERC to obtain the approvals needed to remove four hydroelectric dams from the portion of the Klamath River within the State of California, pursuant to the terms of the Amended Klamath Hydroelectric Settlement Agreement (2016) (KHSA). KRRC appreciates the hard work shown in the Recirculated Portions of the Draft Environmental Impact Report (RPDEIR). As is discussed below, KRRC generally agrees with the conclusions set forth in the document, with just one exception.

Response to Comment RE-11-1
Thank you for submitting comments on the Recirculated Sections of the Draft EIR. Comment noted.

Comment RE-11-2
The primary purpose of these comments is to confirm certain assumptions and understandings set forth in the RPDEIR with respect to KRRC's intentions and commitments regarding various issues. As the document acknowledges, the State Water Board lacks regulatory authority over the main subjects addressed in the RPDEIR, namely, mitigation for air pollutant and greenhouse gas (GHG) emissions. These issues are beyond the State Water Board's jurisdiction because these topics are outside the Board's statutory mission to protect water quality, as created by the California Legislature,[1] and because of the preemptive effects of the Federal Power Act (16 U.S.C. § 791a et seq.).[2] The RPDEIR identifies air quality and GHG mitigation to which it believes the KRRC has committed for the purpose of its license surrender application pending before FERC. KRRC intends to implement these measures after FERC approves KRRC's pending surrender application. The RPDEIR also makes representations regarding theoretically available additional mitigation for GHG emissions associated with natural riverine processes, to which KRRC is not committed. As is explained below, this letter confirms that the State Water Board's findings on these points are correct.

Response to Comment RE-11-2
Comment noted.

Comment RE-11-3
KRRC parts company with the RPDEIR only with respect to its "conservative" conclusion that the proposed dam removals pursuant to the KHSA would be inconsistent with the 1993 Energy Element of the Siskiyou County General Plan. KRRC sees no such inconsistency, for reasons explained below.

Response to Comment RE-11-3
The comment expresses disagreement with the conclusion in the Recirculated Draft EIR Section 3.10 *Greenhouse Gas Emissions and Energy* that the Proposed Project would conflict with the County of Siskiyou General Plan Energy Element. As discussed in the Recirculated Draft EIR Section 3.10.5 *Greenhouse Gas Emissions and Energy – Potential Impacts and Mitigation* (page 3-104), the Energy Element generally promotes further development of renewable energy sources in the county, and removal of an existing renewable energy source could conservatively be considered to conflict with such policies in the Energy Element. Such a conflict would not be an impact that can be feasibly mitigated and, therefore, the Recirculated Draft EIR concludes that the Proposed Project would result in a significant and unavoidable impact because it conflicts with a local plan.

Although the commenter does not believe that the Recirculated Draft EIR is in error, it disagrees that the Proposed Project is inconsistent with the Energy Element for the reasons stated in the comment letter, including in comments RE-11-15 through RE-11-25. In sum, the commenter disagrees that the County's General Plan applies to the project due to federal preemption under the Federal Power Act. Even if the General Plan applies, however, the commenter does not agree that the Proposed Project would be inconsistent with the Energy Element, in part, because the Energy Element largely focuses on prospective development projects and does not contain policies specifically addressing whether the County favors maintaining existing dams or other power generation facilities. Although the Energy Element generally promotes further development of renewable energy sources in the County, the commenter opines that, by itself, this emphasis within the Element is not a sufficient basis for finding the Proposed Project to be inconsistent.

Consistent with the fundamental purpose of CEQA, the Recirculated Draft EIR discloses to the public the likely environmental impacts of the Proposed Project. This disclosure allows decisionmakers and the public to make informed decisions about the project, ways in which significant effects may be mitigated, and alternatives to the project. The analytical approach to assessing the Proposed Project's potential conflict with the Energy Element is a conservative one, but it serves to provide meaningful information for environmental assessment and thus apprise interested persons of the potential environmental consequences of the entire project. Moreover, the issue of whether the County Plan is preempted is subject to legal dispute among the commenters, see letter to Ms. Michelle Siebal, State Water Board, and Mr. Anton Porter, Federal Energy Regulatory Commission, from Mr. Paul Weiland on behalf of Siskiyou County, dated Feb. 18, 2020.

No change is made to the determination in the EIR based on the comments on the Energy Element.

Comment RE-11-4

The KRRC appreciates that the updated air quality analysis found in the RPDEIR addresses comments regarding the dated nature of the modeling used in the Draft EIR. That issue has been put to rest by the updated analysis, which uses current technical methodologies.

Response to Comment RE-11-4

The comment expresses the commenter's appreciation that the updated air quality analysis in the Recirculated Draft EIR addresses comments regarding the dated nature of the modeling used in the Draft EIR. Comment noted.

Comment RE-11-5

On pages RE-3-35 and RE-3-36, the RPDEIR lays out a number of construction-related air pollution control measures to which the State Water Board believes

that KRRC has committed. These commitments are set forth in so-called Mitigation Measures AQ-1 through AQ-5. Through this letter, KRRC is confirming with the SWRCB that, indeed, KRRC is committed to carrying out these measures, despite the SWRCB's lack of any legal authority to impose them. The State Water Board's significance conclusions premised on these commitments are therefore sound.

Response to Comment RE-11-5
The comment confirms Klamath River Renewal Corporation's (KRRC's) commitment to implement the air quality mitigation measures AQ-1 through AQ-5 in the Recirculated Draft EIR and concludes that the significance conclusions premised on these commitments are sound. Comment noted.

Comment RE-11-6
These commitments reflect KKRC's overall commitment to employ all reasonable control air quality control measures to minimize the emissions associated with construction, dam removal, and restoration activities. These measures will be sufficient to protect public health, as the State Water Board has concluded on page RE-3-34, where the text states that "it is not reasonably foreseeable to conclude that the project would result in significant health impacts," despite NOx emissions that cannot feasibly be brought down below the applicable significance threshold employed in the RPDEIR.

Response to Comment RE-11-6
The comment expresses the commenter's opinion that the air quality mitigation measures Klamath River Renewal Corporation (KRRC) has committed to implement will be sufficient to protect public health. Comment noted.

Comment RE-11-7
The RPDEIR includes a substantial amount of new information and analysis on the subject of GHG emissions and energy usage. This new information fully addresses comments on the Draft EIR.

The Draft EIR had dealt with GHG emissions under two broad categories of impacts, which were determined to be less than significant:

- *generation of GHG emissions, either directly or indirectly, that would exceed 10,000 MT C02e; and*
- *conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions.*

Response to Comment RE-11-7
The comment expresses the commenter's opinion that the new information and analysis on Greenhouse Gas emissions and energy usage in the Recirculated Draft EIR fully addresses the comments on the Draft EIR. Comment noted.

Comment RE-11-8

The RPDEIR, in contrast, addresses a total of four categories of GHG-related impacts:

- *generation of direct GHG emissions from construction activity and operations (Potential Impact 3.10-1);*
- *generation of direct GHG emissions from reservoir sediments during drawdown that would exceed a no net increase threshold (Potential Impact 3.10-2);*
- *generation of direct GHG emissions from conversion of the reservoir areas to riverine, wetland, and terrestrial habitat types, that would exceed a no net increase threshold (Potential Impact 3.10-3); and*
- *generation of indirect GHG emissions from continued power production for the PacifiCorp PCA (Potential Impact 3.10-4).*

Of these four categories, one can be mitigated to a less than significant level (3.10-1); two are deemed significant and unavoidable (3.10-2 and 3.10-3); and the last is deemed to be less than significant (or nonexistent) (3.10-4).

Response to Comment RE-11-8

The comment summarizes the impacts and significance determinations related to Greenhouse Gas emissions impacts in the Recirculated Draft EIR. Comment noted.

Comment RE-11-9

The RPDEIR also addresses three new related impact categories dealing with the energy production and consumption. Under these new categories, significant effects would occur if the project would:

- *result in the wasteful, inefficient, or unnecessary consumption of energy resources during project construction or operations (Potential Impact 3.10-5);*
- *result in a substantial impact on local and regional energy supplies and/or on requirements for additional capacity (Potential Impact 3.10-6); and*
- *conflict with or obstruct a state or local plan for renewable energy or energy efficiency (Potential Impact 3.10-7).*

Response to Comment RE-11-9

The comment summarizes the three new impact categories related to energy production and consumption in the Recirculated Draft EIR. Comment noted.

Comment RE-11-10

KRRC has no objection to the State Water Board's use of a "no net increase" significance threshold for the generation of GHG thresholds. The use of this threshold addresses comments lodged against the Draft EIR. We do note that, under this threshold, any project that results in GHG emissions -thus, any

construction project-would have a potentially significant impact, thus emphasizing the importance of mitigation.

Response to Comment RE-11-10
The comment addresses the use of a “no net increase” significance threshold for Greenhouse Gas emissions in the Recirculated Draft EIR. Comment noted.

Comment RE-11-11

With respect to the first category of GHG-related impacts (Potential Impact 3.10-1), the RPDEIR is correct in stating on page RE,.3-82 that "the KRRC has agreed to purchase carbon offsets per GHG Mitigation Measure ENR-1." Thus, notwithstanding the fact that the State Water Board lacks any legal authority by which it can impose such a measure, KRRC intends to carry out Mitigation Measure ENR-1, which contemplates the purchase of "carbon offsets," as it appears in the RPDEIR (seep. RE-3-83). The State Water Board's significance conclusion premised on this commitment is therefore sound. KRRC thus agrees that the proposed project will not cause significant effects relating to the generation of direct GHG emissions from construction activity and operations. Mitigation Measure ENR-1 will ensure the avoidance of any net increase in GHG emissions from construction and operations activities (Potential Impact 3.10-1).

Response to Comment RE-11-11
The comment confirms Klamath River Renewal Corporation’s (KRRC’s) intention to carry out Greenhouse Gas Mitigation Measure ENR-1 and characterizes the significance conclusion premised on this comment as sound. Comment noted.

Comment RE-11-12
With respect to the next two categories of GHG-related impacts (Impacts 3.10-2 and 3.10-3), which address GHG emissions from the exposure of previously submerged reservoir sediments to aerobic conditions and from the natural functioning of restored riverine, wetland, and terrestrial habitats, KRRC does not object to the conclusions that these effects are significant and unavoidable.

KRRC does not intend to pursue carbon offsets to address these effects and that requiring such offsets are outside of the State Water Board's jurisdiction. KRRC urges the Board, in ultimately adopting CEQA findings for water quality certification for the project, to embrace KRRC's reasoning discussed below as one ground (along with preemption) for finding that carbon offsets are not feasible mitigation for Impacts 3.10-2 and 3.10-3.[3]

Response to Comment RE-11-12
The comment does not object to the conclusion that Potential Impact 3.10-2 and Potential Impact 3.10-3 are significant and unavoidable. The comment states that Klamath River Renewal Corporation (KRRC) does not intend to pursue the purchase of carbon offsets to address these effects. Comment noted.

Comment RE-11-13

KRRC is committed to carrying out the proposed project in the most environmentally sensitive manner possible. KRRC recognizes that many natural processes, by their very nature, involve the generation of carbon dioxide as part of the natural carbon cycle. To the extent that regulatory efforts to address climate change could be a factor in undermining efforts to restore environmental conditions that, in their natural state, would be part of that natural cycle, such efforts could have counterproductive effects, by dramatically raising the costs of environmental restoration or by making such restoration prohibitively expensive and thus financially infeasible.

Impact 3.10-2 and 3.10-3 both deal with GHG emissions that are part of the natural carbon cycle. The RPDEIR has the following to say about Impact 3.10-2:

> *[T]he CARB Scoping Plan primarily focuses on anthropogenic sources of GHG emissions from construction and ongoing operational emissions from stationary industrial projects with high rates of fossil fuel combustion emissions or the construction and increased power and transportation needs from newly constructed residential or commercial projects. Other than mitigating any related construction emissions, the CARB Scoping Plan does not contain guidance on assessing or mitigating the potential GHG emissions impacts from dam removal and habitat restoration activities. Generally, the Scoping Plan encourages the rehabilitation of natural ecosystems as part of the state's climate solution. The sediment release associated with this restoration project would result in the release of methane and oxidation of the sediment deposits, which is conservatively estimated to result in a one-time release of 19,350 MTC02e of GHG emissions. The majority of these emissions would occur within six months of reservoir drawdown. As noted above, these GHG emissions would have occurred gradually on an annual basis if the dams had not been built. As such, the temporary GHG emissions associated with Lower Klamath Project reservoir sediments are part of the natural 'fast carbon cycle'. Although these GHG emissions would exceed the no net increase threshold, reductions of emissions from the natural fast carbon cycle are not part of the Scoping Plan strategies for achieving the GHG reductions for 2030 and beyond. Therefore, the emissions from reservoir sediments during drawdown would not conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of GHGs.*
>
> *(RPDEIR, pp. RE-3-89 -RE-3-90 [italics added].)*

KRRC agrees with the State Water Board that the proposed project is not inconsistent with state climate policies. Indeed, the project is totally consistent with state climate policy, which looks to healthy natural lands as part of an overall solution to climate change worldwide. Although the natural carbon cycle will

continue as rivers flow freely, wetlands serve their ecological functions, and plants live, die, and decay, the GHG emissions that occur are part of the natural functioning of Nature. Such emissions are not problematic. Loading up huge additional costs on environmental restoration projects subverts effective solutions such as dam removal.

This logic is even more compelling with respect to Impact 3.10-3, where the State Water Board made the following observations:

> *Conversion of the impounded areas of the four Lower Klamath Project reservoirs to free-flowing riverine habitats has the potential to result in long-term changes in total annual GHG emissions from aquatic and terrestrial habitats within the reservoir footprint. ****
>
> ***
>
> *While the reservoir contribution to GHG production would be zero under the Proposed Project, and the increase in riparian (forest) areas in the Hydroelectric Reach would result in more carbon sequestration compared with existing conditions, the addition of restored riverine habitat would result in roughly 60 percent more annual GHG emissions from the Hydroelectric Reach area under the Proposed Project. This would be an exceedance of the no net increase threshold for GHG emissions and would be a significant impact.*
>
> *However, as discussed in Potential Impact 3.10-2, freshwater streams and rivers serve as large, natural sources of CO2 in regional and global carbon budgets (Tranvik et al. 2009, Butman and Raymond 2011, Raymond et al. 2013, Deemer et al. 2016). Riverine oxidation of organic matter to produce CO2 is part of the natural cycling of carbon between the atmosphere and freshwater and terrestrial ecosystems. As the focus of the Lower Klamath Project is to restore the Klamath River and the habitat that it provides for anadromous fish, it would not be reasonable or feasible to reduce the amount of restored riverine habitat, or to inte1fere with the natural processing of carbon in the river, as a means of reducing annual GHG emissions under the Proposed Project.*
>
> ***
>
> *While the additional GHG emissions above the current baseline cause a significant impact based on the no net increase emissions threshold, it does not conflict the CARB Scoping Plan or other applicable plans, policies, or regulations adopted for the purpose of reducing the emissions of GHGs. The nature of the GHG emissions that would result from the conversion of the reservoir areas to restored natural systems under the Proposed Project differs from the human-caused or fossil-fuel-based emissions that are inventoried under state emissions*

> *assessments, and for which CARB has developed comprehensive emissions reductions plans in order to reach statewide goals. * * **
>
> *As indicated in the CARB Scoping Plan, the rehabilitation and maintenance of natural and working lands is identified as part of the state's climate solution. * * **
>
> *The Proposed Project is consistent with the goals of the Scoping Plan related to the rehabilitation of natural and working lands, since it proposes to remove the Lower Klamath Project dam complexes and restore the various habitat types associated with this section of the Klamath River watershed, and since reductions of emissions from the natural 'fast carbon cycle' are not part of the Scoping Plan strategies for achieving the GHG reductions for 2030 and beyond.*
>
> *(RPDEIR, pp. RE-3-90, RE-3-93, RE-3-94 [italics added].)*

The purchase of offsets to address the GHG emissions associated with Impact 3.10-3 is especially problematic, in that the GHG emissions at issue will essentially occur forever, or for at least as long as the natural conditions that the proposed project seeks to create remain in place. No entity, including the KRRC, has the financial means to purchase viable offsets that must continue forever. KRRC also submits that it would be an absurd public policy outcome for such offsets to be undertaken as mitigation for a project to restore lands to their natural conditions, consistent with state climate policy. Indeed, such an outcome would appear to be contrary to the whole purpose of CEQA, which is to protect the natural environment against human-caused degradation. KRRC believes that, in enacting CEQA, the California Legislature never intended that the law be used to frustrate, rather than facilitate, efforts to preserve or restore natural ecological wonders such as free-flowing rivers supporting robust anadromous fisheries. If GHG mitigation were required for restoration projects of the kind KRRC is undertaking, then no landowner in California with a degraded watercourse crossing its property would have any incentive to cooperate in the restoration of such a watercourse, for fear of mitigation obligations that would persist as long as the restored waters kept flowing.[4]

Response to Comment RE-11-13
The comment addresses Impacts 3.10-2 and 3.10-3, which deal with greenhouse gas (GHG) emissions that are part of the natural carbon cycle, and the infeasibility of purchasing offsets to address associated GHG emissions. Comment noted.

Comment RE-11-14
KRRC agrees with the conclusions in the RPDEIR that all of the following potential impacts will be less than significant without mitigation: 3.10-4 (generation of indirect GHG emissions from continued power production for the

PacifiCorp PCA); 3.10- 5 (result in the wasteful, inefficient, or unnecessary consumption of energy resources during project construction or operations), and 3.10-6 (result in a substantial impact on local and regional energy supplies and/or on requirements for additional capacity). More specifically, KRRC agrees that (i) PacifiCorp will be able to successfully replace lost hydroelectric power with sources of electricity that are not derived from fossil fuels; (ii) that the proposed project will not use energy in a wasteful or inefficient manner; and (iii) that the removal of the dams at issue will not have substantial impacts on regional or local energy supplies or necessitate the construction of new power plants.

Response to Comment RE-11-14
The commenter agrees with the significance determinations for Impacts 3.10-4, 3.10-5, and 3.10-6. Comment noted.

Comment RE-11-15
With respect to Potential Impact 3.10-7, KRRC agrees that the proposed project will not conflict with or obstruct a state plan for renewable energy or energy efficiency. Indeed, as the RPDEIR explains, the project does not conflict with California policies favoring renewable energy production and is consistent with state policies related to the restoration of degraded natural lands.

KRRC respectfully disagrees, however, with the State Water Board's conclusion that the project is inconsistent with the Siskiyou County Energy Element, adopted in 1993. KRRC also does not agree that this alleged inconsistency will result in a significant unavoidable environmental effect. KRRC has several reasons.

Response to Comment RE-11-15
Please refer to the response to comment RE-11-3 related to the conclusion in Recirculated Draft EIR Section 3.10 *Greenhouse Gas Emissions and Energy* that the Proposed Project would result in a significant and unavoidable impact due to inconsistency with the Siskiyou County Energy Element.

Comment RE-11-16
First, the County's General Plan simply does not apply to the project, due to federal preemption under the Federal Power Act. (See footnote 2, supra.) Rather, the Element only applies to the County itself and to private applicants proposing projects requiring some sort of discretionary County approval under its General Plan. One of the significance thresholds employed by the State Water Board in this context asserts that a significant effect would result if the project would "[c]onflict with or obstruct a state or local plan for renewable energy or energy efficiency." KRRC suggests that, in the Final EIR, this threshold be modified to read as follows: "[c]onflict with or obstruct an applicable state or local plan for renewable energy or energy efficiency." This change would bring the threshold into line with one of the questions that lead agencies should address from the sample Initial Study checklist promulgated by the California Natural Resources Agency, as found in Appendix G to the CEQA Guidelines. That question is

whether a proposed project would"[c]onflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases[.]" (Cal. Code Regs., tit. 14, div. 6, ch. 3, appen. G, sample questions, § VIII, italics added.) This inquiry echoes a requirement found in CEQA Guidelines section 15125, subdivision (d), that EIRs "shall discuss any inconsistencies between the proposed project and applicable general plans, specific plans, and regional plans." (Italics added.)[5] Because the Siskiyou County General Plan does not apply to the project, KRRC believes that the State Water Board should not have treated the perceived inconsistency with the Energy Element as creating a significant environmental effect cognizable under CEQA.

Response to Comment RE-11-16
Please refer to the response to comment RE-11-3 related to the conclusion in Recirculated Draft EIR Section 3.10 *Greenhouse Gas Emissions and Energy* that the Proposed Project would result in a significant and unavoidable impact due to inconsistency with the Siskiyou County Energy Element.

Comment RE-11-17
Second, KRRC does not agree that, even if the General Plan applied, the project would be inconsistent with the Energy Element. As the RPDEIR text concedes, "[t]he Energy Element focuses on energy efficiency and minimizing the impacts of any future renewable development. The Energy Element is primarily forward looking and does not specifically address the removal of the Lower Klamath Project facilities or contain any policies related to maintaining such facilities." (PRDEIR, p. RE-3-104, italics added.)

Response to Comment RE-11-17
Please refer to the response to comment RE-11-3 related to the conclusion in Recirculated Draft EIR Section 3.10 *Greenhouse Gas Emissions and Energy* that the Proposed Project would result in a significant and unavoidable impact due to inconsistency with the Siskiyou County Energy Element.

Comment RE-11-18
KRRC parts company with the State Water Board when the RPDEIR goes on to reason as follows:

> *Nevertheless, the Energy Element generally promotes further development of renewable energy sources in the county, and removal of an existing renewable energy source could conservatively be considered to conflict with such policies in the Energy Element. Such a conflict would not be an impact that can be feasibly mitigated. Therefore, this would be a significant and unavoidable impact.*

This conclusion speculates about intent and is inconsistent with the plain meaning of the General Plan. KRRC respectfully urges the State Water Board to reconsider and change its determination in the Final EIR. As the PRDEIR notes,

the Element "does not specifically address the removal of the Lower Klamath Project facilities or contain any policies related to maintaining such facilities."

Response to Comment RE-11-18
Please refer to the response to comment RE-11-3 related to the conclusion in Recirculated Draft EIR Section 3.10 *Greenhouse Gas Emissions and Energy* that the Proposed Project would result in a significant and unavoidable impact due to inconsistency with the Siskiyou County Energy Element.

Comment RE-11-19
Notably, California law "does not require ... an exact match between the project and the applicable general plan." (San Franciscans Upholding the Downtown Plan v. City and County of San Francisco (2002) 102 Cal.App.4th 656, 678; see also Friends of Lagoon Valley v. City of Vacaville (2007) 154 Cal.App.4th 807, 817.) "Rather, in determining whether a project conflicts with a general plan, 'the nature of the policy and the nature of the inconsistency are critical factors to consider.'" (Spring Valley Lake Assn. v. City of Victorville (2016) 248 Cal.App.4th 91, 100 (Spring Valley), quoting Families Unafraid to Uphold Rural etc. v. Board of Supervisors (1998) 62 Cal.App.4th 1332, 1341.) Thus, "[a] project is inconsistent with a general plan 'if it conflicts with a general plan policy that is fundamental, mandatory, and clear.'" (Spring Valley, supra, 248 Cal.App.4th at p. 100, quoting Endangered Habitats League, Inc. v. County of Orange (2005) 131 Cal.App.4th 777, 782.) "[G]eneral ... plans attempt to balance a range of competing interests. It follows that it is nearly, if not absolutely, impossible for a project to be in perfect conformity with each and every policy set forth in the applicable plan.... It is enough that the proposed project will be compatible with the objectives, policies, general land uses and programs specified in the applicable plan." (Sierra Club v. County of Napa (2004) 121 Cal.App.4th 1490, 1510-1511, italics added.)

Under these legal standards, the removal of the J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate dams and associated facilities will not be inconsistent with the 1993 Siskiyou County Energy Element. That document, which is now nearly 27 years old, is mainly informational, and contains only a relative handful of actual goals and policies, which are found starting on page 167 of the Element. Nearly all of the policies relate to proposed prospective development projects, and the policies include no language specifically addressing whether the County favors maintaining existing dams or other power generation facilities already in place.

Response to Comment RE-11-19
Please refer to the response to comment RE-11-3 related to the conclusion in Recirculated Draft EIR Section 3.10 *Greenhouse Gas Emissions and Energy* that the Proposed Project would result in a significant and unavoidable impact due to inconsistency with the Siskiyou County Energy Element.

Comment RE-11-20

Although the Energy Element includes an extended discussion of hydropower resources as they existed within the County in 1993 (see pages 135 through 145), nothing in this discussion purports to require that the County oppose efforts to remove existing hydro facilities in which it had no ownership interest and over which it had no regulatory control. In fact, the discussion notes some of the environmental drawbacks associated with hydroelectric power within the County. For example, on page 140, the Element acknowledges that "[s]ome hydro projects can present migration barriers to the passage of upstream and downstream anadromous fish." (Energy Element, p. 140.) With respect to the possibility that new dams might be built, the text notes the potential for conflicts with natural resources "such as fish, scenic qualities, and competing water uses, e.g. agricultural applications." (Id., p. 144.) "The most notable consequence from hydro conflicts is expected to be environmental, where negative impacts to surrounding uses could have moderate to severe impacts on fish and wildlife, water quality, other water uses, and scenic qualities." (Ibid.)

Response to Comment RE-11-20

Please refer to the response to comment RE-11-3 related to the conclusion in Recirculated Draft EIR Section 3.10 *Greenhouse Gas Emissions and Energy* that the Proposed Project would result in a significant and unavoidable impact due to inconsistency with the Siskiyou County Energy Element.

Comment RE-11-21

Notably, by its own terms, the 1993 Energy Element's "planning horizon is the year 2010. This approximate 20-year time frame is considered to be the longest planning horizon that is reasonable without becoming unreliably speculative." (Energy Element, p. 6.) As the text notes, "[e]nergy conditions can change relatively fast, making it important to maintain a current, factual basis for policy and implementation decisions." The fact that, by its own terms, the Energy Element is now stale is another reason why the State Water Board, in the Final EIR, should alter its conclusion with respect to Impact 3.10-7.

Response to Comment RE-11-21

Please refer to the response to comment RE-11-3 related to the conclusion in Recirculated Draft EIR Section 3.10 *Greenhouse Gas Emissions and Energy* that the Proposed Project would result in a significant and unavoidable impact due to inconsistency with the Siskiyou County Energy Element.

Comment RE-11-22

In 1993, when the Siskiyou County Board of Supervisors adopted the County's Energy Element, the County could not have foreseen the future changes in California law that, over the course of the last two decades, have required electric power providers such as PacifiCorp to purchase renewable energy on a large scale. As the PRDEIR itself discusses in connection with Impacts 3.10-4 and 3.10-7, PacifiCorp is subject to stringent California statutes requiring the

increasing use of renewable energy over time. The PRDEIR explains that, due to its efforts to comply with these laws, PacifiCorp will be able to replace the lost electricity associated with dams to be removed by relying instead on clean sources of electricity such as solar and wind power. (See PRDEIR, pp. RE-3-95 – RE-3-99, RE-3-105.) Thus, the proposed dam removals will not undermine the County's general policy preference for an increase in the amount of energy used within the County coming from renewable resources.

Response to Comment RE-11-22
Please refer to the response to comment RE-11-3 related to the conclusion in Recirculated Draft EIR Section 3.10 *Greenhouse Gas Emissions and Energy* that the Proposed Project would result in a significant and unavoidable impact due to inconsistency with the Siskiyou County Energy Element.

Comment RE-11-23
It is true that the Energy Element contains the following policy (on page 175), which on its face might appear to apply to the project:

> *The technically and environmentally-sound use of renewable energy resources for direct application and power generation purposes. An objective of this goal is increasing the amount of current local renewable use, and sustaining such use over time without adverse effects to energy resources or the surrounding environment.*

It is clear, however, from both the language of the goal and from the policies that implement it that the policy is purely forward-looking, and only applies to new projects being proposed for the first time. The most grammatical reading of the goal is that the County should increase the amount of renewable energy use beyond what was in place in 1993, and that, once new sources are in place, their use should be sustained over time. This interpretation is reinforced by the four specific policies intended to implement the goal, all of which are forward-looking and only apply to new projects.[6]

Response to Comment RE-11-23
Please refer to the response to comment RE-11-3 related to the conclusion in Recirculated Draft EIR Section 3.10 *Greenhouse Gas Emissions and Energy* that the Proposed Project would result in a significant and unavoidable impact due to inconsistency with the Siskiyou County Energy Element.

Comment RE-11-24
Even if the goal is understood to apply to the project, the project would be consistent with the goal, in that the dams cannot be left in place "without adverse effects to ... The surrounding environment." Indeed, the ongoing adverse environmental effects associated with keeping the dams in place are the very reason why the dams are being removed.

Response to Comment RE-11-24
Please refer to the response to comment RE-11-3 related to the conclusion in Recirculated Draft EIR Section 3.10 *Greenhouse Gas Emissions and Energy* that the Proposed Project would result in a significant and unavoidable impact due to inconsistency with the Siskiyou County Energy Element.

Comment RE-11-25
In short, even if we assume for the sake of argument that the 1993 Siskiyou County Energy Element applies to the project, there is simply no "fundamental, mandatory, and clear" policy therein with which the project would be inconsistent. KRRC agrees with the State Water Board that "the Energy Element generally promotes further development of renewable energy sources in the county"; but this emphasis within the Element is not, by itself, a sufficient basis for finding the project to be inconsistent with the Element. This is especially so in light of other conclusions within the PRDEIR to the effect that the project will not lead to an increased use of fossil fuels by PacifiCorp and will not in any way undermine state climate policy.

Response to Comment RE-11-25
Please refer to the response to comment RE-11-3 related to the conclusion in Recirculated Draft EIR Section 3.10 *Greenhouse Gas Emissions and Energy* that the Proposed Project would result in a significant and unavoidable impact due to inconsistency with the Siskiyou County Energy Element.

Comment RE-11-26
For the reasons discussed above, the RPDEIR assists the State Water Board in ensuring that its upcoming Final EIR will satisfy all applicable requirements of CEQA relating to the analysis of air quality, greenhouse gas emissions, and energy. As the Board correctly discerned, KRRC is willing to undertake aggressive air quality mitigation to reduce its construction-related emissions to the extent feasible and is also willing to purchase carbon offsets to render the GHGs emitted during construction, restoration, and operations. KRRC will implement these commitments through the management plans that it will propose as conditions of license surrender.

Response to Comment RE-11-26
The comment summarizes Klamath River Renewal Corporation's (KRRC's) commitments to undertake air quality mitigation. Comment noted.

Comment RE-11-27
KRRC will not, however, purchase offsets to address emissions that represent the normal functioning of a free-flowing river, wetlands, and other terrestrial habitat. Such mitigation would be contrary to public policy. Although KRRC urges the State Water Board to change its conclusion with respect to Impact 3.10-7, this difference of opinion does not indicate that the Board has erred under CEQA with respect to that issue. KRRC simply believes that the more

persuasive, and correct, conclusion with respect to that issue is that the project is not inconsistent with the Siskiyou County Energy Element.

Response to Comment RE-11-27
The comment states that Klamath River Renewal Corporation (KRRC) will not purchase carbon offsets to address emissions that represent the normal functioning of a free-flowing river, wetland, and other terrestrial habitat. Comment noted.

Please refer to the response to comment RE-11-3 related to the conclusion in Recirculated Draft EIR Section 3.10 *Greenhouse Gas Emissions and Energy* that the Proposed Project would result in a significant and unavoidable impact due to inconsistency with the Siskiyou County Energy Element.

Native Fish Society, Kevin P. Bundy

Comment RE-16-1
This firm represents the Native Fish Society in matters relating to the proposed Lower Klamath License Surrender Project ("Project"). On behalf of our client, we have reviewed the Recirculated Portions of the Draft Environmental Impact Report ("RDEIR") and respectfully submit these comments to help ensure that agency decision- makers fully comply with the California Environmental Quality Act ("CEQA"), Public Resources Code § 21000 et seq., and the CEQA Guidelines, California Code of Regulations, Title 14, § 15000 et seq. ("Guidelines").

Response to Comment RE-16-1
Thank you for your comments.

Comment RE-16-2
The RDEIR does not consider many of the topics discussed in the Prior Comments. Nor does it respond to issues raised in the Prior Comments for the most part. Moreover, the EIR as a whole does not contain the full analysis requested in the coalition comments on the scoping document. All of the Prior Comments thus remain relevant and applicable to the EIR as a whole. The comments that follow focus primarily on the RDEIR's analysis of greenhouse gas ("GHG") emissions and energy impacts, as well as its updated discussion of the No Hatchery Alternative.

Response to Comment RE-16-2
Comment noted. For responses to comments provided by the Native Fish Society on the Draft EIR please refer to Volume III Section 2.3.4 *Public Comments and Responses – Written Comments and Responses – Draft EIR – Organizations, Kevin P. Bundy and Mark Sherwood* and Volume III Attachment 1. Additionally, please refer to Master Response R-1.

Comment RE-16-3

The RDEIR fails to disclose, analyze, and propose adequate mitigation the Project's GHG emissions and energy impacts in accordance with CEQA.

Response to Comment RE-16-3

Comment noted. Please refer to the response to comments RE-16-4 to RE-16-21 for a response to the specific issues raised about the adequacy of the Recirculated Draft EIR.

Comment RE-16-4

The RDEIR uses a "no net increase" threshold to measure the significance of GHG emissions. (RDEIR at RE-3-68.) Accordingly, any increase in GHG emissions over existing conditions is considered significant. This is not an unreasonable threshold per se, but it is a quantitative threshold; accordingly, the RDEIR's significance conclusions in relation to the threshold must be supported by a quantitative analysis and evidence. "[W]hen [an] agency chooses to rely completely on a single quantitative method to justify a no-significance finding, CEQA demands the agency research and document the quantitative parameters essential to that method." (Center for Biological Diversity v. Department of Fish & Wildlife (2015) 62 Cal.4th 204, 228.)

Response to Comment RE-16-4

The commenter asserts that, because the State Water Board's "no net increase" significance threshold for greenhouse gas (GHG) emissions is quantitative in character, CEQA required that the State Water Board support its significance conclusions with "quantitative analysis and evidence."

The State Water Board notes that its analysis of GHG-related impacts is supported by quantitative analysis and substantial evidence. Notably, though, the CEQA Guidelines and CEQA case law recognize that lead agencies have discretion to employ qualitative analyses where appropriate. CEQA Guidelines section 15064.4, subdivision (a), provides that "*[a] lead agency shall have discretion to determine, in the context of a particular project, whether to: (1) [q]uantify greenhouse gas emissions resulting from a project; and/or (2) [r]ely on a qualitative analysis or performance based standards*." (Italics added.)

Thus, CEQA allows both quantitative and qualitative analysis of GHG-related impacts. What ultimately matters is whether substantial evidence and reasoned analysis support a lead agency's impact conclusions. Here, as explained below, the State Water Board quantified the vast majority of the GHG emissions associated with the Proposed Project, and chose not to quantify only one limited category of emissions – operational emissions – for which it is readily apparent that existing levels of GHG emissions will drop significantly compared to baseline conditions.

Contrary to the commenter's assertion, the use of a no net increase threshold of significance did not necessitate quantification of operational emissions. A no net increase threshold means that any increase in GHG emissions over existing conditions is considered significant. A no net increase threshold did not require quantification of operational emissions because it could be reasonably determined that future operational emissions will be less than existing conditions. The Proposed Project is unique because it involves the removal of most facilities that currently generate GHG emissions. This would eliminate operational GHG emissions from the four Lower Klamath Project facilities, which under existing conditions currently generate emissions from employee traffic, maintenance equipment, and releases of minor amounts of SF_6 from gas insulated switchgear equipment. Relative to existing conditions, the hatcheries will be the only source of operational emissions after removal of the dams. Therefore, the Proposed Project is different from most projects that typically propose new land uses that would result in increased GHG emissions.

The "quantitative method" that demanded research and documentation of "quantitative parameters" according to the court in the case cited by the commenter (*Center for Biological Diversity v. Department of Fish & Wildlife* (2015) 62 Cal. 4th 204, 228) entailed the use of a numeric GHG reduction target for the state as a whole to evaluate the cumulative impacts of a specific land use development project. The case did not address a qualitative comparison to a no net increase threshold and is not relevant to the adequacy of the analysis in the Recirculated Draft EIR.

Comment RE-16-5

The RDEIR fails to provide an adequate quantitative analysis here because it does not quantify emissions from the two hatcheries that would continue to operate for eight years under the Project. The RDEIR attempts to quantify GHG emissions from virtually every other component of the Project, from construction to reservoir drawdown to sediment mobilization. (See RDEIR at RE-3-72 to -75.) For the Iron Gate and Fall Creek Hatcheries, in contrast, the RDEIR states only that because emissions from operation of the hatcheries are "expected" to be lower than emissions from the four existing Lower Klamath Project facilities plus Iron Gate Hatchery (RDEIR at RE-3-70 to -71), "no net increase" in emissions would occur as a result of maintaining Iron Gate Hatchery and reopening Fall Creek Hatchery. (RDEIR at RE-3-81.) The RDEIR reaches the same conclusion regarding energy impacts. (RDEIR at RE-3-77.)

Response to Comment RE-16-5

The commenter asserts that the Recirculated Draft EIR includes an inadequate GHG-related impact analysis because the document "does not quantify emissions from the Iron Gate and Fall River fish hatcheries, which would continue to operate for eight years under the Project." The commenter faults the State Water Board for assuming that operational GHG emissions from these two hatcheries under the Proposed Project would be lower than the existing

operational GHG emissions occurring from the existing Iron Gate Hatchery and the four existing Lower Klamath Project facilities.

In addressing Potential Impact 3.10-1 – Generation of direct GHG emissions from construction activity and operations – the Recirculated Draft EIR addressed four broad categories of activities involving GHG emissions: Pre-Dam Removal Activities; Dam and Powerhouse Deconstruction; Restoration (Seeding); and Construction Activity and Hatchery Operations. (See Section 3.10.5 *Greenhouse Gas Emissions and Energy – Potential Impacts and Mitigation* Tables RE-3.10-7, RE-3.10-8, RE-3.10-9, and RE-3.10-10) Pre-Dam Removal Activities, which include GHG-emitting activities include the following: Fall Creek hatchery (FCH) modification; access, road, bridge, and culvert replacements; recreational facility removal; flood improvements; Yreka water supply pipeline relocation; seed collection; invasive exotic vegetation control; and Iron Gate hatchery modification. In the first three of the four tables within the discussion of Potential Impact 3.10-1, GHG emissions from every category of emissions-generating activities is quantified. Within the fourth table, emissions are quantified for all construction-related activities and for restoration. Only operational emissions – a single category of activity – are not quantified. Rather, within the table, the words "no net increase" appear, with a footnote.

As this fourth table (RE-3.10-10), with its footnote, reflects, once the dams are fully removed, the only remaining operations – and thus the only remaining sources of operational GHG emissions – will be two hatcheries: the Iron Gate Hatchery, which is currently operational; and the Fall Creek Hatchery, which has not operated since 2003. Under the Proposed Project, the combined fish production of these two facilities, which will only last eight years, will be less than the current production at the Iron Gate Hatchery. (See Volume I Section 2.7.6.1 *Proposed Project – Proposed Project – Hatchery Operations – Iron Gate Hatchery* Table 2.7-13 [page 2-80].) Under existing baseline conditions, in contrast, ongoing operational GHG emissions are being generated by the Iron Gate Hatchery plus the four Lower Klamath Project facilities, and associated employee traffic, maintenance equipment, and releases of minor amounts of SF_6 from gas insulated switchgear equipment. Quantification of these baseline emissions are not publicly available.

In summary, the Recirculated Draft EIR, in assessing Potential Impact 3.10-1, quantified all categories of emissions sources except one – operational emissions. The State Water Board took this approach because current baseline operational GHG emissions are plainly significantly higher than operational GHG emissions would be under the Proposed Project, and because quantification of the current operational emissions were not publicly available.

The State Water Board's approach and methods here were wholly appropriate and within the agency's reasonable and informed discretion. There was no need to quantify the difference between current operational GHG emissions and future

operational GHG emissions because there is no question that the reduction in future emissions levels will be substantial. As the Recirculated Draft EIR makes clear, the vast majority of GHG emissions from construction and operations for the Proposed Project will be associated with pre-dam removal activities, dam and powerhouse removal, associated construction activities, and restoration activities. These emissions are all quantified, as set forth in Recirculated Draft EIR Section 3.10.5 *Greenhouse Gas Emissions and Energy – Potential Impacts and Mitigation* Tables RE-3.10-10, RE-3.10-11, and RE-3.10-12. Once the dams are removed and the formerly inundated areas are restored, very substantial amounts of existing operational GHG emissions will have simply gone away. All that will remain will the two hatcheries, and only for eight years.

Under the Proposed Project, GHG emissions from employee traffic (except for hatchery employees), maintenance equipment, and releases of minor amounts of SF_6 from gas insulated switchgear equipment would all be eliminated entirely. And GHG emissions from the Iron Gate Hatchery would go down, as the hatchery would operate at a reduced level of activity and production. Although the Fall Creek Hatchery, which has not produced fish since 2003, would be reinstated under the Proposed Project, causing GHG emissions that are not currently occurring, these "new" operational emissions will represent only a portion of the operational emissions that are currently occurring. Importantly, fish production levels at the combined operations at the Iron Gate Hatchery and the reinstated Fall Creek Hatchery will decrease compared with existing conditions at just the Iron Gate Hatchery. (See Volume I Section 2.7.6.1 *Proposed Project – Proposed Project – Hatchery Operations – Iron Gate Hatchery* Table 2.7-13 [page 2-80].) Thus, any "new" emissions at the Fall Creek Hatchery will be offset by decreased emissions at the Iron Gate Hatchery (see Recirculated Draft EIR Section 3.10.4 *Greenhouse Gas Emissions and Energy – Impact Analysis Approach* (page RE-3-71) and the absence of the dams and powerhouses. And hatchery operations will continue only for eight years under the Proposed Project. In short, there can be no doubt that, with all other current operational GHG emissions simply going away, there will be an overall decrease in operational emissions.

Given the order of magnitude difference between current operational emissions and expected future operational emissions, and the lack of available information quantifying baseline emissions, there is no need to quantify the difference in this one category of GHG-emitting activities (project operations). The vast majority of existing GHG operational emissions will cease to occur, and the two hatcheries will operate at production levels lower than levels currently occurring at the Iron Gate Hatchery. Under the no net increase threshold, the important fact was that operational emissions under the Proposed Project would be only a portion of currently occurring operational emissions. Quantifying the precise extent of the dramatic drop-off in operational GHG emissions was unnecessary in order to demonstrate a substantial decrease in operational emissions.

Note that, although commenter insists that quantification of this category was required, the practical consequence of the absence of quantification could redound to the benefit of the environment. Under Mitigation Measure ENR-1 (Purchase of Carbon Offsets), the State Water Board expects that the Klamath River Renewal Corporation (KRRC) will purchase and retire carbon offsets for an estimated 20,128 MTCO2e of construction GHG emissions. This number is derived from Section 3.10.5 *Greenhouse Gas Emissions and Energy – Potential Impacts and Mitigation* Table RE-3.10-10 (Unmitigated Direct GHG Emissions Inventories for Construction Activity and Hatchery Operations). This number (20,128 MTCO2e) would have been lower if KRRC had received quantified credit within the table for the fact that projected operational emissions will be less than baseline operational emissions.

Comment RE-16-6

The RDEIR's approach is impermissible for several reasons. First, it omits critical information about the Project. The Project explicitly includes operation of the two hatcheries for eight years. Yet the GHG and energy analysis—which quantifies both construction and operational emissions from all other components of the Project—fails to disclose both emissions and energy usage from hatchery operation. The RDEIR's statement that hatchery operations will result in "no net increase" in emissions or energy usage (see RDEIR at RE-3-77, -81) is merely conclusory and unsupported by any analysis. An "EIR must contain facts and analysis, not just the bare conclusions of the agency." (Bakersfield Citizens for Local Control v. City of Bakersfield (2004) 124 Cal.App.4th 1184, 1197 [quotation omitted].)

Response to Comment RE-16-6

Please refer to the response to comment RE-16-5.

Comment RE-16-7

Second, the RDEIR improperly—and misleadingly—treats the hatcheries as having no emissions. Even the RDEIR's conclusory "no net increase" statement suggests that GHG emissions and energy usage from hatchery operations will be greater than zero; nothing in the RDEIR supports a conclusion that the hatcheries will have zero emissions. Yet Table RE-3.10-10 (RDEIR at RE-3-81) effectively treats operational hatchery emissions under the Project as zero by failing to add them to the sum of other Project construction emissions. As a result, the quantitative "Total Emissions" figures provided in the RDEIR omit emissions associated with hatchery operations, and are thus incomplete and inaccurate. Omission of information about hatchery emissions and energy usage prejudices both informed decision-making and development of adequate mitigation, and deprives the RDEIR's significance conclusions of necessary evidentiary support. (See Center for Biological Diversity, 62 Cal.4th at 228.)

Response to Comment RE-16-7

The commenter asserts that the State Water Board's analysis assumes that the two hatcheries will have no GHG emissions. This assertion is incorrect, for

reasons explained at length in the response to comment RE-16-5. The State Water Resources Control Board recognizes that hatchery operations will have some level of GHG emissions; but these levels will be below the current, baseline level of operational emissions. Thus, there is no need to quantify the exact amount of operational reductions that would occur under the Proposed Project.

If the difference in operational GHG emissions between existing conditions (i.e., the four Lower Klamath Project facilities and Iron Gate Hatchery) and the operation of the two hatcheries post-dam removal were quantified, there would be a significant reduction in operational GHG emissions post dam removal. If this reduction in operational emissions were compared to construction GHG emissions in Table RE-3.10-10, as the commenter suggests, the GHG emissions from construction and operation of the Proposed Project would be less than estimated in the Recirculated Draft EIR. This would also result in fewer carbon offsets being purchased to mitigate GHG emissions from construction of the Proposed Project. As such, not quantifying the reduction in operational emissions between existing conditions and post dam removal conditions is conservative, because it overestimates the GHG emissions from construction and operation of the Proposed Project relative to existing conditions.

Comment RE-16-8

Third, by comparing energy emissions from one component of the Project—ongoing operations at two hatcheries—to total existing emissions from all four dams and one hatchery, the RDEIR offers a meaningless and misleading comparison. The comparison CEQA requires here is between the proposed Project as a whole (removal of the dams plus operation of two hatcheries) and existing environmental conditions (operation of the four dams and Iron Gate Hatchery), not between one component of the proposed project and existing conditions. (See CEQA Guidelines § 15125(a); see also Friends of Oroville v. City of Oroville (2013) 219 Cal.App.4th 832, 842–843 [rejecting GHG analysis where EIR improperly compared project emissions to inappropriate standards and failed to quantify emissions from component of project].) Indeed, by separating out hatchery operations from the rest of the Project and concluding they will cause "no net increase, the RDEIR engages in improper "piecemeal" analysis. Under CEQA, the "project" that must be analyzed is the "whole of an action" under consideration. CEQA Guidelines § 15378(a). CEQA thus clearly prohibits an approach by which "environmental considerations . . . become submerged by chopping a large project into many little ones," each with lesser effects, in order to avoid analysis of the project in its entirety. (Bozung v. Local Agency Formation Com. (1975) 13 Cal.3d 263, 283–284.) Here, the RDEIR effectively segments ongoing hatchery operations from the rest of the Project in order to dismiss their GHG and energy impacts as insignificant. This is unlawful.

Response to Comment RE-16-8

The commenter contends that the State Water Board impermissibly contrasts the operational emissions from the two hatcheries under the Proposed Project to

emissions not only from the existing hatchery, but also from dam operations. To the commenter, this comparison amounts to a kind of improper piecemealing, as the State Water Board's approach allegedly fails to properly analyze "the whole of the action."

Through this argument, the commenter essentially suggests that the State Water Board acted beyond the bounds of its discretion as a lead agency to isolate the category of operational GHG emissions and opt not to quantify that one category of emissions.

As noted above under the response to comment RE-16-7, the Proposed Project is unique because it involves the removal of most facilities whose operation currently generate GHG emissions and uses energy. Relative to existing conditions, the hatcheries will be the only source of operational emissions after removal of the dams. Since the two hatcheries will be the only remaining operational facilities at the various project sites once the dams are removed, and operational emissions are expected to decrease, the State Water Board properly compared existing operations against future operations.

As described in Recirculated Draft EIR Section 3.10 *Greenhouse Gas Emissions and Energy*, the Proposed Project has three potential sources of GHG emissions besides the hatcheries: short-term construction emissions, emissions from the exposure of reservoir sediments to aerobic conditions for six months after drawdown, and ongoing emissions from the conversion of the reservoir areas to riverine, wetland, and terrestrial habitat types. These sources of emissions are quantified and compared to the no net increase threshold.

As discussed above under the response to comment RE-16-7, if the difference in operational GHG emissions between existing conditions (i.e., the Lower Klamath Project dams and associated facilities and Iron Gate Hatchery) and the operation of the two hatcheries post-dam removal were quantified, there would be a significant reduction in operational GHG emissions post dam removal. If this reduction in operational emissions were compared to all other potential sources of emissions (i.e., the whole of the action), the GHG emissions from the Proposed Project would be less than estimated in the Recirculated Draft EIR. This would be even more true if the ongoing reductions in GHG emissions from continued power production for the PacifiCorp PCA were compared to all other sources of GHG emissions (direct and indirect) related to the Proposed Project.

Therefore, not quantifying the significant reductions in GHG emissions that would occur for operational emissions after removal of the dams is conservative, because it overestimates the GHG emissions from the Proposed Project relative to existing conditions. Contrary to the commenter's assertion, this methodology provides a worst-case scenario for GHG emissions from the Proposed Project as opposed to segmenting the analysis in order to dismiss the impacts as insignificant.

Friends of Oroville v. City of Oroville (2013) 219 Cal.App.4th 832, cited by the commenter, in inapposite. In that case, the court held that a city's analysis of the GHG impacts of a project to replace and expand a Wal-Mart store was invalid because the city compared the emissions of the new store, which had been quantified, to GHG emissions state-wide, and concluded they were insignificant. The court faulted the city for its failure to quantify the GHG emissions of the existing store and mitigation measures in order to allow for a comparison of the GHG emissions of the new store, with mitigation, to the emissions of the existing store. The city erred in *Friends of Oroville* by using a flawed point of comparison for purposes of evaluating the significance of the project's GHG emissions. That case does not stand for the proposition that an agency may not conduct a qualitative analysis of the GHG emissions of one component of a project, and a quantitative analysis of the GHG emissions of the remainder of the project.

Comment RE-16-9

Fourth, and finally, the RDEIR does not justify its failure to quantify hatchery emissions. Nowhere does the RDEIR explain why, of all the construction and operational emissions quantified in the document, hatchery emissions could not also be quantified. Put another way, the RDEIR fails to explain or justify its apparent decision to pursue a qualitative analysis of GHG emissions and energy impacts from one portion of the overall Project. As shown in the literature review attached as Exhibit A and accompanying scientific materials, there are ample resources available to support at least a good-faith effort to quantify emissions from the hatchery component of the Project and include them in the analysis. The Board therefore should undertake this analysis, and make a determination as to whether this portion of the EIR should be recirculated, before proceeding with the Project.

Response to Comment RE-16-9

The commenter faults the State Water Board for failing to explain why it chose not to quantify operational emissions, but cites no authority indicating that, where an agency exercises its discretion under CEQA Guidelines section 15064.4 to qualitatively assess GHG-related impacts, the agency must provide a written justification for that choice. The State Water Board knows of no such requirement. In any event, its reasons are set forth above in the responses to comments RE-16-5 through RE-16-8.

Comment RE-16-10

The RDEIR proposes a single mitigation measure that addresses only a portion of the Project's GHG emissions. Mitigation Measure ENR-1 would require the applicant to purchase and retire carbon offsets for the Project's construction emissions. Offsets could be purchased from the California Air Resources Board ("CARB"), California Air Pollution Control Officers Association ("CAPCOA"), the Siskiyou County Air Pollution Control District, or "any other equivalent or verifiable registry" dealing in carbon credits. Offsets also would be required to

meet several "criteria," including that they be real, "additional/surplus," quantifiable, enforceable, validated, and permanent. (RDEIR at RE-3-83.) Mitigation Measure ENR-1 does not, however, require any offsets for the Project's operational emissions.

Response to Comment RE-16-10

As discussed in Recirculated Draft EIR Section 3.10 *Greenhouse Gas Emissions and Energy* (pages RE-3-70 to RE-3-84), the only source of operational GHG emissions from the Proposed Project post dam removal would be from the operation of two hatcheries, the Iron Gate Hatchery, which is currently operational; and the Fall Creek Hatchery (FCH), which has not operated since 2003. Operational emissions under current conditions (i.e., of the four Lower Klamath Project dams and associated facilities and Iron Gate Hatchery) are anticipated to be significantly greater than the reduced operation of Iron Gate Hatchery combined with the re-instated operation of Fall Creek Hatchery. This is because existing emissions generated by operation of the Lower Klamath Project dams and associated facilities (e.g., employee traffic, maintenance equipment, releases of minor amounts of SF_6 from gas insulated switchgear equipment, etc.) would be eliminated, and production levels at the two hatcheries post-dam removal would decrease relative to current conditions. Thus, overall, it is anticipated that there would be a net decrease in operational emissions post dam removal as compared to existing conditions. Based on the no net increase threshold, operational emissions from the hatcheries would be less than significant and no mitigation is required. (See, e.g., Recirculated Draft EIR Section 3.10.4 *Greenhouse Gas Emissions and Energy – Impact Analysis Approach* [pages RE-3-70 to RE-3-71], Recirculated Draft EIR Section 3.10.5 *Greenhouse Gas Emissions and Energy – Potential Impacts and Mitigation* [page RE-3-80].)

The other potential sources of emissions besides construction emissions would be generated by the natural 'fast carbon cycle' (i.e., emissions from the exposure of reservoir sediments to aerobic conditions for six months after drawdown and ongoing emissions from the conversion of the reservoir areas to riverine, wetland, and terrestrial habitat types) and indirect emissions from continued power production for the PacifiCorp PCA.

The explanation for not purchasing carbon offsets as mitigation for GHG emissions generated by the natural 'fast carbon cycle', is provided in Recirculated Draft EIR Section 3.10.5 *Greenhouse Gas Emissions and Energy – Potential Impacts and Mitigation* (pages RE-3-89 to RE-3-90 and RE-3-93 to RE-3-94). Requiring mitigation for GHG emissions that occur from the normal functioning of a free-flowing river, wetlands, and other terrestrial habitat would be inconsistent with state policy and would have the potential to discourage future restoration activities in the state.

Please refer to Recirculated Draft EIR Section 3.10.5 *Greenhouse Gas Emissions and Energy – Potential Impacts and Mitigation* (pages RE-3-95 to RE-3-99 and RE-3-100 to RE-3-104) for a discussion of the PacifiCorp Power Control Area and the company's proposed transition to renewable energy sources to comply with State Renewable Portfolio Standards. As discussed on page RE-3-98, this transition to renewable energy sources will ensure that there will be not net increase in GHG emissions from continued power production by PacifiCorp after removal of the dams.

Comment RE-16-11

Mitigation Measure ENR-1 is inadequate in a number of ways. First and foremost, the actual effect of GHG offset credits on overall atmospheric emissions is inherently uncertain. (See Haya et al. 2016; attached as Exhibit B.) Even the most rigorous offset protocols—such as those established by CARB for compliance with California's Cap and Trade program—are beset with uncertainties and likely overestimate emissions reductions. (See Haya 2019; attached as Exhibit C.)

Response to Comment RE-16-11

The comment states that Mitigation Measure ENR-1 is inadequate because the actual effect of GHG offset credits on overall atmospheric emissions is inherently uncertain. State agencies, including the California Air Resources Control Board and the California Natural Resources Agency, have recognized offset credits as a means of addressing GHG emissions and mitigation (see, e.g., CARB 2017b; CNRA 2009). The CEQA Guidelines expressly identify offsets as a means of mitigating a project's emissions. (CEQA Guidelines section 15126.4(c)(3).) The CARB Scoping Plan identifies the purchase of carbon offsets as a viable method to reduce or eliminate the impact of GHG emissions and the use of carbon offsets to mitigate GHG emissions.

Mitigation Measure ENR-1 requires that purchased offsets must comply with CEQA Guidelines Section 15126.4(c)(3) and must be issued by the California Air Resources Board, Climate Action Reserve, California Air Pollution Control Officers Association, the APCD, or any other equivalent or verifiable registry. In addition, the reductions must be real, additional/surplus, quantifiable, enforceable, validated, and permanent. (Recirculated Draft EIR Section 3.10.5 *Greenhouse Gas Emissions and Energy – Potential Impacts and Mitigation* [page RE-3-83].) This mitigation measure is consistent with state policy supporting offsets as a means of addressing GHG emissions.

Comment RE-16-12

Second, Mitigation Measure ENR-1 fails to incorporate adequate standards to ensure offset quality. The measure identifies a few sources of offsets, but does not provide any evidence that offsets purchased from those sources or "any other equivalent or verifiable registry" will meet adequate standards. CARB may issue offsets for purposes of Cap and Trade compliance, but it does not typically issue

voluntary offsets for other purposes (such as CEQA mitigation). CAPCOA nominally operates a GHG offset exchange (http://www.ghgrx.org/), but as of January 31, 2020, no GHG credits were listed as available. (See GHGRx home page; attached as Exhibit D.) It is not clear that the Siskiyou County APCD has any functioning GHG offset program, or that any credits issued by the APCD would meet adequate standards.

Response to Comment RE-16-12

The comment states that Mitigation Measure ENR-1 is inadequate because it fails to ensure adequate standards to ensure offset quality. As discussed in the response to comment RE-16-11, the California Air Resources Board (CARB) Scoping Plan identifies the purchase of carbon offsets as a viable method to reduce or eliminate the impact of GHG emissions. The Scoping Plan also states that California Air Pollution Control Officers Association (CAPCOA) has developed the GHG Reduction Exchange (GHG Rx) for CEQA mitigation and that it may also be appropriate to utilize offsets issued by a recognized and reputable voluntary carbon registry.

Although carbon offsets may not currently be available from the CAPCOA GHG Rx, there are other sources of carbon offsets for CEQA mitigation that are acceptable to CARB and currently have offsets or forecast mitigation units available. As indicated on the 'Offset Project Registries' page on the CARB website, these include the American Carbon Registry, Climate Action Reserve, and Verra.

As stated in Mitigation Measure ENR-1, any carbon offset that is used to reduce the Project's GHG emissions must meet the requirements of CEQA Guidelines Section 15126.4(c), be issued by certain entities or other equivalent or verifiable registry, and be real, additional/surplus, quantifiable, enforceable, validated, and permanent. By the very terms of the mitigation measure, any offset must in part represent reductions actually achieved, be readily accounted for, acquired through legally binding commitments or agreements, and verified by a reliable third party. Therefore, this measure provides an enforceable commitment that GHG offsets purchased pursuant to the criteria listed in Mitigation Measure ENR-1 would in fact offset the quantity of GHG emissions needed to reduce the Proposed Project's construction-related emissions to a less than significant level.

Comment RE-16-13

Absent specific requirements for evaluating the protocols used by these (and other) registries to issue credits, there is no evidence that the measure's standards will be met. On the contrary, there is ample evidence that offset credits available on the voluntary market do not constitute real, additional emissions reductions. For example, one study of offsets under the Kyoto Protocol's Clean Development Mechanism—which is still used by some offset registries, such as Verra—concluded that 85% of the reductions credited to the programs were questionable. (See Cames et al. 2016; attached as Exhibit E).

An open-ended list of possible sources of credits is not an adequate standard for mitigation.

Response to Comment RE-16-13
Comment noted. Please refer to the responses to comments RE-16-11 and RE-16-12 related to the adequacy of Mitigation Measure ENR-1.

Comment RE-16-14
Third, the measure's reference to "other equivalent or verifiable registr[ies]" introduces further uncertainty about what standards might apply, and how they might be evaluated. The measure provides no standards for determining what other registries might be "equivalent or verifiable," and does not identify the person or entity responsible for making this determination. As a result, the measure fails to satisfy CEQA's requirement that mitigation measures be "fully enforceable." (CEQA Guidelines § 15126.4(a)(2).) Moreover, the measure improperly defers mitigation by failing to articulate "specific performance standards" for offset quality verification and the "potential action(s)" necessary to achieve those standards. (Id., § 15126.4(a)(1)(B).)

Response to Comment RE-16-14
The comment states that Mitigation Measure ENR-1's reference to "other equivalent or verifiable registry" fails to satisfy CEQA's requirement that mitigation measures be fully enforceable because there are no standards for determining what registries might be equivalent or verifiable (CNRA 2009).

CEQA requires a mitigation measure to be fully enforceable, which implies that it must be real and verifiable. Here, the mitigation measure is fully enforceable. The Klamath River Renewal Corporation (KRRC) has committed to purchasing and retiring carbon offsets for a specific quantity of construction greenhouse gas (GHG) emissions, and to including this commitment in its proposal before FERC. As discussed in the responses to comments RE-16-11 and RE-16-12, the offsets must meet certain criteria, including being verified through accurate means by a reliable third party. Thus, the mitigation measure identifies a numeric standard for the total quantity of offsets and criteria by which the offsets will be evaluated.

Comment RE-16-15
Fourth, the RDEIR's requirement that offsets be "additional/surplus" is vague and insufficient. "Additional" and "surplus" are not necessarily the same thing. While "surplus" generally refers to an emissions reduction not otherwise required by law or regulation, "additional" also means that the action would not have been undertaken for any other reason—in other words, that the emissions reductions embodied in the credit would not have occurred but for the offset program. (See Health & Safety Code § 38562(d)(2) [to be additional, reductions must be "in addition to any greenhouse gas emission reduction otherwise required by law or regulation, and any other greenhouse gas emission reduction that otherwise would occur"; emphasis added]; Cal. Code Regs., tit. 17, §§ 95802(a)

("'Additional' means, in the context of offset credits, greenhouse gas emission reductions or removals that exceed any greenhouse gas reduction or removals otherwise required by law, regulation or legally binding mandate, and that exceed any greenhouse gas reductions or removals that would otherwise occur in a conservative business-as-usual scenario"; emphasis added].) This two-part "additionality" requirement simply reflects basic physics: an offset credit based on reductions that would have happened anyway, for whatever reason, does not actually offset anything.

Response to Comment RE-16-15
Comment noted. Please refer to the responses to comments RE-16-11 and RE-16-12 related to the adequacy of Mitigation Measure ENR-1. The terms of the mitigation measure make clear that any offset must not be "already planned or required by regulations or policy (i.e., double counted)." This concept is consistent with CEQA Guideline Section 15126.4(c), which refers to "offsets that are not otherwise required," and other laws that generally require emissions offsets to be surplus or additional (CNRA 2009).

Comment RE-16-16
Finally, the RDEIR fails to justify its conclusion that operational GHG emissions from the Project cannot be mitigated. The RDEIR claims that mitigation for emissions from reservoir drawdown and sediment release is infeasible "in light of federal preemption," and because these emissions are part of the "fast carbon cycle" and thus would be unenforceable without the applicant's agreement. (See RDEIR at RE-3-89, -93 to -94.) These conclusory, unexplained statements cannot support a finding of infeasibility. "An EIR that incorrectly disclaims the power and duty to mitigate identified environmental effects based on erroneous legal assumptions is not sufficient as an informative document." (City of San Diego v. Board of Trustees of California State University (2015) 61 Cal.4th 945, 956 [quotation omitted].) The RDEIR fails to explain and justify its refusal to propose mitigation for the Project's non-construction emissions.

Response to Comment RE-16-16
The comment states that the Recirculated Draft EIR fails to justify its conclusion that operational GHG emissions from the Proposed Project cannot be mitigated. Comment noted.

Please refer to the response to comment RE-16-10 for information regarding why mitigation is not required for other potential sources of GHG emissions from the Proposed Project. Also please refer to CEQ-2 Master Response for a discussion of Federal Power Act Preemption of State and Local Authority. In addition, the explanation for not purchasing carbon offsets as mitigation for GHG emissions generated by the natural 'fast carbon cycle', is provided in Recirculated Draft EIR Section 3.10.5 *Greenhouse Gas Emissions and Energy – Potential Impacts and Mitigation* (pages RE-3-89 to RE-3-90 and RE-3-93 to RE-3-94).

Comment RE-16-17

The omissions and inadequacies in the RDEIR's GHG and energy analysis detailed above undermine a full and robust discussion of the No Hatchery Alternative. The RDEIR simply concludes that the No Hatchery Alternative would result in greater emissions reductions relative to existing conditions than the proposed Project. (RDEIR at RE-4-23.) While this conclusion is likely correct, it can and should be supported with adequate data and analysis.

Response to Comment RE-16-17

The commenter appears to agree with the Recirculated Draft EIR's conclusion that, compared with the Proposed Project, the reduction in operational GHG emissions compared to existing baseline operations would be greater under the No Hatchery Alternative, in that no hatchery operations would continue. The commenter advocates a greater level of detail to support this conclusion. See the responses to comments RE-16-5 through RE-16-9, which explain why the State Water Board operated within its discretion in opting not to quantify its analysis of operational GHG emissions. Because this approach was reasonable, there was no need to quantify the operational emissions of project alternatives.

Comment RE-16-18

Correcting the deficiencies discussed above would facilitate the alternatives analysis CEQA requires. Specifically, quantification of emissions from hatchery operations under the proposed Project would enable a more meaningful comparison among alternatives—and would likely show that the GHG and energy benefits of the No Hatchery Alternative are considerable.

Response to Comment RE-16-18

See the response to comment RE-16-17. The State Water Board does not agree with the commenter that a meaningful comparison between the EIR alternatives is not possible without quantification of GHG emissions from operational activities. The State Water Board acknowledges that the GHG emissions of that alternative would be less than those of the Proposed Project due to the absence of hatchery operations. Given that the vast majority of GHG emissions will come from non-operational activities, however, and given the global scale of climate change, the differences in GHG emissions between the Proposed Project and the No Hatchery Alternative are relatively minor.

Comment RE-16-19

Moreover, quantification would further demonstrate that adoption of the No Hatchery Alternative would result in certain, measurable reductions in emissions that could reduce the Project's reliance on uncertain GHG offsets.

Response to Comment RE-16-19

See responses to comments RE-16-5 through RE-16-8, RE-16-17, and RE-16-18. In light of the extent of federal preemption under the Federal Power Act, the State Water Board lacks jurisdiction and legal authority to require the Klamath

River Renewal Corporation (KRRC) to obtain carbon offsets, which do not relate to water quality issues. Instead, the State Water Board has suggested Mitigation Measure ENR-1 based on KRRC's representation of its willingness to pursue such credits to mitigate for GHG emissions from construction activities. A reduction in operational emissions would not affect the extent to which KRRC must invest in carbon offsets to mitigate its construction-related GHG emissions. For these reasons, the quantification requested by the commenter would not reduce the project's reliance on GHG offsets.

Comment RE-16-20

That said, even without correction of these deficiencies, the RDEIR clearly shows that the Project as proposed cannot be approved, and that the No Hatchery Alternative must be adopted in its stead. CEQA prohibits a public agency from approving a project that has significant environmental impacts if there are feasible alternatives or mitigation measures that would reduce or avoid those impacts. (Pub. Resources Code§§ 21002, 21002.l(b).) Moreover, before approving a project despite significant environmental impacts, the agency must expressly find that mitigation measures or alternatives identified in the EIR are infeasible. (Pub. Resources Code§§ 2108l(a)(3).)

Response to Comment RE-16-20

The commenter asserts that the State Water Board must adopt the No Hatchery Alternative because it would avoid or reduce significant project impacts. This comment concerns the CEQA findings that the State Water Board must make before deciding whether and under what conditions to approve the Proposed Project. No response is necessary.

Comment RE-16-21

The Board cannot make a defensible finding that the No Hatchery Alternative is infeasible on this record. As discussed in the Prior Comments, the No Hatchery Alternative is both feasible and environmentally superior to the proposed Project. Nothing in the RDEIR-notwithstanding its flaws-shows otherwise. Indeed, the RDEIR confirms that the No Hatchery Alternative "accomplishes the applicant's stated goals" and would reduce GHG and energy impacts relative to the Project. (RDEIR at RE- 4-23 to -24.) The Board therefore must adopt the No Hatchery Alternative.

Response to Comment RE-16-21

The commenter asserts that the State Water Board must adopt the No Hatchery Alternative because it is feasible and environmentally superior to the Proposed Project. Please refer to the response to comment RE-16-20.

Native Fish Society, Mark Sherwood

Comment RE-1-1

We are submitting the following comments that fully support the proposed decommissioning of all four Lower Klamath Project dams and the license

surrender, which will improve the biological conditions in the Klamath watershed to benefit sensitive and threatened wild, native fish species, as well as the human and environmental communities who depend on the health of these iconic fish species. Our coalition continues to stress support for decommissioning the four Lower Klamath Dams (Iron Gate, Copco 1 & 2, and J.C. Boyle). Decommissioning all four dams is critical to the recovery and long-term protection of these iconic fish species that provide important subsistence for tribal fisheries, economies for commercial and sport fishing communities along the California and Oregon coast, and sustains the many plants and animals dependent on the return of marine nutrients that contribute to overall watershed health.

Response to Comment RE-1-1
Thank you for your comment.

Comment RE-1-2
Our concerns are centered on the significant environmental impacts that would result from the Project's proposed hatchery operations, and the lack of description for how the proposed hatchery operations would contribute to the recovery of the watershed's imperiled fish species. Additionally, we found the RDEIR's analysis of GHG and energy impacts deficient and the proposed mitigation for GHG impacts inadequate.

Response to Comment RE-1-2
The comment states the commenter's concerns are centered on the significant environmental impacts that would result from the Proposed Project's hatchery operations and the lack of description for how the proposed hatchery operations would contribute to the recovery of the watershed's imperiled fish species. The comment generally concludes that the commenter found the Recirculated Draft EIR's analysis of greenhouse gas (GHG) and energy impacts deficient and the proposed mitigation for GHG impacts inadequate.

Please refer to the response to comments RE-16-1 to RE-16-21 for a response to the specific issues raised by the Native Fish Society about the adequacy of the Recirculated Draft EIR's analysis of GHG and energy impacts.

Sierra Club, John Livingston

Comment RE-9-1
1. *In the future it would be very helpful if copies of the documents were available at the Redding Public Library in Redding, Ca.*

Response to Comment RE-9-1
Thank you for your comment. Comment regarding library availability of documents is noted.

Comment RE-9-2

2. *The decommissioning air quality impacts related to construction activities can be reduced by frequent application of water to all exposed surfaces. This includes the actual dam and concrete demolition areas, haul roads and reservoir areas that have not been stabilized to prevent dust movement. Firm enforcement of dust control measures must be incorporated into the deconstruction contract specifications.*

Response to Comment RE-9-2

Please refer to Master Response CEQ-2 regarding preemption of state authority over certain mitigation measures under the Federal Power Act. Please note, Klamath River Renewal Corporation (KRRC) has committed to implement Mitigation Measure AQ-5 – *General Construction Dust Control Measures* to reduce emissions of particulate matter that is 10 micrometers or less in diameter (PM_{10}) to less than significant. For measures that are outside of the State Water Board's water quality certification authority, KRRC has committed to propose that the mitigation measures be included in the Federal Energy Regulatory Commission (FERC) license-surrender order. (See KRRC's Water Quality Certification Application, December 3, 2019 [KRRC 2019a], Attachment B.)

Comment RE-9-3

3. *Greenhouse gas emissions during construction can be reduced by enforcing the mitigation measures to utilize low carbon emitting equipment. The measures presented should be included in the project specifications and enforced to prevent outdated construction equipment from being used.*

Response to Comment RE-9-3

Please refer to Master Response CEQ-2 regarding preemption of state authority over certain mitigation measures under the Federal Power Act. Please note that Klamath River Renewal Corporation (KRRC) has committed to implement Air Quality Mitigation Measures AQ-1 – *Off-Road Construction Equipment Engine Tier*, AQ-2 – *On-Road Construction Equipment Engine Model Year*, and AQ-3 – *Heavy-Duty Trucks Engine Model Year* to primarily reduce emissions of nitrogen (NOx). As discussed in Recirculated Draft EIR Section 3.10.5 *Greenhouse Gas Emissions and Energy – Potential Impacts and Mitigation* (page RE-3-82), these Air Quality Mitigation Measures include the use of newer, low-carbon-emitting equipment that are likely to reduce greenhouse gas emissions generated from implementation of the Proposed Project. Additionally, the KRRC has committed to the purchase of offsets for construction-related greenhouse gas emissions. Please see Mitigation Measure ENR-1 - *Purchase of Carbon Offsets*. For measures that are outside of the State Water Board's water quality certification authority, KRRC has committed to propose that the mitigation measures be included in the Federal Energy Regulatory Commission (FERC) license-surrender order (KRRC 2019a).

Comment RE-9-4

4. *Removal of the hydroelectric portion of the dams should be replaced with new renewable energy projects in northern California. This project provides an opportunity to find locations for solar and wind facilities when properly designed and constructed can provide clean electricity for use in northern California.*

Response to Comment RE-9-4

Please refer to Recirculated Draft EIR Section 3.10.2 *Greenhouse Gas Emissions and Energy – Environmental Setting* (pages RE-3-64 to RE-3-65) and Section 3.10.5 *Greenhouse Gas Emissions and Energy – Potential Impacts and Mitigation* (pages RE-3-95 to RE-3-99, and RE-3-100 to RE-3-104) for a discussion of the PacifiCorp Power Control Area, PacifiCorp's Integrated Resource Plan (IRP), and the company's proposed transition to renewable energy sources to comply with California's Renewable Portfolio Standards. As mentioned in Recirculated Draft EIR Section 3.10.2 *Greenhouse Gas Emissions and Energy – Environmental Setting*, PacifiCorp's latest IRP (2019d) states that between 2018 and 2020, PacifiCorp will have increased the percentage of renewable energy resources in its portfolio by 70 percent. This shift towards procuring renewable energy sources is expected to replace the lost power generation from the hydroelectric portions of the Lower Klamath Project, including for areas serving Northern California.

Siskiyou County Water Users Association, Rex Cozzalio

Comment RE-7-1

The first two 'Draft' pages alone predict the tone and predetermined 'decisions' of not only the 'recirculated' portion of the EIR, but of the entire EIR itself. Stillwater Sciences, along with several other closely intertwined entities, have been personally and jointly profiting from their position creating anecdotal revisionist regional history and 'modeled scientific support' promoting Klamath destruction from the agenda beginning. Unfortunately, in the face of nearly a billion dollars and decades of devastating confiscatory regulatory implementations based upon the constructed 'best available science' miserably failing in virtually EVERY 'objective' aspect, the ONLY alteration in agenda direction has been in their alterations to assure continued self-benefit through the cleaver creation of unaccountable 'Adaptive Management'.

Though the California State Department of Water Resources (SWR) publicly declares objectivity, it is an overt lie from any perspective. The Commission is appointed by, and to carry out, the environmental policies at the pleasure of the Governor. In every past 'Water Crisis Plan' and the current 'Water Management' draft 'Report', the Governor has specifically instructed that Klamath Dams' destruction is his high priority to be facilitated by his State Agencies. Water Resources has worked hand in hand with the Governors declared agenda objectives by 'justifying' their own enhanced authority, 'revising' Klamath 'impairments' to accommodate KHSA 401 permit coercion, and increasing

'discretionary' power throughout the entire so-called 'Agreements' compelling Klamath destruction. At no time has SWR wavered in support of that agenda regardless of ignored extensive presented historical documentation and empirical evidence contradicting agenda premise.

It is unsurprising, if disconcerting that, as equally seen throughout the whole of the original draft EIR, in its entirety this 'Report' continues the Agency and Author mutually beneficial relationship towards a common objective. Carefully crafted to demonstrate a legally defensible 'paper trail' assessment, anyone with more than superficial knowledge of the Klamath region, environment, and history, cannot but appreciate the well-crafted parsed, exclusionary, assumptive, inconsistent rationalizations, and disconnected conclusions all geared towards a biased outcome.

If that were not true, the thousands of submissions acknowledged as received by State Water Resources (SWR) pertaining to the draft EIR, many of which reference history and evidence refuting EIR conclusions by adding and/or expanding upon inclusions and omissions throughout the Draft, would have caused the ENTIRE document to be opened for recirculation and revision, not just a small portion responsive to selective submissions furthering a legally defensible outcome. Consistent in its past record, SWR and its sub agencies have repeatedly received much of the agenda-contradicting history and data irrefutably contradicting Agency 'conclusions' in past agenda proceedings relative to Klamath destruction, only to end up eliminated through inaccurate 'summaries', dismissive responses, or ignored completely. Based upon past history, it is unlikely that anything different will be expected here. Given the continuing implemented agenda policy-directed 'environmental' failures to date, and given the ignored historical documented experience and current empirical data which irrefutably prove Klamath Project environmental benefits, one thing is abundantly and 'robustly' clear. 'Sustainability', the 'environment', and even the 'fisheries' are NOT the objectives of this directed agenda outcome, they have been and are merely the pawns used to bring about effective resource confiscation from the most affected and vested owners WITHOUT compensation or accountability for imposed environmental and economic damages, placing ALL resources under personally benefitting control of a relative few having little concern, continuity of knowledge, and even LESS consequence for failed 'decisions'. This EIR offers NO evidence contradicting that continued objective.

Response to Comment RE-7-1

Thank you for your comment letter on the Recirculated Portions of the Draft EIR. This comment includes several paragraphs explaining the commenter's opinion of the Proposed Project, the administrative process, and the adequacy of the analysis in the Draft EIR. The comment does not provide specific information about the environmental analyses presented in the portions of the Recirculated Draft EIR for the Proposed Project. Please see Master Response R-1 for information on comments not relating to recirculated portions of the Draft EIR.

Comment RE-7-2

This 192 page EIR portion is a compendium of contradiction and agenda marketing too extensive and pointless to detail here, with a complete inclusion of highlights and individual comments being available upon request. If consistent with prior offers to provide SWR with the entire texts of referenced studies and documents directly refuting Agency stated conclusions, we will have a very long wait. Therefore, only a few specific major issues of the many deficiencies contained will be discussed.

Response to Comment RE-7-2

The comment relates to the commenter's opinion of the adequacy of the analysis in the recirculated portions of the Draft EIR and how the commenter intends to address the analysis. Comment noted.

Comment RE-7-3

It appears that the authors have no difficulty making inherently conflicting claims, readily known inaccurate statements, selectively chosen 'considerations', and 'discussion' disconnected conclusions. Even though acknowledgement of obvious facts are detailed, such as 'significant' Project destruction impacts upon health, property use values, GHGs, noise, dust, and odors, there invariably seems no evident recommended sanctions of impacts, as though SWR acknowledgement of damages unwillingly imposed upon others is sufficient in itself for SWR to unaccountably grant approval.

Response to Comment RE-7-3

The comment suggests that there are no recommended mitigation for impacts. Please refer to Recirculated Draft EIR Section 3.9.5 *Air Quality – Potential Impacts and Mitigation* (pages RE-3-25 to RE-3-44) and Section 3.10.5 *Greenhouse Gas Emissions and Energy – Potential Impacts and Mitigation* (pages RE-3-77 to RE-3-105) for a discussion of potential impacts and mitigation measures.

Comment RE-7-4

Examples such as stating the much greater health impacts of dust upon older individuals are later dismissed since the demographics of Copco and Iron Gate are 'unknown'. Seriously? SWR 'experts' purported in-depth evaluations seem unaware of the few keystrokes needed to obtain readily available public demographic information?

Response to Comment RE-7-4

The comment's assertion that the Recirculated Draft EIR dismisses health impacts due to unknown demographics at Copco and Iron Gate reservoirs is incorrect. The discussion of dust impacts acknowledges, apart from number of people, that it is based on age, health, and genetic sensitivity. Although a quantitative analysis on human health impacts is not possible, the EIR discusses

the potential impacts qualitatively. Please refer to Recirculated Draft EIR Sections 3.9.4 *Air Quality – Impact Analysis Approach* and 3.9.5 *Air Quality – Potential Impacts and Mitigation* (pages RE-3-32 to RE-3-35) for a discussion of health impacts from construction activities.

Additionally, please refer to Volume I Appendix B: *Definite Plan* and Appendix B: *Definite Plan* –Appendix H *Reservoir Area Management Plan* for a description of the restoration plan for the reservoirs.

Comment RE-7-5

Claiming Authors' knowledge gained from 'similar' project destructions, the potential dangers of dust are mentioned, and then minimized due to 'replanting', distance, 'sparse residential populations', and 'lack of discovered asbestos', when ANY minimal awareness of those 'Projects' reveal TREMENDOUS problems from failed plantings and dust damaging the health and quality of life of those local residents resulting in ongoing lawsuits.

Response to Comment RE-7-5

Please refer to Master Response R-2 for a discussion of the potential for windblown dust to be generated after drawdown of the reservoirs and vegetation establishment efforts.

Please refer to Recirculated Draft EIR Section 3.9.2 *Air Quality – Environmental Setting* and Section *3.9.5 Air Quality – Potential Impacts and Mitigation* (pages RE-3-15, RE-3-16, and RE-3-42) for a discussion of asbestos and related impacts, and Volume I Appendix B: *Definite Plan* and Appendix B: *Definite Plan* Appendix H *Reservoir Area Management Plan* for a description of the restoration plan for the reservoirs.

Comment RE-7-6

SWR finding 'no evident asbestos' and therefore concluding 'no potential airborne sediment toxicity' inspires profound confidence when ANYONE from the region knows the extremely HIGH amounts of naturally occurring arsenic, boron, and other endemic heavy metals likely to be concentrated in sediment pockets, such as mercury that used to be panned from upstream river banks in the 1800's to be used for gold and silver amalgamation downstream.

Response to Comment RE-7-6

Please refer to Recirculated Draft EIR Section 3.9.2 *Air Quality – Environmental Setting* and Section *3.9.5 Air Quality – Potential Impacts and Mitigation* (pages RE-3-15, RE-3-16, and RE-3-42) for a discussion of asbestos and related impacts, Section 3.2.2.8 *Water Quality – Environmental Setting – Inorganic and Organic Contaminants – Sediment Contaminants* for a discussion of reservoir sediment contaminants, and Master Response R-2 for a discussion of the potential for windblown dust to be generated after drawdown of the reservoirs. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*.

Comment RE-7-7

Claiming the 'significant' impacts will be 'insignificant' due to the expansive Project, Authors' seem to suddenly utilize different numbers than the previously stated millions of cubic yards of exposed sediments and the KRRC described site specific destruction work immediately adjacent to lake residents cited within the very 'Definite Plan' which SWR is supposed to be evaluating. Apparently those damages are ok, since SWR considers the area 'sparsely populated' and therefore declare the hundreds of residents 'insignificant'.

Response to Comment RE-7-7

Please refer to Recirculated Draft EIR Section 3.10.4 *Greenhouse Gas Emissions and Energy – Impact Analysis Approach* (page RE-3-74) and Table RE-3.10-12 (page RE-3-87) for a discussion of the estimated sediment volumes in the reservoirs.

Please refer to Recirculated Draft EIR Section 3.9.5 *Air Quality – Potential Impacts and Mitigation* (pages RE-3-32 to RE-3-35) for a discussion of health impacts from construction activity.

Comment RE-7-8

Regarding 'climate change', It makes little sense in this context and purpose to give a 14 page mass marketing extensive, if biased, Agency policy mandated 'climate change' opinion perspective. The problem is, much of the information presented has equally, if not greater, credentialed research challenging that perspective, such as definitive impact solar cycles far more identifiably climatologically impacting than the fractional percentage increases in GHGs, questioning SWR assertions, effects, and conclusions. Much of the 'predicted' hypothesis has empirically proven repeatedly defective over the past 50 years. Many of the 'data' points have little support, major predictive divergence, alternative causations, and/or no credible confirmation. Other CONFIRMED data of geological cycles over eons from ice core studies shows the repetitive cycle we are in to be one of GREAT concern, with the world at the repetitively seen current PEAK point of temperatures preceding a precipitous descent into glaciation, a condition previously occurring WITHOUT prior human influence and FAR more perilous to human (and other species) survival. Under that scenario, the dictated 'policy' position's destructive actions could equally be either of LITTLE beneficial consequence, NO consequence, or DETRIMENTAL to future survival. NO WHERE is there ANY scientific support that imposing NO 'anthropogenic impacts' will prevent those natural cycles from occurring or their ensuing 'natural' devastation to species. Depending upon the confluence of variable conditions, it is logically JUST as likely that the current 'anthropogenic impacts' may help DEFER or LESSEN that disaster. The variables of 'NATURE' CARE NOT for the survival of ANY species, including Man. ONLY through the INTENTIONAL 'anthropogenic impacts' to MINIMIZE future uncertainties can mankind manage the variabilities of Nature to provide the long term consistent surplus of resources necessary for continuity of man and species alike. The

ability to minimize uncertainties is directly proportional to the PROGRESS of knowledge and technology. Only the continuing increase of individual options and quality of life encompassing the greatest percentage of individuals, allowing for the surplus resources, discretionary time, and diverse number of approaches required to rapidly enhance knowledge and solutions necessary to reduce future uncertainties offers the highest potential to MAXIMIZE Progress. However, the current policy directed regulatory agenda using imposed oppression to 'minimize' anthropogenic impacts by DESTROYING past cumulative improvements to quality of life and consistent availability of surplus production for the majority, in fact REDUCES potential adaptive options and discretionary resources, thereby IMPEDING progress and placing the eventual ability of mankind to survive Nature's variables at FAR GREATER RISK. While it is reasonably responsible under any scenario to maximize progress and minimize likelihood of unknown outcomes, SWR policies and their EIR are adversarial to both. Regardless of 'climate change' perspective, by any rationale the 'Draft' EIR policy promoting 'climate change' presentation lies outside the intended EIR scope and pointedly details 'climate change' perspective policy bias. Policy bias inescapably limits objective consideration of information and options which could increase potential for survival and 'sustainability' of all species, including Man. By limiting consideration of information and options relevant to realizing stated goals within its own purported context due to a directed policy perspective, the EIR becomes inherently inaccurate, illogical, and hypocritical.

Response to Comment RE-7-8
The comment expresses disagreement with the climate change discussion in Recirculated Draft EIR Section 3.10 *Greenhouse Gas Emissions and Energy*. Comment noted.

Comment RE-7-9
SWR repeatedly demonstrates those qualities when addressing issues, such as effectively dismissing massive 'natural' perpetual INCREASED GHGs and permanently DEGRADED downstream water quality after Project destruction in favor of the SWR UNASSESSED currently empirically challenged 'preference' of 'volitional fish travel' for which they have no technical expertise; or SWR's determination of overall destruction detriments being minimized due to their presumed "benefits" of volitional salmon travel, when recent "submitted but unconsidered" sentinel fish and polychate/certomyxa shasta studies now indicate HIGH likelihood of resultant compounding disease, complete and irreversible failure of "volitional" stated benefits, and long term devastation to the Klamath fisheries.

Response to Comment RE-7-9
Regarding natural greenhouse gas (GHG) emissions, please refer to Recirculated Draft EIR Section 3.10.5 *Greenhouse Gas Emissions and Energy – Potential Impacts and Mitigation* (pages RE-3-84 to RE-3-95) for an analysis of potential GHG emissions impacts from the natural 'fast carbon cycle'.

The recirculated portions of the Draft EIR do not include an analysis of water quality impacts. Please refer to Section 3.2.5 *Water Quality – Potential Impacts and Mitigation* Potential Impact 3.2-1 to Potential Impact 3.2-14 for an analysis of potential downstream water quality impacts. Please refer to Volume III Attachment 1 for the final Section 3.2 *Water Quality*. Similarly, the recirculated portions of the Draft EIR do not include an analysis of impacts to fish. Please refer to Section 3.3.5.9 *Aquatic Resources – Potential Impacts and Mitigation – Aquatic Resource Impacts* for a discussion of potential impacts to fish species. Please refer to Volume III Attachment 1 for the final Section 3.3 *Aquatic Resources.*

In addition, please see Master Response R-1 regarding comments not relating to recirculated portions of the Draft EIR.

Comment RE-7-10

By their own presented scenario, it is inescapable that destroying the CURRENTLY EXISTING 'GREEN' reliable renewable energy to be replaced by 'carbon footprint' dense NEWLY MANUFACTURED facilities producing inconsistent power after years of interim fossil fuel substitution is INCONSISTANT to SWR stated intent. Even though they are forced to acknowledge the obvious MAJOR detriments to local power distribution, EIR authors effectively MARGINALIZE the drastic and 'unavoidable' detriments to regional power costs, availability, stability, safety, and security for regional communities and TENS of THOUSANDS of residents. They effectively dismiss, sidestep, or ignore the massive unaddressed and/or unmitigated harm to affected residents, regional infrastructure, economic stability, and the very Klamath environment they claim to protect. No matter WHAT convoluted mutilation of reason subsequently cobbled within the EIR to achieve assigned outcome from a conflicted agenda, under NO amount of this SWR presented hyperbole can they 'justify' a 'determination' of 'no significant impact' for the loss of renewable and consistently available resources.

Response to Comment RE-7-10

Please refer to Recirculated Draft EIR Section 3.10.3 *Greenhouse Gas Emissions and Energy – Environmental Setting* and Section 3.10.5 *Greenhouse Gas Emissions and Energy – Potential Impacts and Mitigation* (pages RE-3-64 to RE-3-65, RE-3-95 to RE-3-99, and RE-3-100 to RE-3-104) for a discussion of the PacifiCorp Power Control Area, PacifiCorp's Integrated Resource Plan, PacifiCorp's proposed transition to renewable energy sources to comply with California's Renewable Portfolio Standards, and for a discussion of potential impacts to local and regional energy sources.

See also Volume I Section 5.4 *Social and Economic Factors Under CEQA* for a discussion of the scope of the CEQA analysis as it relates to social and economic factors.

Comment RE-7-11

It should be clear to any reading of the original 'Draft' and this selectively 'recirculated' portion, that the EIR is inherently and fatally biased and flawed, purposely selectively limiting both holistic and regional 'considerations', impacts, inputs, causes, and unaccountable irreversible consequences of KNOWN Project destruction environmental and regional damages. Given SWR's own self-structured unaccountable EIS stated policy perspective bias, it is clear that ANY prescribed eventual 'determination' by SWR offers little credibility and even LESS reliability. Similar prior submissions to SWR and sub Agencies' in its procedural steps to a predetermined unaccountable agenda outcome, delivered by regional residents suffering destruction costs and consequences over years of prior Klamath related comment periods, can no doubt once again expect the same level of prior inclusion… none. However, it is hopefully clear to FERC by virtue of that bias and limited consideration, that the SWR Klamath EIR offers no comprehensive or objective value for the purposes of determining PacifiCorp-KRRC License Transfer or Surrender.

Response to Comment RE-7-11

The comment is a concluding paragraph that expresses the commenter's opinion of the adequacy of the analysis in the recirculated portions of the EIR and the State Water Board permitting process. Comment noted.

2.5.4 Individuals

This section presents written comments received on the recirculated portions of the Draft EIR from individuals and the State Water Board's responses to those comments. Written comments and responses in this section are organized alphabetically by last name, first name. To determine whether your comment is associated with an affiliation type other than individuals, please refer to Table 2-4 or Table 2-5.

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Alderton, Janet

Comment RE-14-1

Thank-you for this opportunity to comment on the recirculated portions of the Draft Environmental Impact Report (EIR) for the Lower Klamath Project license surrender of the Federal Energy Regulatory Project.

I have carefully studied the recirculated portions of the Draft EIR sections and appendices related to air quality, greenhouse gas emissions, and energy analysis found at:

Recirculated Portions of the Draft EIR:

- *Recirculated Sections of the Draft Environmental Impact Report for the Lower*
- *Klamath Project License Surrender*
- *Appendix N: Air Emissions Modeling for the Lower Klamath Project*
- *Appendix O: Greenhouse Gas and Energy Modeling for the Lower Klamath Project*

Although the project will impact air quality and produce greenhouse gas emissions, I have concluded that the benefits of the proposed project, which consists of the decommissioning and removal of the J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate Dams and associated facilities located on the Klamath River, greatly outweigh the potential negative impacts.

I strongly support returning the Klamath River to free-flowing conditions and providing fish passage in the portion of the Klamath River currently occupied by the Lower Klamath Project.

I retired as a biologist from the University of California at Berkeley in 2005. Since 2005 I have been focused on the restoration of salmon habitat in the western United States. This project will restore vital salmon habitat along the Klamath River.

Response to Comment RE-14-1

Thank you for submitting comments on the Recirculated Sections of the Draft EIR. The comment expresses support for the project and concludes that the benefits of the project outweigh the potential impacts. Comment noted.

Beardsmore, Loy and John

Comment RE-10-1

When we submitted our comments for the Scoping meetings we did present our beliefs that there would be air quality issues, specifically with toxic dust storms,

as occurred after the Condit Dam removal, despite your claim that not one comment received mentioned air quality.

Response to Comment RE-10-1
Comment noted. Section 3.9 *Air Quality* of the Recirculated Portions of the Draft EIR for the Lower Klamath Project License Surrender (Recirculated Draft EIR), acknowledges comments related to air quality that were received during the Draft EIR public comment period. Comments received during the Draft EIR public comment period pertaining to air quality, greenhouse gas emissions, and energy consumption were considered during development of the Recirculated Draft EIR.

For air quality health impacts associated with the Proposed Project, please refer to the *Health Impacts* portion under the Recirculated Draft EIR Section 3.9.5 *Air Quality – Potential Impacts and Mitigation* Potential Impact 3.9-1, which discusses potential human health impacts from exposure to criteria air pollutant emissions and Potential Impact 3.9-4 for a discussion of the Proposed Project's potential to create a significant hazard to sensitive receptors near construction sites through exposure to substantial toxic air contaminant concentrations during construction activities. Additionally, please refer to Master Response R-2 for a discussion of the potential for windblown dust and associated windblown dust related contaminates to be generated after drawdown of the reservoirs.

Comment RE-10-2
The above statements now hold even more credibility that the SWRCB, is "recirculating" PART of the DEIR, not recirculating the ENTIRE DEIR, failing to address our comments and concerns, as well as those of PacifiCorp, and Siskiyou County. Many of the previous submissions during the comment period which reference local history and scientific evidence refuting the DEIR should have led the SWRCB to recirculate the entire DEIR for comments and not just these narrow sections. By the Water Board not doing so, they are acting prejudicially by marginalizing the unavoidable detriments of this project.

Response to Comment RE-10-2
Comment noted. Please refer to Master Response R-1 and Volume III Section 2 *Public Comments and Responses* and Volume III Attachment 1 for comment responses related to the Draft EIR.

Comment RE-10-3
Incomplete/omitted/obsolete data seem to be a pattern with the Water Board as also evidenced in the lawsuit brought by the Department of Justice and the U.S. Department of the Interior, against the California SWRCB for failing to comply with the California Environmental Quality Act (CEQA). The environmental analysis by the Water Board hid the true impacts of your plan. CEQA requires state and local agencies to identify the significant environmental impacts of their actions and to avoid or mitigate those impacts. This is a pattern with the SWRCB

that cannot be ignored. You are being negligent in not addressing all comments and concerns and lack of mitigation as it relates to this ever-changing project.

Response to Comment RE-10-3
Please refer to Master Response R-1. All comments received during the public comment period for the Notice of Preparation (NOP) were considered during development of the Draft EIR. All comments received during the Draft EIR public comment period have been considered and responded to in the Final EIR. Comments received during the Draft EIR public comment period pertaining to air quality, greenhouse gas emission, and energy consumption were reviewed and considered during development of the Recirculated Draft EIR.

Comment RE-10-4
This is what we previously submitted in our comments on Air quality. "Regarding air quality, the sediments left behind will cause problems for residents around the reservoirs, especially Copco, and yet there is NO mention of this in the DEIR!! Look at the Condit Dam removal when they encountered toxic dusts storms when people experienced Mercury poisoning. What about when these sediments from the Klamath dams become airborne? What about the PCB's, evidence of DDT, etc.? In past drawdowns of Copco Lake, there were days when dust from the sediments became airborne. Where are the plans to mitigate this for homeowners that live around the lakes? The only mention of dust issues relates to during dam deconstruction, but there are absolutely no plans to mitigate sediment dust issues after dams are removed! Again, the Definite Plan and DEIR are a plan/report that is far from definitive or complete!"

Response to Comment RE-10-4
Please refer to Master Response R-2 for a discussion of the potential for windblown dust to be generated after drawdown of the reservoirs.

Comment RE-10-5
Finally, the Recirculated version acknowledges some of our concerns, still doesn't adequately address airborne sediments and it doesn't address the soil testing of banks and slopes which have not been studied. It also fails to adequately address asbestos and chemicals released into the air which can become airborne and there are no mitigations tied to these toxic releases.

Response to Comment RE-10-5
Please refer to Master Response R-2 for a discussion of the potential for windblown dust and associated windblown dust related contaminates to be generated after drawdown of the reservoirs.

Please refer to Recirculated Draft EIR Section 3.9.2.6 *Air Quality – Environmental Setting – Toxic Air Contaminates* for a discussion of the potential for naturally occurring asbestos to be encountered during implementation of the Proposed Project. Additionally, please refer to Recirculated Draft EIR Section 3.9.5 *Air Quality – Potential Impacts and Mitigation* Potential Impact 3.9-4, which

evaluates the Proposed Project's potential to create a significant hazard to sensitive receptors (e.g., residents and recreationists) near the construction sites through exposure to substantial toxic air contaminants (including asbestos) during construction activities. As discussed in the Recirculated Draft EIR, an investigation concluded that it is unlikely that the bedrock in the Lower Klamath Project boundary and the concrete used to construct the dams contain naturally occurring asbestos. Although unlikely, if naturally occurring asbestos is encountered either during bedrock-disturbing activities, or in concrete during demolition activities, Klamath River Renewal Corporation (KRRC) or its representatives will handle the naturally occurring asbestos in accordance with, as relevant, the federal Environmental Protection Agency's (EPA's) fact sheet, *Naturally Occurring Asbestos: Approaches for Reducing Exposure* (March 2008) and the *Guide to Normal Demolition Practices Under the Asbestos NESHAP* (September 1992) (KRRC 2019e).

Comment RE-10-6

The Recirculated version uses the nearest air quality monitoring station in Yreka (located at 525 South Foothill Drive), which is the closest monitoring station to the Proposed Project in the NPAB. Your report states, "This monitoring station is centrally located in Siskiyou County and is the main station that measures criteria air pollutants in the county. As such, this monitoring station is considered representative of air quality in Siskiyou County."

Response to Comment RE-10-6

Recirculated Draft EIR Section 3.9.2.3 *Air Quality – Environmental Setting – Monitoring-Station Data and Attainment-Area Designation* has been revised to clarify that the monitoring station is considered representative of ambient air quality in Siskiyou County and site-specific conditions may vary. Please see Volume III Attachment 2 Section 3.9.2.3 *Air Quality – Environmental Setting – Monitoring-Station Data and Attainment-Area Designation* for this revision.

Comment RE-10-7

The Water Board uses this for convenience, but it is not indicative of what will occur around Copco and it does need to be recalculated. The report states, "Annual average wind speeds in Siskiyou County are approximately 6.1 miles per hour and predominantly blow from the south. (Western Regional Climate Center 2016)."

This again is inaccurate information as it pertains to Copco. In the mornings, the winds tend to run down the Klamath River Canyon from the east and in the afternoons, the winds run the opposite way, from the west or northwest. The topography around Copco and the river canyon create their own micro climate and we would challenge the accuracy of the data above.

Response to Comment RE-10-7
The commenter is concerned the Air Quality Environmental Setting inaccurately describes wind patterns around Copco Reservoir and the river canyon. Please note, the Air Quality Environmental Setting identifies the prevailing wind pattern in Siskiyou County and provides annual average wind speeds in Siskiyou County. Annual average wind speeds may not represent wind speeds on a specific day or location within Siskiyou County as it is an average of wind speeds observed over a year time period. Nonetheless, this information adequately represents the environmental setting.

Comment RE-10-8
The Recirculated version states, "Following drawdown of the reservoirs and prior to the establishment of ground vegetation from reseeding, there is the potential for windblown dust to be generated from the exposed sediment deposits remaining in the reservoirs. Once reseeding occurs, it typically takes a minimum of four weeks for vegetation to be established to reduce the potential for windblown dust. Considering that reservoir drawdown would occur in the winter months (January to March), it is anticipated that the seasonally wet conditions would substantially reduce the potential for windblown dust until the establishment of vegetation. However, there is the potential for short-term impacts from windblown dust not accounted for in the particulate matter emission estimates.

The Recirculated report states, "As noted above, high concentrations of criteria air pollutants and toxic air contaminants can result in adverse health effects to humans. Some population groups are considered more sensitive to air pollution and odors than others; children, elderly, and acutely ill and chronically ill persons, especially those with cardio-respiratory diseases, such as asthma and bronchitis. Sensitive land uses are facilities that generally house more sensitive people (e.g., schools, hospitals, nursing homes, residences, etc.). The areas surrounding Iron Gate Dam, Copco No. 1 Dam, and Copco No. 2 Dam are sparsely populated with few sensitive land uses".

If you live around Copco or Iron Gate this will create adverse health effects. There are children (some of which are home schooled), many elderly, acutely and chronically ill persons living around the reservoirs, but because the report states that these are "sparsely populated areas", there is not a "significant impact". Tell that to the people living here, and again, no real viable plans to mitigate or compensate these residents for the adverse health effects of these pollutants, or compensation for ongoing health issues.

Response to Comment RE-10-8
The Recirculated Draft EIR Section 3.9.3 *Air Quality – Significance Criteria* (page RE-3-20) lists five criteria used when determining if the Proposed Project would have a significant impact. The criteria included:

1. Exceed the Siskiyou County Air Pollution Control District (SCAPCD) emissions thresholds for stationary sources in Rule 6.1 (Construction Permit Standards for Criteria Air Pollutants).
2. Substantially conflict with or obstruct implementation of the California Regional Haze Plan.
3. Result in a cumulatively considerable net increase of any criteria pollutant for which the SCAPCD is in non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors).
4. Expose sensitive receptors to substantial toxic air contaminant concentrations.
5. Create objectionable odors adversely affecting a substantial number of people.

The significance criteria and potential impact analysis did not rely on the number of sensitive receptors exposed to substantial toxic air contaminant concentrations when evaluating if the Proposed Project would have a potential impact. As listed in Recirculated Draft EIR Section 3.9.5 *Air Quality – Potential Impacts and Mitigation* Potential Impact 3.9-1*,* it was determined that the Proposed Project would have a significant and unavoidable impact with mitigation for nitrogen (NOx) emissions, No Significant Impact with Mitigation for particulate matter that is 10 micrometers or less in diameter (PM_{10}) emissions, and No Significant Impact for (reactive organic gases [ROG]), carbon monoxide (CO), sulfur dioxide (SO_2), and particulate matter that is 2.5 micrometers or less in diameter ($PM_{2.5}$) emissions.

Additionally, as listed in Recirculated Draft EIR Section 3.9.5 *Air Quality – Potential Impacts and Mitigation* Potential Impact 3.9-4, it was determined that the Proposed Project would have no significant impact with inclusion of Mitigation Measure HZ-1 Hazardous Materials Management*.* This determination was based, in part, on an analysis of dilution of concentrations of mobile source emissions of diesel PM10 decreasing by 60 percent at a distance of approximately 300 feet (Zhu et al. 2002) and 70 percent at a distance of approximately 500 feet (CARB 2005), while the closest residences are located approximately 850 feet away from the construction sites where the major construction activity associated with the Proposed Project would occur.

The significance criteria and potential impact analysis relied on the number of people exposed to objectionable odors, namely, a “substantial number of people,” when evaluating if the Proposed Project would have a significant and unavoidable impact. This criteria is consistent with the Siskiyou County Air Pollution Control District that addresses odor impacts through Rule 4.2 (Nuisance Section 24243), which states “No person shall discharge from any source whatsoever, such quantities of air contaminants or other material which cause injury, detriment, nuisance or annoyance to any considerable number of persons

or to the public or which endanger the comfort, repose, health or safety of any such persons or the public or which cause or have a natural tendency to cause injury or damage to business or property."

Please refer to the Health Impacts portion under Recirculated Draft EIR Section 3.9.5 *Air Quality – Potential Impacts and Mitigation* Potential Impact 3.9-1, which discusses potential human health impacts from exposure to criteria air pollutant emissions and Potential Impact 3.9-4 for a discussion of the Proposed Project's potential to create a significant hazard to sensitive receptors near construction sites through exposure to substantial Toxic Air Contaminant (TAC) concentrations during construction activities. Additionally, please refer to Master Response R-2 for a discussion of the potential for windblown dust and associated windblown dust related contaminates to be generated after drawdown of the reservoirs and revegetation of reservoir sediments.

Comment RE-10-9

We do not see plans to mitigate the sediment dust issues that will occur with the drying sediments, if revegetation is unsuccessful, from March and beyond, nor the additional green-house gas emissions accounted for, when trying to mitigate these dust storms.

Response to Comment RE-10-9

Please refer to Master Response R-2 for a discussion of the potential for windblown dust and associated windblown dust-related contaminants to be generated after drawdown of the reservoirs and revegetation of reservoir sediments. As discussed in Master Response R-2, windblown dust from reservoir sediments is not anticipated to be a significant impact. Additionally, please note, the emissions from equipment that will be used for restoration activities have been accounted for in the conservative assumptions used to estimate the GHG emissions from construction activities.

Comment RE-10-10

The above statements assume that revegetation would occur and, if not, then fall hydro seeding might be needed again as well. How would a failure of revegetation result in a short-term impact? A second seeding right before winter and freezing temperatures seems useless as any vegetation will die off during the winter months resulting in at least another year before revegetation could occur, hardly a short-term impact. Again, where do you account for a second reseeding/replanting of vegetation. In the meantime, the dust storms will continue, until such time, as revegetation occurs.

Response to Comment RE-10-10

Please refer to Master Response R-2 for a discussion of the potential for windblown dust and associated windblown dust related contaminates to be generated after drawdown of the reservoirs and revegetation of reservoir sediments.

Comment RE-10-11

In the Definite Plan the restoration activities mention grading of the reservoir footprints, placement of irrigation pipe and sprinklers, and planting of trees. The Recirculated version only refer to "aerial hydro seeding", and even this only refers to it taking place at Iron Gate and not at Copco. This Recirculated plan does not mention any of these projected plans and the air quality effects of the vehicles and manpower needed to perform these actions will produce. In addition, they only address the first year after reservoir drawdown, while the Definite Plan says this would be an ongoing plan until revegetation is complete. That being said, this report is deficient. They would also use water trucks. I have repeated asked where the water will come from to fill these trucks, to irrigate vegetation during restoration activities, and, also during dam deconstruction, but have yet to receive a single answer from the SWRCB or the KRRC.

Response to Comment RE-10-11

Please refer to Volume II Appendix B *Definite Plan* and Volume II Appendix B: *Definite Plan –Appendix H* for a description of the restoration plan for the reservoirs.

Please refer to Recirculated Draft EIR Appendix N for a discussion of the construction schedule and construction activities used to model emissions of criteria air pollutants. All restoration activities included in the Definite Plan were incorporated into the emissions estimates prepared for the Proposed Project. As such, the analysis in the Recirculated Draft EIR considers potential air quality impacts of all proposed restoration activities. The Recirculated Draft EIR includes a statement about hydroseeding activities to make the point that fall hydroseeding may be necessary to supplement areas where spring hydroseeding was unsuccessful. As indicated in Volume II Appendix B: *Definite Plan Appendix H*, vegetation establishment efforts may extend for several years to ensure the successful establishment of vegetation. The emissions estimates for restoration activities included conservative assumptions to account for these potential activities.

Klamath River Renewal Corporation (KRRC) has committed to obtain water required for dust suppression, irrigation, and other project-related activities in compliance with all applicable regulatory requirements.

Comment RE-10-12

As for mitigation measures, here is what the Recirculated report states, "Blasting-related Dust Control Measures-Dust control measures will be incorporated to the maximum extent feasible during blasting operations at Copco No. 1 Dam. The following control measures will be used during blasting activities as applicable: Conduct blasting on calm days to the extent feasible. Wind direction with respect

to nearby residences must be considered. Design blast stemming to minimize dust and to control fly rock."

Here we have underlined the key words. The odds of this project working on days of no/little wind will just not happen, as we have previously stated, there are daily prevailing winds. Contractors will not halt work for these reasons and there will be no mitigation.

Response to Comment RE-10-12
The comment asks questions about the implementation of blasting-related dust control measures. Comment noted.

Comment RE-10-13
Contractors will not halt work for these reasons and there will be no mitigation. Additionally, what entity will be overseeing such dust control measures? How will this be enforceable? We do not see this addressed in the Recirculated DEIR.

Response to Comment RE-10-13
Klamath River Renewal Corporation (KRRC) has committed to implement Air Quality Mitigation Measures AQ-4 – Blasting-related Dust Control Measures and AQ-5 – General Construction Dust Control Measures to reduce emissions of particulate matter that is 10 micrometers or less in diameter (PM_{10}) to less than significant. For measures that are outside of the State Water Board's water quality certification authority, KRRC has committed to propose that the mitigation measures be included in the FERC license-surrender order. (See KRRC's Water Quality Certification Application, December 3, 2019 [KRRC 2019a], Attachment B.)

Comment RE-10-14
Odor impacts. The Recirculated versions states, "It is not anticipated that the Proposed Project would create objectionable odors affecting a substantial number of people and thus would not result in a significant impact. Ultimately, the Proposed Project is anticipated to substantially reduce the annual occurrence of odors from algae blooms since this section of the Klamath River would be restored to a free- flowing condition."

Again, the report minimizes the impacts of odors, as well as the insubstantial number of people. It says that people would remain indoors. That is not a minimal impact to people living around Copco and Iron Gate. They blame the odors on the algae.

Response to Comment RE-10-14
The comment expresses disagreement with the analysis of odor impacts in Recirculated Draft EIR Section 3.9 *Air Quality*. Please see response to RE-10-8 regarding significance criteria for odors and its relation to the Siskiyou County Air Pollution Control District.

Comment RE-10-15

The algae blooms in Irongate and Copco reservoirs are always cited as a problem, but at the end of last summer, an extensive list of reservoirs and lakes were cited to have this problem. If one were to follow that line of thinking, then they should also be looking to eliminate dams such as Shasta and Oroville because they have the same issues. The Upper Klamath Lake has an extensive algae problem and the Water Board does not address the "source" of the problem because it is outside of their purview.

Response to Comment RE-10-15

Comment noted. Please see Master Response R-1 for information on comments not requiring a CEQA response.

Comment RE-10-16

The report is also working on the assumption that the Klamath River would be restored to a "free flowing river". Once again, the report attempts to downplay the impacts and does not use historical data in arriving at their conclusions. Historically, the Native Americans named the river the Klamath, meaning "stinky river" because it was not free flowing, had stagnant water that created algae, and that resulted in objectionable odors and this was pre-dam era.

Response to Comment RE-10-16

Please see Master Response R-1 for information on comments not requiring a CEQA response.

Comment RE-10-17

As you will see below, Climate change will exasperate algae blooms in the river, especially as wildfires are expected to proliferate. During years after a wildfire, there can be dramatic increase nutrient levels such as phosphorus, nitrogen, and potassium in the streams and river. This can exacerbate algae blooms. The idea that eliminating the dams and reservoirs will eliminate problems with algae is ludicrous at best and a flimsy justification for dam removal as it relates to water quality and odor impacts.

Response to Comment RE-10-17

Please see response to RE-10-8 regarding significance criteria for odors and its relation to the Siskiyou County Air Pollution Control District (SCAPCD).

To the extent the comment addresses the Proposed Project's purposes and does not pertain to the environmental analyses presented in the portions of the Recirculated Draft EIR for the Proposed Project, please see Master Response R-1 for information on comments not relating to recirculated portions of the Draft EIR.

Comment RE-10-18

Most notably, there is nothing in this Recirculated report that adequately addresses all effects of Climate Change as the project will affect air quality, greenhouse gas emissions, and energy consumption. See the reports below:

Response to Comment RE-10-18

Comment noted. The comment relates to the adequacy of the discussion of climate change in the Recirculated Draft EIR.

Comment RE-10-19

See the California Fourth Climate Change Assessment – Statewide Summary Report (CEC 2018a). States:

California is already experiencing the effects of a changing climate, and these impacts are projected to worsen, even with only moderate increases in global GHG emissions. These effects include, but are not limited to, increasing temperatures, greater variability in precipitation levels, reductions in the amount of precipitation falling as snow, more frequent and severe forest wildfires, and rising sea levels that cause increased coastal flooding and erosion, as discussed further below.

Increasing frequency and severity of wildfires: Wildfire characteristics are determined by both natural and anthropogenic factors. Climate change, combined with anthropogenic factors, has already contributed to more frequent and severe forest wildfires in the western U.S. Wildfires have also been occurring at higher elevations in California, which is a trend that is projected to continue as climate change worsens. Changing vegetation patterns in the state due to climate change will also affect the location and characteristics of fires (CEC 2018a).

Projected changes in climate conditions are expected to result in a wide variety of effects in the Klamath Basin, based on projections developed for the broader Pacific Klamath Basin include changes to stream flow, temperature, precipitation, groundwater, and vegetation changes. In general, climate model projections include:

- *<!--[if !supportLists]--><!--[endif]-->Increased average ambient air and water temperature*
- *<!--[if !supportLists]--><!--[endif]-->Increased number of extreme heat days*
- *<!--[if !supportLists]--><!--[endif]-->Changes to annual and seasonal precipitation, including increased frequency and length of drought, less winter snow and more winter rain, and changes in water quality*
- *<!--[if !supportLists]--><!--[endif]-->Increased heavy precipitation*
- *<!--[if !supportLists]--><!--[endif]-->Reduced snowpack and snow melt, resulting in less runoff during the late spring through early autumn*

<!--[if !supportLists]-->● <!--[endif]-->Vegetation changes
<!--[if !supportLists]-->● <!--[endif]-->Groundwater hydrology changes
<!--[if !supportLists]-->● <!--[endif]-->Changes to annual stream flow

Intergovernmental Council on Climate Change states, "Generally, global impacts from climate change include increases in mean temperature in most terrestrial and marine regions, hot extremes in most developed regions, heavy precipitation in several regions, and the probability of drought and precipitation deficits in some regions. Furthermore, temperature increases amplify the exposure of small islands, low-lying coastal areas and deltas to the risks associated with sea-level rise for many human and ecological systems, including increased saltwater intrusion, flooding, and damage to infrastructure (IPCC 2018).

Evidence of observed climate change impacts are the strongest and most comprehensive for natural systems. Many terrestrial, freshwater, and marine species have shifted their geographic ranges, seasonal activities, migration patterns, abundances, and species interactions in response to ongoing climate change. Many land and ocean ecosystems and some of the services they provide (e.g., habitat, cycling of water and nutrients) have already changed due to climate change. Some impacts may be long-lasting or irreversible, such as the loss of some ecosystems (IPCC 2018).

On January 3, 2020, the state of California released its draft Water Resilience Portfolio. The document was created through a joint effort of several California agencies, including the California Natural Resources Agency, the California Environmental Protection Agency and the California Department of Food and Agriculture. It recommends numerous actions to help the state deal with its deepening water woes. Among these recommendations are calls for increasing water storage within the state. Those values are increasingly at risk as California confronts more extreme droughts and floods, rising temperatures, depleted groundwater basins, aging infrastructure and other challenges magnified by climate change."

The state of California with the SWRCB, governor, legislature, and the department of natural resources are so intent on removing the Klamath Dams, that neutrality, specifically with the Water Board, that they are ignoring their own studies. The California draft Water Resilience Report is a bipolar report. You cannot claim water woes, and then promote eliminating it, but only on the Klamath River. You cannot state there will be more extreme drought, rising temperatures, and depleting groundwater basins, and then promote dam removal with clean energy and water storage that can be used for many purposes such as fire suppression in the face of increasing wildfire, flushing of an infected river, replenish water tables, and possible uses not even contemplated.

Response to Comment RE-10-19
Comment noted. The comment cites to information on climate change but does not provide substantial evidence explaining why impacts not already identified as significant would be potentially significant. The reports cited by the commenter, the *California Fourth Climate Change Assessment – Statewide Summary Report* (CEC 2018a) and the *Intergovernmental Panel on Climate Change (IPCC) Summary for Policy Makers* (IPCC 2018), were used in development of the Recirculated Draft EIR.

Comment RE-10-20
So intent is the state of California to remove the dams that they pass legislation to authorize the decimation of one endangered species, the Suckerfish, to cite that the dams imperil another species of Salmon, while at the same time ignoring all signs of climate change that point to rising ocean temperatures, and rising temperatures in rivers and streams while these same endangered Salmon need cold water. The SWRCB cannot claim that Climate Change, as it relates to this project, will not have a significant effect, and most especially as it will increase the likelihood of wildfires with increased fuels IF the reservoir beds are revegetated, but also a natural fuel break that the Klamath River cannot provide, and eliminate water resources to extinguish these fires. The Air Quality indexes in and around California counties that have experienced wildfire have seen these indexes spiral upward and this has a direct impact on Climate Change. It cannot be ignored, or at the very least, minimalized by the Water Board to meet their biased goal of dam removal.

Response to Comment RE-10-20
Comment noted. The comment relates to the project purpose and the impacts of climate change on temperatures, wildfires, and air quality. For Proposed Project potential impacts to greenhouse gas emissions (GHG), please see Recirculated Draft EIR Section 3.10.5 *Greenhouse Gas Emissions and Energy – Potential Impacts and Mitigation* (Potential Impact 3.10-1 to 3.10-4). The comment does not provide substantial evidence explaining why impacts not already identified as significant would be potentially significant. Please see Master Response R-1 for information on comments not related to recirculated portions of the Recirculated Draft EIR.

Comment RE-10-21
Greenhouse Gas Emissions-The Recirculated report states, "Greenhouse Gas Emissions – Greenhouse Gas Emissions and Global Climate Change). In the absence of applicant agreement, such a mitigation measure would not be enforceable, and therefore not feasible."

This last statement, more, or less, says it all. It brings into question the entire Definite Plan. It is ironic that the SWRCB intends to issue a water quality certification since there will be no applicant agreement to mitigate GHG emissions and it would be a significant and unavoidable impact. The DEIR goes

on to state that, "PacifiCorp explains that it uses Klamath energy, when available, (We would ask, when is it not available?) to displace higher cost, fossil generation.

Response to Comment RE-10-21
The comment relates to the feasibility of mitigation related to greenhouse gas emissions and the use of energy generated by the hydroelectric facilities. Please refer to Master Response CEQ-2. Please refer to Recirculated Draft EIR Section 3.10.5 *Greenhouse Gas Emissions and Energy – Potential Impacts and Mitigation* (pages RE-3-95 to RE-3-99 and RE-3-100 to RE-3-104) for a discussion of the PacifiCorp Power Control Area and the company's proposed transition to renewable energy sources to comply with State Renewable Portfolio Standards. Please refer to Recirculated Draft EIR Section 3.10.5 *Greenhouse Gas Emissions and Energy – Potential Impacts and Mitigation* (pages RE-3-100 to RE-3-104 and RE-3-100 to RE-3-104) for a discussion of potential impacts to local and regional energy sources.

Comment RE-10-22
In its Final License Application to FERC, PacifiCorp states that if generation were to cease at Klamath it would still be able to service its local customers." We would ask at what the costs would be for this replacement energy, as we are quite certain energy costs would increase. Our energy bills are certainly not going down. As this also relates to Energy, they tend to say one thing and then try to justify a determination of "no significant impact" for the loss of renewable, consistent, currently existing source of green energy. These statements by the Water Board are inconsistent. The SWRCB is marginalizing the significant detriment that will result in increased power costs, and negative impacts of lack of availability, stability, safety, and security for the local communities of thousands of residents.

Response to Comment RE-10-22
The comment relates to energy costs, the availability of green energy, and impacts to local energy supplies from removal of the hydroelectric facilities. Please refer to Master Response ENR-1 related to power rate increases for PacifiCorp customers. Please refer to Recirculated Draft EIR Section 3.10.5 *Greenhouse Gas Emissions and Energy – Potential Impacts and Mitigation* (pages RE-3-95 to RE-3-105) for a discussion of the PacifiCorp Power Control Area, the company's proposed transition to renewable energy sources to comply with State Renewable Portfolio Standards, potential impacts to local and regional energy sources, and other information related to renewable energy.

Comment RE-10-23
This statement reinforces our comments that the hydropower produced by the dams is offsetting power coming from other sources that produce GHG emissions. Granted PacifiCorp could still meet current customer needs, but at what price to the environment and does it take into consideration Climate

Change and the increased demand for energy? It also doesn't take into consideration the growing number of electric vehicles. It is projected by the National Renewable Energy Laboratory that electric vehicles could account for a 38% increase in US electricity needs by 2050. That percentage does not account for the massive power demands needed for data centers that create, transport and store virtual information. Wind and solar only currently deliver 7.6 % of US electricity. The United States Energy Administration projects that global energy consumption will rise by 50% by 2050 and there are no signs of this trend slowing down. Power grids are beginning to show the signs of strain. There are high costs associated with extending grids to remote areas and significant requirements and costs to update aging assets. We doubt that this will align with the UN Sustainable Development Goal of "access to affordable, reliable, sustainable and modern energy for all."

Response to Comment RE-10-23
Please refer to the response to comment RE-10-22.

Comment RE-10-24
The report states: "Siskiyou County Energy Element generally promotes further development of renewable energy sources in the county, and removal of an existing renewable energy source could conservatively be considered to conflict with such policies in the county's Energy Element. Such a conflict would not be an impact that can be feasibly mitigated. Therefore, the Proposed Project would conflict with a local plan supporting renewable energy sources. This would result in a cumulative energy impact and the incremental contribution of the Proposed Project would be cumulatively considerable."

The plan also goes on to state that it would conflict with this local plan supporting renewable energy sources and, thus, there would be a significant and unavoidable impact, but would meet the state's plan. Once again we find that what is best for the local area is to be sacrificed and ignored by California State agencies.

Response to Comment RE-10-24
Comment noted. The commenter is noting that the Recirculated Draft EIR identifies a significant and unavoidable impact for conflicting with a local plan as identified in Potential Impact 3.10-7.

Comment RE-10-25
Another aspect of the Recirculated DEIR that is lacking specificity is how the area's narrow roads will be clogged and the GHG that will result due to excess traffic and pollution. Also, not adequately addressed is the need for road repair, and consequent GHG resulting, to bring those roads back up to a condition, as good or better, than they were found prior to the project as promised by the KRRC. I would challenge the SWRCB to find any plans to mitigate local road repair in the Definite Plan, as that is constantly evolving.

Response to Comment RE-10-25
The comment relates to greenhouse gas (GHG) emissions generated by vehicular traffic and the construction of road improvements. Please refer to Recirculated Draft EIR Appendix O for a discussion of the construction schedule and activities used to model GHG emissions.

The estimates of construction GHG emissions from the Proposed Project does not include potential traffic congestion that could occur in the project area during the construction period. Determining emissions from potential traffic congestion would be speculative and would be subject to several variables (e.g., the type of vehicles, where congestion would occur, for how long it would occur, and how it would reduce vehicle speeds in specific areas) that could not be known at the time of calculating the estimates of GHG emissions from the Proposed Project. Please note, the Klamath River Renewal Corporation (KRRC) has committed to implement a Traffic Management Plan to ensure road safety, coordination with applicable agencies (California Department of Transportation (Caltrans), Siskiyou County Public Works and Sheriff's Departments, California Highway Patrol, California Department of Forestry and Fire Protection (CALFIRE), and other emergency response agencies), and road repair and rehabilitation.

The estimates of construction GHG emissions from the Proposed Project included all transportation-related improvements that were known at the time the estimates were calculated.

Comment RE-10-26
The plan also mentions the potential cumulative impact with short-term increases in air pollutant emissions in combination with wildfires. It ironically states: "If wildfires were to produce substantial quantities of smoke near the proposed Limits of Work during the Proposed Project construction and restoration period, there would be an adverse air quality impact. However, if the Area of Analysis is disaster-stricken, it is likely that Proposed Project construction and restoration activities would be placed on hold to protect the health and safety of workers until the wildfire is under control.

The idea of any activities would be placed on hold to protect the health and safety of workers is ironic, as residents in the area will be more at risk of wildfire with the reservoirs eliminated, with no plans to mitigate, not to mention the dust issues again. Not only will dam removal and consequent revegetation result in more fuel for fires, but the source of extinguishing any fires will now be eliminated. As evidenced by Climate Change studies, we can expect rising temperatures, extended periods of drought, and lower flows in streams and rivers that will increase the risk of wildfire. What level of hazardous air quality will the project managers decide is "unsafe" for their workers, as it's not stated in the Proposed Project, so there is no guarantee that work would be halted and not have a cumulative effect. The Recirculated report refers to the Fire Management

Plan, but again no specifics as it relates to wildfire and cumulative effects on GHG emissions from wildfire.

Response to Comment RE-10-26
The comment relates to wildfire risk and air quality, including greenhouse gas (GHG) emissions impacts from wildfires.

Please refer to the Recirculated Draft EIR, which discusses wildfires as a source of air quality impairment and increasing frequency and severity of wildfires. In particular, see Section 3.24.9 *Air Quality Cumulative Effects* (page RE-3-112), Section 3.24.10 *Greenhouse Gas Emissions and Energy Cumulative Effects* (pages RE-3-114 to RE-3-115), and Section 3.24.9 *Air Quality Cumulative Effects* Potential Cumulative Impact 3.24-34 (page RE-3-112) for an analysis of potential cumulative air quality and GHG emissions impacts, including an assessment of short-term increase in criteria air pollutant emissions under the Proposed Project in combination with wildfires.

Also, please refer to Volume II Appendix B: *Definite Plan – Appendix H* for a description of the restoration plan for the reservoirs.

Also, please see Master Response R-1 for information on comments not related to recirculated portions of the Draft EIR.

Comment RE-10-27
The proposed continued operations with fish passage only consider the use of fish ladders and don't consider additional alternatives such as fish cannons that would result in little air pollutants in comparison. Once again the DEIR and Recirculated report are based on information and technologies that are minimally over 8-10 years old. It's also ironic that they state fish ladders would take four to eight years to construct! One would ask where that time table comes from, but even so, it is stated that impacts would be less than significant.

Siskiyou County also suggested an environmentally friendly alternative such as fish passage by an alternative tunnel route, and of course this alternative is not mentioned in the report despite it costing less than fish ladders and dam removal. It would also result in the least adverse effects to the environment, while preserving almost every negative impact of dam removal. Both fish tunnels and fish cannons, have not been adequately studied by the SWRCB as viable, less impactful to GHG and air pollution.

Response to Comment RE-10-27
Please see Recirculated Draft EIR Section 4.4.9 *Air Quality - Continued Operations with Fish Passage Alternative*. The Continued Operations with Fish Passage Alternative considers potential air quality impacts of trap and haul in addition to fish ladders.

Additionally, portions of this comment do not pertain to the environmental analyses presented in the portions of the Recirculated Draft EIR for the Proposed Project. Please see Master Response R-1 for information on comments not requiring a CEQA response.

Comment RE-10-28

We would point to the words significant effect. Dam removal will have a significant adverse effect on human beings with air pollution at the very least. Even though the SWRCB claims this is a sparsely populated area, non-the-less, it is populated. We are not seeing how the homeowners around Copco are going to have these impacts mitigated, other than the Water Board to say that people should stay indoors. Many are wondering where the compensation for such adverse health cost effects will be for local residents and their loss of property values. If one wants to sell their homes, odors from drying sediments, toxic dust storms created by dam removal, and an increased risk for wildfire make their homes lose their value.

Response to Comment RE-10-28

The comment expresses concern about odor impacts, dust impacts, increased wildfires, and decreasing property values.

Please refer to Recirculated Draft EIR Section 3.9.5 *Air Quality – Potential Impacts and Mitigation* (pages RE-3-43 to RE-3-44) for a discussion of potential odor impacts from the Proposed Project.

Please refer to Recirculated Draft EIR Section 3.9.5 *Air Quality – Potential Impacts and Mitigation* (pages RE-3-25 to RE-3-36) for a discussion of potential impacts from particulate matter during construction activity. In addition, please refer to Master Response R-2 for a discussion of the potential for windblown dust to be generated after drawdown of the reservoirs.

Please see Master Response R-1 for information on comments not related to recirculated portions of the Draft EIR.

Please see Volume I Section 5.4 *Other Required CEQA Discussion and Consideration of Social and Economic Factors – Social and Economic Factors Under CEQA* (pages 5-3 to 5-12) for information regarding consideration of social and economic factors under CEQA.

Comment RE-10-29

The water board refers to the term "sparsely populated". Even the Federal Aviation Agency cannot agree as to the definition of sparsely populated, except to say that it might be defined as less than 10 people per square mile. By using the FAA's rubric, the area around Copco Lake would NOT qualify as sparsely populated. Copco covers 1.6 square miles, is approximately three miles long and the population count around the lake is slightly over two hundred people that

this project will cause residents to experience negative significant effects. The SWRCB is intending to use the term of "sparsely populated" as a measure for insignificant or significant impacts in the EIR without a clear and legally defendable definition in this legal document. I would point out that any legal document using terminology such as "sparsely populated" should require a proven legal definition of which there is none. All aspects and consequences of dam removal will have a negative effect and a significant impact on the environment and on residents around Copco, and CANNOT be mitigated. We see no discussion of compensation for future health care costs for residents, detrimental effects on everyday life, not to mention lost property values. The KRRC has referenced a "Local Impact Mitigation Fund", but admits it is only conceptual.

Response to Comment RE-10-29
Please refer to the response to comment RE-10-8 for information on how significance criteria was applied to the assessment of potential impacts.

Additionally, please refer to the Health Impacts portion under Recirculated Draft EIR Section 3.9.5 *Air Quality – Potential Impacts and Mitigation* Potential Impact 3.9-1, which discusses potential human health impacts from exposure to criteria air pollutant emissions and Potential Impact 3.9-4 for a discussion of the Proposed Project's potential to create a significant hazard to sensitive receptors near construction sites through exposure to substantial Toxic Air Contaminant (TAC) concentrations during construction activities. Additionally, please refer to Master Response R-2 for a discussion of the potential for windblown dust and associated windblown dust related contaminates to be generated after drawdown of the reservoirs.

Please see Master Response R-1 for information on comments not related to recirculated portions of the Recirculated Draft EIR.

Please note that under CEQA, potential effects from implementing a project, such as reductions in property values, loss of property tax revenues, and increases in energy costs, that are solely social or economic in nature, do not constitute an effect (i.e., an impact) to the physical environment (see also Volume I Section 5.4 *Other Required CEQA Discussion and Consideration of Social and Economic Factors – Social and Economic Factors Under CEQA* [pages 5-3 to 5-12]).

Comment RE-10-30
We would restate that the SWRCB is only recirculating a selective portion of the DEIR that is biased and flawed as it relates to irreversible impacts and consequences that will potentially result in regional and environmental harm. Dam removal will contribute to increases in air pollution, green-house gases, energy consumption, and, therefore, contribute negatively to Climate Change.

Response to Comment RE-10-30
The comment relates to the commenter's opinion of the adequacy of the analysis in the recirculated portions of the Draft EIR. Comment noted.

Comment RE-10-31
For all the above reasons, the inadequate Draft EIR, all sections of the DEIR should be recirculated, this project should NOT receive a water quality certification.

Response to Comment RE-10-31
The comment is a concluding paragraph that expresses the commenter's opinion of the adequacy of the analysis in the EIR, requests recirculation of all sections of the Draft EIR, and states that the Proposed Project should not receive a water quality certification. Comment noted. The Draft EIR provides a clear, sufficiently detailed project description to adequately analyze and disclose the environmental impacts of the Proposed Project.

Gierak, Richard

Comments RE-15-1 and RE-17-1
The J. C. Boyle Dam:

- *…*
- *Provides clean, renewable, low-cost hydroelectric power for 70,000 households*

Response to Comments RE-15-1 and RE-17-1
Thank you for your comment. Please refer to Recirculated Draft EIR Section 3.10.5 *Greenhouse Gas Emissions and Energy – Potential Impacts and Mitigation* Potential Impact 3.10-4 and Potential Impact 3.10-6 (pages RE-3-95 to RE-3-99 and RE-3-100 to RE-3-104) for a discussion of the PacifiCorp Power Control Area and the company's proposed transition to renewable energy sources to replace the Lower Klamath Project hydroelectric generation and comply with California's Renewable Portfolio Standards, and for a discussion of potential impacts to local and regional energy sources.

Krizo, Jacqui

Comment RE-3-1
70,000 households receive the green clean power from our hydroelectric dams.

Response to Comment RE-3-1
Thank you for your comment. Please refer to Recirculated Draft EIR Section 3.10 *Greenhouse Gas Emissions and Energy* (pages RE-3-95 to RE-3-99 and RE-3-100 to RE-3-104) for a discussion of the PacifiCorp Power Control Area and the company's proposed transition to renewable energy sources to replace the Lower Klamath Project hydroelectric generation and comply with California's Renewable Portfolio Standards.

Comment RE-3-2
Wildfires severely affect our air quality and oxygen in the river. Without firefighting capabilities, forests, wildlife and housing get totally burned up.

Response to Comment RE-3-2
Please refer to Recirculated Draft EIR Section 3.24.9 *Air Quality Cumulative Effects* (page RE-3-112) for a discussion of cumulative impacts of the Proposed Project in combination with wildfires.

Comment RE-3-3
We want to keep the water storage, ecosystems for wildlife in and near the reservoirs, flood control, recreation, clean green energy, forests, water in reservoirs for firefighting, agriculture, water quality from the dam reservoirs, and air quality that these dams provide. We have had some record runs of salmon since the dams were built.

Response to Comment RE-3-3
The comment expresses support for keeping the dams and lists numerous benefits including clean energy and air quality. Please refer to the response to comments RE-3-1 and RE-3-2 for a discussion on clean energy and air quality, respectively.

Comment RE-3-4
In your EIR we find no accountability or mitigation certainty for all the resulting destruction listed above. Will the California State Water Resources Control Board be the agency to compensate and mitigate the resulting destruction to our communities, resources and lives.

Response to Comment RE-3-4
Comment noted. Please refer to Master Response R-1.

Marquis, Tor

Comment RE-5-1
a general comment on removing a large alternative energy source. The Klamath Dam provides clean hydroelectric power , replace CO2 producing power. The US in general, has to follow the lead of the Scandinavian nations that depend largely on hydroelectric power.

Response to Comment RE-5-1
Thank you for submitting comments on the Recirculated Sections of the Draft EIR. The comment refers to alternatives to addressing the environmental problems occurring in the Klamath River basin besides removing the dams and associated hydroelectric power generation.

The comment does not pertain to the environmental analyses presented in the portions of the Recirculated Draft EIR for the Proposed Project. Please see Master Response R-1 for information on comments not requiring a CEQA response. In addition, please refer to recirculated Section 3.10.5 *Greenhouse Gas Emissions and Energy – Potential Impacts and Mitigation* (pages RE-3-95 to RE-3-99 and RE-3-100 to RE-3-104) for a discussion of the PacifiCorp Power Control Area and the company's proposed transition to renewable energy sources to replace the Lower Klamath Project hydroelectric generation and comply with California's Renewable Portfolio Standards.

Comment RE-6-1
there is a negative impact of dumping millions of gallons of polluted river water into the ocean which is already suffering from fish kills and reduced phytoplankton populations..... Phytoplankton, by the way, sequesters 30 to 50 percent of CO2 in the atmosphere.

Response to Comment RE-6-1
Thank you for submitting comments on the Recirculated Sections of the Draft EIR. This comment refers to phytoplankton and its role in CO_2 sequestration, and impacts from pollutants flowing to the ocean. Please refer to Recirculated Draft EIR Section 3.10.2 *Greenhouse Gas Emissions and Energy – Environmental Setting* (pages RE-3-52 to RE-3-53 and RE-3-63 to RE-3-64) for a discussion of the natural "fast carbon cycle." Please refer to Volume I Section 3.4.2.3 *Phytoplankton and Periphyton – Environmental Setting – Hydroelectric Reach*, Section 3.4.2.4, *Phytoplankton and Periphyton – Environmental Setting – Middle and Lower Klamath River*, and Section 3.4.5.1 *Phytoplankton and Periphyton – Potential Impacts and Mitigation – Phytoplankton* (pages 3-405 to 3-418 and 3-426 to 3-433) for information about phytoplankton in the Klamath River and an analysis of potential impacts related to phytoplankton. Please refer to Volume III Attachment 1 Section 3.2.5 *Water Quality – Potential Impacts and Mitigation* for an analysis of potential downstream water quality impacts.

Reynolds, Chrissie

Comment RE-4-1
And so it begins…. And before I begin I just want to document my journey. I am sitting here on a snowy morning getting ready to pour over 222+ pages in Appendix N and the other recirculated portions of the draft environmental impact report. People wonder what I am doing now since I quit my job so that I could continue to be engaged in this process. Well, I am going over documents that right out of the gate talk about changes to equipment estimates and I have to talk myself into calming down.

Response to Comment RE-4-1
Comment noted.

Comment RE-4-2

These things get put out right during the holiday season and then a brief period to make a public comment on while things just keep moving along as if they are meeting some sort of timeline. Look, the timeline that was set has passed.

Response to Comment RE-4-2

The comment relates to the timeline for recirculation of the Draft EIR and the Proposed Project. Comment noted.

Comment RE-4-3

I also find it ironic that this is supposed to be about air quality and greenhouse gas emissions when we are literally breathing in nano particles of barium, strontium, aluminum, coal fly ash, lithium, and other chemicals used for weather modification and ice nucleation not to mention the carbon fiber from the bunker fuel operations happening in the Pacific from the Pandarra fog, and yet, these operations are all but denied yet the proof is in the water and soil as lab tests from all over Siskiyou County have proven.

Response to Comment RE-4-3

The comment relates to weather modification. Comment noted.

Comment RE-4-4

As I continue to look over the voluminous pages of science-speak and look over tables I feel I need to mention some pretty basic stuff here. The wind blows twice a day here. In the morning it blows towards the dam. In the afternoon, it blows hard upriver. It is pretty much guaranteed. The amount of dust that we will all be breathing post dam removal will be unacceptable. One of the things we love about living here is that we like to keep our windows and doors open any time day or night. We like the fresh air. During past drawdown situations, the mud dries quickly and starts cracking and soon the wind picks up furthering the drying process and also creates whirlwinds of dust and debris. The winds are usually very heavy here. I have had journalists over the past summer come and interview me and I like to ask them to come around 4 in the afternoon so they can see for themselves the wind conditions. If you were here I'd show you too so you could experience daily life in this location. You could feel it for yourself.

Response to Comment RE-4-4

Please refer to Master Response R-2 for a discussion of the potential for windblown dust to be generated after drawdown of the reservoirs.

Please note, the Recirculated Draft EIR Section 3.9.2.1 *Air Quality – Environmental Setting – Meteorology* (page RE-3-3) identifies the prevailing wind pattern in Siskiyou County and provides annual average wind speeds in Siskiyou County. Annual average wind speeds may not represent wind speeds on a specific day or location within Siskiyou County as it is an average of wind speeds observed over a year time period. The information related to wind speed

presented in the Recirculated Draft EIR was the best available information at the time of preparation.

Comment RE-4-5
So, I have been reading the recirculated information and it is just more of the same tone and tenure. It is so obvious that they just keep moving the field goal posts to fit whatever box they need to check instead of really doing the work of a fair and unbiased report. I get seriously disgusted at being considered "insignificant" and "inconsequential" in their findings. Really?

Response to Comment RE-4-5
The comment expresses the commenter's opinion of the adequacy of the analysis in the Recirculated Draft EIR. Comment noted.

Comment RE-4-6
Our docks and boats left to rot because they will be unusable. Our homes and lungs filled with filth and dust.

Response to Comment RE-4-6
Please refer to the Health Impacts portion under Recirculated Draft EIR Section 3.9.5 *Air Quality – Potential Impacts and Mitigation* Potential Impact 3.9-1, which discusses potential human health impacts from exposure to criteria air pollutant emissions and Potential Impact 3.9-4 for a discussion of the Proposed Project's potential to create a significant hazard to sensitive receptors near construction sites through exposure to substantial Toxic Air Contaminant (TAC) concentrations during construction activities. Additionally, please refer to Master Response R-2 for a discussion of the potential for windblown dust and associated windblown dust related contaminates to be generated after drawdown of the reservoirs.

Comment RE-4-7
They need to redo the whole eir and not just regurgitate, recirculate certain portions. It is based on purely marketed junk science and is biased and incomplete and completely disappointing in its representation of facts.

Response to Comment RE-4-7
The comment is a concluding paragraph that requests recirculation of the entire Draft EIR and expresses the commenter's opinion of the adequacy of the analysis in the Recirculated Draft EIR. Comment noted.

Ward, Brian

Comment RE-13-1
My opinion for the Klamath River water project is to leave all the dams in place and operational just as they are. They are a good source for generating electricity using natural resources. For those people in opposition to dams causing fish restriction to total river access, I would also suggest making a fish

passage device at each location needed. My idea for allowing fish to proceed upstream is to build an apparatus designed similar to a snow ski lift. It would consist of large buckets instead of seats which would dip into a funneled semi-holding pen for fish at the bottom of the dam. As these buckets moved through the water, they could gather fish congregated in the pen. As the buckets were lifted out of the water they would then be transported to the top end of the lift where they would be mechanically tilted over to dump out the water and fish. The water and fish would then be dumped into a chute or slide which took them to the river above the dam. The fish could then continue their journey up the river. A fish ladder could be used for those desiring to go down stream. The lift might be operated either by water pressure from the dam or electricity produced by it.

Response to Comment RE-13-1
Thank you for submitting comments on the Recirculated Sections of the Draft EIR. The comment expresses opposition to removal of the dams and provides suggestions for facilitating fish passage. The comment does not pertain to the environmental analyses presented in the portions of the Recirculated Draft EIR for the Proposed Project. Please see Master Response R-1 regarding comments not relating to recirculated portions of the Draft EIR.

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3 VOLUME III REFERENCES

The below references are cited in this Volume III responses to public comments on the Draft EIR. For clarity, references and text citations that contain an "a", "b", or "c", etc. follow the designations used in the corresponding references and text citations in EIR Volume I and Volume II. Clarifications or modifications to text references cited in EIR Volume I and/or Volume II can be found in Attachment 1.

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REVISIONS TO THE DRAFT EIR

This attachment identifies revisions to the Draft EIR that clarify or amplify or make insignificant modifications in an adequate EIR, consistent with CEQA Guidelines, section 15088.5, subdivision (b).

None of the modifications to the Draft EIR contained in this Attachment 1 are due to either of the following, as defined by CEQA Guidelines, section 15088.5, subdivision (b):

(1) A feasible project alternative or mitigation measure considerably different from others previously analyzed that would clearly lessen the environmental impacts of the project, but the project's proponents decline to adopt it.

(2) The draft EIR was so fundamentally and basically inadequate and conclusory in nature that meaningful public review and comment were precluded.

For Draft EIR sections that have a relatively small number of revisions, the revisions are presented below, by section. For the revisions, strikethrough is used to indicate deletions and underline is used to indicate additions.

For Draft EIR sections that have a relatively large number of revisions, the entire revised section is presented to facilitate easier public use of the revised information. These include the following:

- **Table ES-1**
- **Section 3.1.6 Summary of Available Hydrology Information for the Proposed Project**
- **Section 3.2 Water Quality**
- **Section 3.3 Aquatic Resources**
- **Section 3.12 Historical Resources and Tribal Cultural Resources**
- **Section 3.19 Aesthetics**
- **Section 3.20 Recreation**
- **Appendix C Water Quality Supporting Technical Information**
- **Appendix S Recreation Supporting Technical Information**

Entire revised sections do not include strikethrough and underline.

For recirculated Draft EIR Sections 3.9 *Air Quality* and Section 3.10 *Greenhouse Gas Emissions and Energy* please refer to Volume III, Attachment 2.

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EXECUTIVE SUMMARY

Volume I Executive Summary – Proposed Project Location, Figure ES-2 Proposed Project Boundary − California Portion on page ES-3:

Since issuance of the Draft EIR, the KRRC has clarified that the Proposed Project "Limits of Work" include the following:

- 34 small areas ranging from 0.02 acres to 6.5 acres in size, with most parcels less than 0.03 acres, all of which are located within the altered 100-year floodplain of the Middle Klamath River between Iron Gate Dam (river mile [RM] 193) and Humbug Creek (RM 174) and have existing legally-established habitable structures that may require relocation or elevation prior to dam removal;
- 1,300 linear feet of the south shore of Copco No. 1 Reservoir inclusive of the adjacent twelve parcels that possess existing habitable structures, which potentially could be impacted by slope failure during or immediately following reservoir drawdown;
- 480 linear feet of Copco Road (unpaved) located on the north shore of Copco No. 1 Reservoir which has the potential to experience slope failure during or immediately following reservoir drawdown.

The EIR Project Boundary, which is inclusive of the Proposed Project Limits of Work, as well as PacifiCorp owned and managed lands immediately surrounding the Lower Klamath Project ("Parcel B lands") that would be transferred as part of the Proposed Project, has been updated accordingly. The proposed updates to the Limits of Work are relatively minor and are all included below in an updated Figure ES-2 *Proposed Project Boundary − California Portion*. The updated Proposed Project Boundary shown in Figure ES-2 applies to all figures in EIR Volume I that include the Project Boundary.

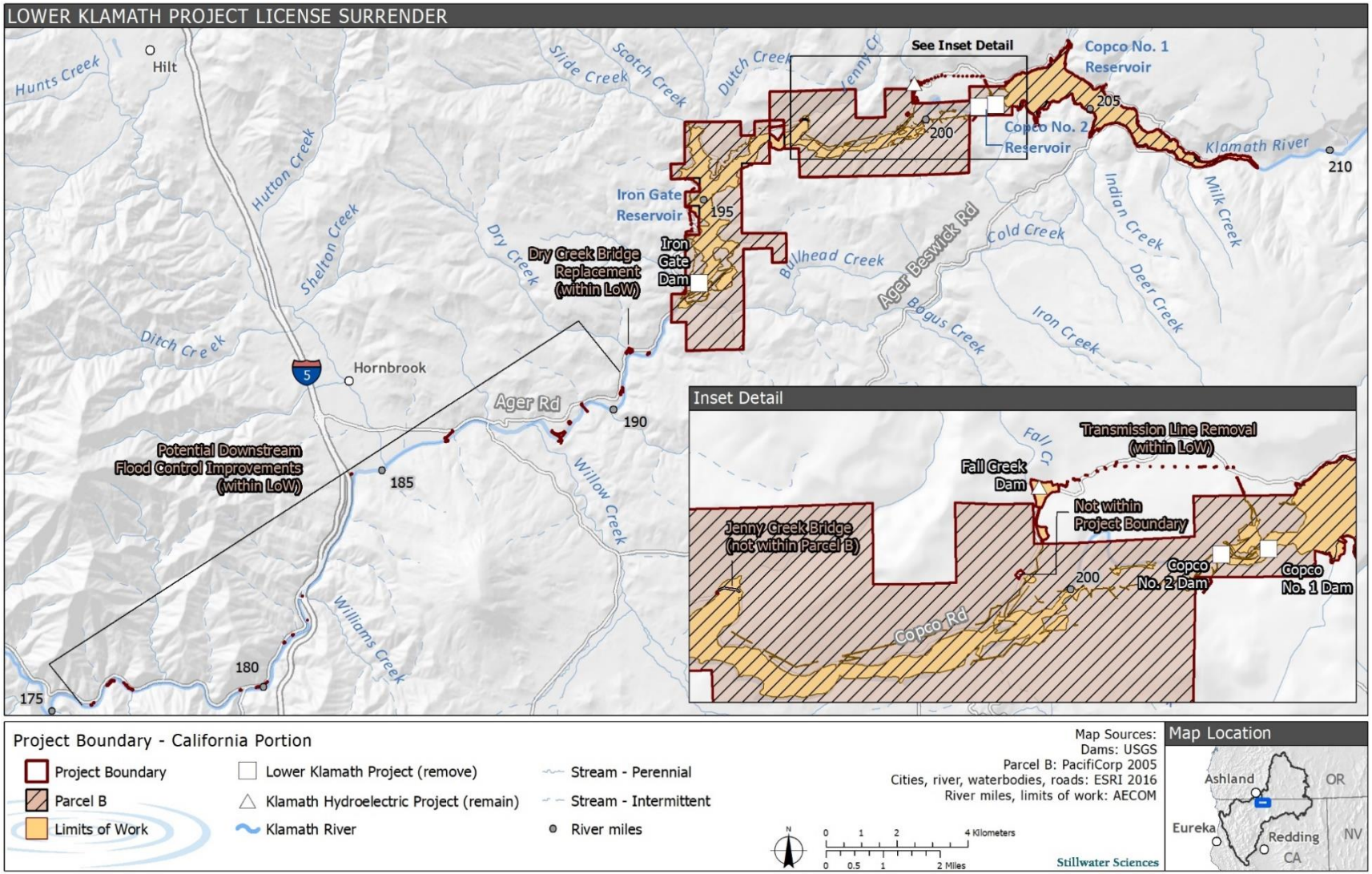

Figure ES-2. Proposed Project Boundary − California Portion.

Volume I Executive Summary – Proposed Project – Reservoir Drawdown, paragraph 1 on page ES-5:

Copco No. 1 Reservoir would be drawn down first (~~November–March of dam removal year 1~~ November of dam removal year 1 to March of dam removal year 2)[1], followed by J.C. Boyle (Oregon) and Iron Gate reservoirs (January–March of dam removal year 2). Copco No. 2 Reservoir is substantially smaller than the other three ~~dams~~ reservoirs and the KRRC proposes to drawdown this reservoir ~~after~~ before Copco No. 1 Dam has been breached to final grade in May of dam removal year 2.

Volume I Executive Summary – Proposed Project – Reservoir Drawdown, paragraph 2 on page ES-5:

During Iron Gate Dam removal, the embankment dam crest would be retained at a level to accommodate the passage of a ~~100-year flood event~~ 1 in 150 probable seasonal flow.

Volume I Executive Summary – Proposed Project – Reservoir Sediment Deposits and Erosion During Drawdown, paragraph 4 on page ES-5:

Reservoir Sediment Deposits and Erosion During Drawdown

There would be an estimated 15.1 million cubic yards (14.6 million tons) of sediment stored in the J.C. Boyle, Copco No. 1, and Iron Gate reservoirs by 2020 (USBR 2012). Between 2020 and 2022~~1~~ (i.e., revised dam removal year 2, when drawdown is anticipated to primarily occur) the sediment volume present behind the dams would increase by approximately 162,000~~81,300~~ cubic yards in Copco No. 1 Reservoir (1.97% increase) and approximately ~~1~~200,000 cubic yards in Iron Gate Reservoir (3.51% increase) based on estimates of annual sedimentation rates for each reservoir (USBR 2012). The increase in sediment volume between 2020 and 2022~~1~~ would be an order of magnitude less than the total uncertainty of the 2020 total sediment volume estimates and the annual sediment deposition rates (i.e., approximately 2,000,000 cubic yards for Copco No. 1 and Iron Gate Reservoirs).~~, so~~ Therefore, the 2020 sediment volumes provide a reasonable estimate ~~for 2021 and thus~~ for the Proposed Project. Copco No. 2 Reservoir does not retain appreciable amounts of sediment, because of its smaller size and location, and would not appreciably contribute to sediment transport during the drawdown of the reservoirs.

Volume I Executive Summary – Summary of Proposed Project Effects, Potential Impacts, and Potential Cumulative Impacts – Significant and Unavoidable Impacts, last paragraph on page ES-11:

Below is a summary, by resource area, of impacts found to be 'significant and unavoidable' with or without mitigation (Table ES-1). Please note ~~the KRRC proposes to further develop~~ that many of these impact determinations are based

on the limited scope of the exception to federal preemption for Clean Water Act section 401 water quality certification. Where measures are within the State Water Board's water quality certification authority, where the State Water Board can reasonably anticipate that other federal agencies will require and enforce mitigation measures, or where the KRRC has agreed to implement the measures, the measures are considered feasible mitigation measures. It is only such mitigation measures that the State Water Board takes into consideration in determining significance of a potential impact. Where there is no reasonable basis to conclude that a recommended measure will be adopted or will be enforceable, the document does not consider the measure to be feasible under CEQA Guidelines, section 15126.4, subdivision (a)(2). The resulting impact determinations are conservative from a public disclosure standpoint.

As summarized in the KRRC's most recent water quality certification application, the KRRC has committed to additional measures to protect resources outside the State Water Board's authority since issuance of the initial Draft EIR, and continue with the further development of Proposed Project actions relating to certain state and local regulatory requirements for several resource areas that fall outside of State Water Board's water quality certification authority.

The State Water Board anticipates implementation of additional measures (e.g., good neighbor agreements between the KRRC and relevant state or local agencies, recommended measures in this EIR, and any modifications developed through the FERC process that provide the same or better level of protection for the resource in question) would reduce impacts. The EIR notes where such protection would eliminate the potential for a significant impact. However, the State Water Board cannot ensure implementation of good neighbor agreements, recommended measures included in this EIR, or modifications anticipated to be developed through the FERC process. Therefore, the State Water Board has identified impacts that rely on implementation of such agreements or recommended measures in this EIR as significant and unavoidable.

Volume I Executive Summary – Summary of Proposed Project Effects, Potential Impacts, and Potential Cumulative Impacts – Significant Unavoidable Adverse Impacts, paragraph 4 on page ES-12:

Terrestrial Resources

- Short-term impacts on special-status plants from construction-related activities within the Limits of Work;
- Short-term and long-term impacts on special-status wetland plants surrounding the reservoirs due to removal of Copco No. 1, Copco No. 2, and Iron Gate reservoirs;
- Short-term impacts on special-status mammals (bats~~, gray wolf,~~ and American badger) from construction-related activities within the Limits of Work;

- Short-term impacts on nesting birds from construction-related noise and habitat removal within and surrounding the Limits of Work;
- Short-term impacts on willow flycatcher from construction-related noise disturbance and habitat removal at Copco No. 1 and Iron Gate reservoirs;
- ~~Short-term impacts on bald and golden eagles from construction-related noise and nesting habitat alterations at Copco No. 1, Copco No. 2, and Iron Gate reservoirs;~~
- Short- and long-term impacts on special-status bats, maternity roosts, and hibernacula from construction noise and loss of roosting habitat at existing Lower Klamath Project facilities; and
- Short-term impacts on sensitive habitats and special-status terrestrial wildlife and plant species from construction activities on Parcel B lands.

Volume I Executive Summary – Summary of Proposed Project Effects, Potential Impacts, and Potential Cumulative Impacts – Significant Unavoidable Adverse Impacts – Public Services, paragraph 1, first bullet on page ES-14:

- Short term increases ~~Increases~~ in public service response times for emergency fire, police, and medical services due to construction and demolition activities, including construction-related traffic; and

Volume I Executive Summary – Summary of Proposed Project Effects, Potential Impacts, and Potential Cumulative Impacts – Effects Found to be Beneficial, water quality bullet items on page ES-15:

Water Quality

- Short-term increases in suspended sediments under the Proposed Project in combination with the 2017 court-ordered flushing and emergency dilution flows or the 2019 BiOp Flows; and
- Short-term water quality effects of the Proposed Project in combination with wildfires.

Volume I Executive Summary – Alternatives to the Proposed Project – No Project Alternative, paragraph 4 on page ES-16:

Additionally, in the short term, the No Project Alternative would not result in any change from the existing management conditions, except regarding flow and certain interim water quality and habitat measures as noted in this paragraph. Neither ~~T~~the 2017 court-ordered flushing and emergency dilution flow releases nor the 2019 BiOp Flows downstream of Iron Gate Dam (U.S. District Court 2017) would modify flow releases compared to the existing condition. Some KHSA Interim Measures (IMs) would cease.

Volume I Executive Summary – Alternatives to the Proposed Project – No Project Alternative, paragraph 5 on page ES-16:

In addition to the KHSA IMs, there are various restoration efforts in the Klamath Basin to improve water quality, which are discussed in *Cumulative Effects* (Section 3.24). The effects of these efforts, including efforts aimed at meeting Klamath River total maximum daily loads (TMDLs), are not analyzed for the short term under the No Project Alternative because the basin response to the restoration ~~measures~~ efforts to meet the TMDLs during the short term is too speculative.

Volume I Executive Summary – Alternatives to the Proposed Project – Continued Operations with Fish Passage Alternative, paragraph 3 on page ES-17:

Conditions would include flows required by the NMFS and USFWS 2013 Joint Biological Opinion for the Klamath Irrigation Project (2013 BiOp Flows), 2017 court-ordered flushing and emergency dilution flows, and the current operational flow requirements for the Klamath Irrigation Project (2019 BiOp Flows), and design and implementation of a Reservoir Management Plan.

Volume I Executive Summary – Alternatives to the Proposed Project – Three Dam Removal Alternative, paragraph 1 on page ES-18:

The alternative assumes that USBR's flow release requirements for Iron Gate Dam would continue to be required as federal Endangered Species Act requirements (i.e., 2013 BiOp Flows and 2017 court-ordered flushing and emergency dilution flows, or 2019 BiOp Flows).

Volume I Executive Summary – Alternatives to the Proposed Project – Two Dam Removal Alternative, paragraph 2 on page ES-19:

This alternative assumes that USBR's flow requirements would be the same as those required under the current federal Endangered Species Act requirements (i.e., 2013 BiOp Flows and 2017 court-ordered flushing and emergency dilution flows, or 2019 BiOp Flows) and considers conditions with and without the 2017 court-ordered flushing and emergency dilution flows for potential impacts related to fish disease.

Volume I Executive Summary – Alternatives to the Proposed Project – No Hatchery Alternative, paragraph 1 on page ES-20:

No Hatchery Alternative

The No Hatchery Alternative is the same as the Proposed Project, except that modification and operation of Fall Creek Hatchery would not occur, and the Iron Gate Hatchery operations would end upon dam removal instead of continuing with reduced production for eight years following removal of the dams, as under

the Proposed Project. Under this alternative, all production of salmonids would be discontinued after hatchery releases occur in the fall of dam removal year 1 and the reduced production goals for the Proposed Project would not occur. Construction activities would include all those identified under the Proposed Project, except that: Iron Gate Hatchery facilities would be completely removed; and, Fall Creek Hatchery would not be refurbished and would not reopen. Water diversions to operate the hatcheries would not be needed. This alternative would reduce construction-related impacts associated with the reopening of Fall Creek Hatchery, modifications to provide water, and installation of a new fish ladder at Iron Gate Hatchery.

In the short-term, the No Hatchery Alternative would reduce the amount of fall-run Chinook and coho salmon present for California Native American tribes that currently use salmon in their diet and consider salmon to be an important part of their culture. This potential short-term impact to the fishery would be greater under the No Hatchery Alternative than under the Proposed Project, because under the Proposed Project the hatcheries would continue to supplement natural adult returns (albeit at a reduced rate of production) until after seven generations or cohorts of fish have been hatched with the benefit from expanded habitat and improved water quality conditions. In addition to supplementing available fish directly, hatchery operation is anticipated to accelerate recolonization of new habitat. The short-term reduction in the fishery due to elimination of hatchery-produced fall-run Chinook and coho salmon under the No Hatchery Alternative would represent a material impairment of the Klamath Riverscape as a resource and a substantial restriction of tribal access to the fishery relative to existing conditions. While the~~The~~ No Hatchery Alternative would further the underlying restoration purpose and objectives, ~~although~~ the alternative would not meet Objective 2 (In a timely manner, to advance the long-term restoration of the natural fish population in the Klamath Basin, with particular emphasis on restoring the salmonid fisheries used for subsistence, commerce, tribal cultural purposes, and recreation) as quickly as under the Proposed Project.

Volume I Executive Summary – Issues to be Resolved, paragraph 2 on page ES-24:

All reaches of the Klamath River from the Oregon-California state line to the mouth of the Klamath River are listed as impaired for one or more water quality parameters, including, but not limited to, elevated water temperature, organic enrichment/low dissolved oxygen, nutrients, and microcystin (see also Table 3.2-3). Long-term declines in Klamath Basin fisheries have been observed for wild fall-run Chinook salmon, spring-run Chinook salmon, steelhead, coho salmon, and Pacific lamprey (see also Table 3.3-2). The declines in coho salmon in the Klamath Basin have contributed to the listing of this species as threatened under the Endangered Species Act. Based on the aforementioned information, and numerous other studies and analyses described in detail in Section 3.2 *Water Quality*, Section 3.3 *Aquatic Resources*, Section 3.4 *Phytoplankton and*

Periphyton, and Section 3.12 *Historical Resources and Tribal Cultural Resources*, ~~I~~it is clear that the Klamath River has significantly degraded water quality and aquatic resources. ~~, and that these~~ The ongoing impacts to water quality and aquatic species in the Klamath River stem from the cumulative effects of a multitude of changing basin conditions including construction and operation of the Lower Klamath Project hydroelectric facilities, other basin-specific hydrologic modifications, changing ocean conditions, and land use changes ~~multiple factors including operation of the hydroelectric facilities.~~, and these impacts have created hardships for commercial fisheries and tribal communities that depend on these fisheries as an important cultural resource.

Volume I Executive Summary – Alternatives to the Proposed Project – Issues to be Resolved, paragraph 4 on page ES-24:

The KRRC proposes to further develop Proposed Project actions related to certain state and local regulatory requirements that fall outside of the State Water Board's water quality certification authority. The State Water Board anticipates that implementation of additional measures, (~~e.g., measures that are ultimately~~ recommended through the good neighbor agreements between the KRRC and relevant state or local agencies, KRRC's ultimate commitment to implement certain recommended measures in this EIR, and any modifications developed through the FERC licensing process, (which includes recommendations or conditions from other federal and state agencies, that would provide the same or better level of protection for the resource in question) would ultimately reduce a number of the Proposed Project's impacts to less than significant levels.

The EIR notes where such protection would be anticipated to eliminate the potential for a significant impact (see Table ES-1 footnote no. 3). However, the State Water Board cannot ensure implementation of anticipated - but not final - good neighbor agreements, recommended measures included in this EIR, or modifications anticipated to be developed through the FERC process. Therefore, the State Water Board has conservatively identified impacts that rely on FERC's adoption of measures included in implementation of such agreements, other conditions that may be imposed by FERC, or recommended mitigation measures in this EIR as significant and unavoidable. The resulting impact determinations are conservative from a public disclosure standpoint.

Volume I Executive Summary, Table ES-1 Summary of Impacts and Mitigation Measures on pages ES-26 to ES-67:

Table ES-1. Summary of Impacts and Mitigation Measures.

PP = Proposed Project; NP = No Project Alternative; PR = Partial Removal Alternative; CO = Continued Operations with Fish Passage;

2R = Two Dam Removal Alternative; 3R = Three Dam Removal Alternative; NH = No Hatchery Alternative

*** Indicates a Significant and Unavoidable Impact that would be reduced to No Significant Impact with Mitigation if one or more Recommended Measures were to be implemented. Due to federal preemption, the State Water Board cannot guarantee the implementation of Recommended Measures. See also footnote no. 3 to this table.**

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Water Quality								
Potential Impact 3.2-1. Short-term and long-term alterations in water temperatures due to conversion of the reservoir areas to a free-flowing river.								
Hydroelectric Reach to the confluence with the Salmon River	S	L	PP, PR, 2R, 3R, NH					
Middle Klamath River downstream from the Salmon River, Lower Klamath River, Klamath River Estuary, Pacific Ocean nearshore environment	S	L		PP, PR, 2R, 3R, NH				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.2-2. Short-term and long-term alterations in seasonal water temperatures in the Klamath River Estuary due to morphological changes induced by dam removal sediment release and subsequent deposition in the estuary.								
	S	L		PP, NP (S only), PR, CO, 2R, 3R, NH				
Potential Impact 3.2-3. Increases in suspended sediments due to release of sediments currently trapped behind the dams.								
	S			NP, CO			PP, PR, 2R, 3R, NH	
		L		PP, PR, CO, 2R, 3R, NH				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.2-4. Increases in suspended material from stormwater runoff due to pre-construction, dam deconstruction and removal, and restoration activities in the Hydroelectric Reach and the Middle Klamath River immediately downstream of Iron Gate Dam.								
	S				WQ-1, TER-1, HZ-1	PP, PR, 2R, 3R, NH		
Potential Impact 3.2-5. Long-term alterations in mineral (inorganic) suspended material from the lack of continued interception and retention by the dams.								
		L		PP, PR, 2R, 3R, NH				
Potential Impact 3.2-6. Long-term alterations in algal-derived (organic) suspended material from the lack of continued interception and retention by the dams.								
		L		PP, PR, 2R, 3R, NH				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.2-7. Short-term increases in sediment-associated nutrients due to release of sediments currently trapped behind the dams.								
	S			PP, NP, PR, CO, 2R, 3R, NH				
Potential Impact 3.2-8. Long-term alterations in nutrients from the lack of interception and retention by the dams and conversion of the reservoir areas to a free-flowing river.								
Annual interception and retention of total nutrients		L		PP, PR, 2R, 3R, NH				
Potential seasonal release of dissolved nutrients		L	PP, PR, 2R, 3R, NH					

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.2-9. Short-term increases in oxygen demand and reductions in dissolved oxygen due to release of sediments currently trapped behind the dams.								
Hydroelectric Reach and Middle Klamath River from Iron Gate Dam to the Salmon River	S			NP, CO			PP, PR, 2R, 3R, NH	
Middle Klamath River downstream from the Salmon River, Lower Klamath River, Klamath River Estuary	S			PP, NP, PR, CO, 2R, 3R, NH				
Potential Impact 3.2-10. Long-term alterations in dissolved oxygen concentrations and daily variability due to conversion of the reservoir areas to a free-flowing river.								
Hydroelectric Reach and the Middle Klamath River immediately downstream of Iron Gate Dam (daily fluctuations)		L		PP, PR, 2R, 3R, NH				
Hydroelectric Reach and the Middle Klamath River immediately downstream of Iron Gate Dam (elimination of summer and fall extremes)		L	PP, PR, 2R, 3R, NH					

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Hydroelectric Reach and Middle Klamath River (winter and spring)		L		PP, PR, 2R, 3R, NH				
Lower Klamath River, Klamath River Estuary, and Pacific Ocean nearshore environment		L		PP, PR, 2R, 3R, NH				
Potential Impact 3.2-11. Alterations in pH and daily pH fluctuations due to a conversion of the reservoir areas to a free-flowing river.								
Hydroelectric Reach at Oregon-California state line	S	L		PP, PR, 2R, 3R, NH				
Hydroelectric Reach from Copco No. 1 Reservoir to Iron Gate Dam	S	L	PP, PR, 2R, 3R, NH					
Middle Klamath River, Klamath River Estuary, Pacific Ocean nearshore environment	S	L		PP, PR, 2R, 3R, NH				
Potential Impact 3.2-12. Alterations in chlorophyll-a and algal toxins due to a conversion of the reservoir areas to a free-flowing river.								
	S	L	PP, PR, 2R, 3R, NH					

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.2-13. Human exposure to inorganic and organic contaminants due to release and exposure of reservoir sediment deposits.								
	S	L			WQ-2, WQ-3	PP, PR, 2R, 3R, NH		
Potential Impact 3.2-14. Freshwater aquatic species exposure to inorganic and organic contaminants due to release of sediments currently trapped behind the dams.								
	S	L		PP, PR, 2R, 3R, NH				
Potential Impact 3.2-15. Short-term increases in inorganic and organic contaminants from hazardous materials associated with construction and restoration activities in the Hydroelectric Reach and the Middle Klamath River immediately downstream of Iron Gate Dam.								
	S				WQ-1, TER-1, HZ-1	PP, PR, 2R, 3R, NH		

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.2-16. Short-term impacts to aquatic biota from herbicide application during restoration of the reservoir areas.								
	S				WQ-4	PP, PR, 2R, 3R, NH		
Potential Impact 3.2-17. Short-term and long-term influence of changes in Iron Gate and Fall Creek hatchery production on Klamath River and Fall Creek water quality.								
Water quality in the Middle Klamath River downstream of Iron Gate Hatchery	S	L		PP, NP (S only), PR, CO, 2R, 3R, NH				
Water temperature and dissolved oxygen in Fall Creek downstream of Fall Creek Hatchery	S			NP, CO, NH			PP, PR, 2R, 3R	
Water quality (except water temperature and dissolved oxygen) in Fall Creek downstream of Fall Creek Hatchery		L		PP, NP (S only), PR, CO, 2R, 3R, NH				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.2-18. Short-term impacts on water quality from construction activities on Parcel B lands.								
	S	L			WQ-1, TER-1, HZ-1	PP, PR		
Potential Impact 4.2.2-1 Seasonal alterations in water temperature due to continued impoundment of water in the reservoirs.								
J.C. Boyle Peaking Reach from the Oregon-California state line to Copco No. 1 Reservoir	S	L	CO	NP (S only)				
Hydroelectric Reach from Copco No. 1 Reservoir to Iron Gate Dam and the Middle Klamath River to the confluence with the Salmon River	S	L		NP (S only), CO				
Middle Klamath River downstream of the confluence with the Salmon River, the Lower Klamath River, and the Klamath River Estuary, and the Pacific Ocean nearshore environment	S	L		NP (S only), CO				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 4.2.2-2. Seasonal increases in algal-derived (organic) suspended material due to continued impoundment of water in the reservoirs.								
Hydroelectric Reach from J.C. Boyle Reservoir to the upstream end of Copco No. 1 Reservoir	S	L		NP (S only), CO				
Hydroelectric Reach from Copco No. 1 Reservoir to Iron Gate Dam, the Middle and Lower Klamath River, and the Klamath River Estuary	S	L		NP (S only), CO				
Potential Impact 4.2.2-3 Increases in suspended material due to implementation of 2017 court-ordered flushing and emergency dilution flows or 2019 BiOp surface flushing flows downstream of Iron Gate Dam.								
	S	L		NP (S only), CO				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 4.4.2-1. Short-term increases in suspended material and contaminants from stormwater runoff due to construction activities associated with replacement and construction of new fish passage facilities.								
Hydroelectric Reach and the Middle Klamath River immediately downstream of Iron Gate Dam	S			CO	WQ-1, TER-1, HZ-1			
Potential Impact 4.2.2-4. Annual interception and retention of nutrients and seasonal release of nutrients due to continued impoundment of water in the reservoirs.								
Hydroelectric Reach and Middle Klamath River (annual interception and retention of nutrients)	S	L		NP (S only), CO				
Hydroelectric Reach and the Middle Klamath River (seasonal release of nutrients)	S	L		NP (S only), CO				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 4.2.2-5. Seasonal low dissolved oxygen concentrations due to continued impoundment of water in the reservoirs.								
Hydroelectric Reach and the Middle Klamath River	S	L		NP (S only), CO				
Middle Klamath River downstream of Seiad Valley, the Lower Klamath River, and the Klamath River Estuary	S	L		NP (S only), CO				
Potential Impact 4.2.2-6. Seasonal high pH and daily pH fluctuations due to continued impoundment of water in the reservoirs.								
Hydroelectric Reach and the Middle Klamath River	S	L		NP (S only), CO				
Middle Klamath River downstream of Seiad Valley the Lower Klamath River, and the Klamath River Estuary	S	L		NP (S only), CO				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 4.2.2-7. Seasonal increases in chlorophyll-a and algal toxins due to continued impoundment of water in the reservoirs.								
Hydroelectric Reach from J.C. Boyle Reservoir to upstream end of Copco No. 1 Reservoir	S	L		NP (S only), CO				
Hydroelectric Reach from Copco No. 1 Reservoir to Iron Gate Dam, the Middle and Lower Klamath River, and the Klamath River Estuary	S	L		NP (S only), CO				
Potential Impact 4.2.2-8. Human and freshwater aquatic species' exposure to inorganic and organic contaminants due to continued impoundment of water in the reservoirs.								
	S	L		NP (S only), CO				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Aquatic Resources								
Potential Impact 3.3-1. Effects on coho salmon critical habitat quality and quantity due to short-term sediment releases and long-term changes in habitat quality and quantity due to dam removal.								
	S				AQR-1 and AQR-2	PP, PR, 2R, 3R, NH		
		L	PP, PR, 2R, 3R, NH					
Potential Impact 3.3-2. Effects on Southern Resident Killer Whale critical habitat quality due to short-term and long-term alterations to salmon populations due to dam removal.								
	S	L		PP, PR, 2R, 3R, NH				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.3-3. Effects on eulachon critical habitat quality due to short-term sediment releases due to dam removal.								
	S	L		PP, PR, 2R, 3R, NH				
Potential Impact 3.3-4. Effects on Chinook and coho salmon Essential Fish Habitat (EFH) quality and quantity due to short-term sediment releases and long-term changes in habitat quality and quantity due to dam removal.								
	S				AQR-1 and AQR-2	PP, PR, 2R, 3R, NH		
		L	PP, PR, 2R, 3R, NH					

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.3-5. Effects on groundfish Essential Fish Habitat (EFH) quality due to short-term sediment releases and long-term changes in habitat quality due to dam removal.								
	S	L		PP, PR, 2R, 3R, NH				
Potential Impact 3.3-6. Effects on pelagic fish Essential Fish Habitat (EFH) quality due to short-term sediment releases and long-term changes in habitat quality due to dam removal.								
	S	L		PP, PR, 2R, 3R, NH				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.3-7. Effects on the fall-run Chinook salmon population due to short-term sediment releases and long-term changes in habitat quality, habitat quantity, and hatchery operations due to dam removal.								
	S			PP, PR, 2R, 3R, NH				
		L	PP, PR, 2R, 3R, NH					
Potential Impact 3.3-8 Effects on the spring-run Chinook salmon population due to short-term sediment releases and long-term changes in habitat quality, habitat quantity, and hatchery operations due to dam removal.								
	S			PP, PR, 2R, 3R, NH				
		L	PP, PR, 2R, 3R, NH					

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.3-9. Effects on coho salmon populations due to short-term sediment releases and long-term changes in habitat quality, habitat quantity, and hatchery operations due to dam removal.								
	S			PP, PR, 2R, 3R, NH				
		L	PP, PR, 2R, 3R, NH					
Potential Impact 3.3-10. Effects on the steelhead population due to short-term sediment releases and long-term changes in habitat quality, habitat quantity, and hatchery operations due to dam removal.								
	S			PP, PR, 2R, 3R, NH				
		L	PP, PR, 2R, 3R, NH					

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.3-11. Effects on the Pacific lamprey population due to short-term sediment releases and long-term changes in habitat quality and quantity due to dam removal.								
	S			PP, PR, 2R, 3R, NH				
		L	PP, PR, 2R, 3R, NH					
Potential Impact 3.3-12. Effects on the green sturgeon population due to short-term sediment releases and long-term changes in habitat quality due to dam removal.								
	S	L		PP, PR, 2R, 3R, NH				
Potential Impact 3.3-13. Effects on Lost River and shortnose sucker populations due to short- and long-term changes in habitat quality and quantity due to dam removal.								
	S	L		PP, PR, 2R, 3R, NH				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.3-14. Effects on the redband trout population due to short-term sediment releases and long-term changes in habitat quality and quantity due to dam removal.								
	S			PP, PR, 2R, 3R, NH				
		L	PP, PR, 2R, 3R, NH					
Potential Impact 3.3-15. Effects on the eulachon population due to short-term sediment releases and long-term changes in habitat quality due to dam removal.								
	S	L		PP, PR, 2R, 3R, NH				
Potential Impact 3.3-16. Effects on the longfin smelt population due to short-term sediment releases and long-term changes in habitat quality due to dam removal.								
	S	L		PP, PR, 2R, 3R, NH				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.3-17. Effects on species interactions between introduced resident fish species and native aquatic species due to short- and long-term changes in habitat quality and quantity due to dam removal.								
	S	L	PP, PR, 2R, 3R, NH					
Potential Impact 3.3-18. Effects on aquatic species from interactions among fish species due to short- and long-term changes in habitat quantity due to dam removal.								
	S	L		PP, PR, 2R, 3R, NH				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.3-19. Effects on freshwater mollusks populations due to short-term sediment releases and long-term changes in habitat quality due to dam removal.								
M. falcata, G. angulata, and freshwater clams	S	L		PP, PR, 2R, 3R, NH				
Anodonta spp.	S	L		2R, 3R			PP, PR, NH	
Potential Impact 3.3-20. Effects on fish species from alterations to benthic macroinvertebrates due to short-term sediment releases and long-term changes in habitat quality due to dam removal.								
	S			PP, PR, 2R, 3R, NH				
		L	PP, PR, 2R, 3R, NH					

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.3-21. Effects on aquatic resources due to short-term noise disturbance and water quality alterations from construction and deconstruction activities.								
	S	L		PP, PR, 2R, 3R, NH				
Potential Impact 3.3-22. Effects on aquatic species due to short-term noise disturbance and water quality alterations from deconstruction activities and long-term fish screen upgrades from the relocation of the City of Yreka Water Supply Pipeline.								
	S	L		PP, PR, 2R, 3R, NH				
Potential Impact 3.3-23. Effects on anadromous salmonid populations due to short-term and long-term Bogus Creek flow diversions for the Iron Gate Hatchery.								
	S			NP, CO, NH	AQR-3	PP, PR, 2R, 3R		
		L			AQR-3	PP, PR, 2R, 3R		

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.3-24. Effects on anadromous salmonid populations due to short-term and long-term Fall Creek flow diversions for the Fall Creek Hatchery.								
	S	L		PP, NP (S only), PR, CO, 2R, 3R. NH				
Potential Impact 4.2.3-1 Effects on coho salmon critical habitat quality and quantity due to continued operations of the Lower Klamath Project.								
	S	L		NP (S only), CO				
Potential Impact 4.2.3-2 Effects on Southern Resident Killer Whale critical habitat quality due to alterations to salmon populations due to continued operations of the Lower Klamath Project.								
	S	L		NP (S only), CO				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 4.2.3-3. Effects on eulachon critical habitat quality due to continued operations of the Lower Klamath Project.								
	S	L		NP (S only), CO				
Potential Impact 4.2.3-4. Effects on Chinook and coho salmon Essential Fish Habitat (EFH) quality due to continued operations of the Lower Klamath Project.								
	S	L		NP (S only), CO				
Potential Impact 4.2.3-5. Effects on groundfish Essential Fish Habitat (EFH) quality due to continued operations of the Lower Klamath Project.								
	S	L		NP (S only), CO				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 4.2.3-6. Effects on pelagic fish Essential Fish Habitat (EFH) quality due to continued operations of the Lower Klamath Project.								
	S	L		NP (S only), CO				
Potential Impact 4.2.3-7. Effects on the fall-run Chinook salmon population due to continued operations of the Lower Klamath Project.								
	S			NP, CO				
		L	CO					
Potential Impact 4.2.3-8. Effects on the spring-run Chinook salmon population due to continued operations of the Lower Klamath Project.								
	S			NP, CO				
		L	CO					

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 4.2.3-9. Effects on coho salmon populations due to continued operations of the Lower Klamath Project.								
	S			NP, CO				
		L	CO					
Potential Impact 4.2.3-10. Effects on the steelhead population due to continued operations of the Lower Klamath Project.								
	S			NP, CO				
		L	CO					
Potential Impact 4.2.3-11. Effects on the Pacific lamprey population due to continued operations of the Lower Klamath Project.								
	S			NP, CO				
		L	CO					

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 4.2.3-12. Effects on the green sturgeon population due to continued operations of the Lower Klamath Project.								
	S	L		NP (S only), CO				
Potential Impact 4.2.3-13. Effects on Lost River and shortnose sucker populations due to continued operations of the Lower Klamath Project.								
	S	L		NP (S only), CO				
Potential Impact 4.2.3-14. Effects on the redband trout population due to continued operations of the Lower Klamath Project.								
	S			NP, CO				
		L	CO					
Potential Impact 4.2.3-15. Effects on the eulachon population due to continued operations of the Lower Klamath Project.								
	S	L		NP (S only), CO				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 4.2.3-16. Effects on the longfin smelt population due to continued operations of the Lower Klamath Project.								
	S	L		NP (S only), CO				
Potential Impact 4.2.3-17. Effects on species interactions between introduced resident fish species and native aquatic species due to continued operations of the Lower Klamath Project.								
	S	L		NP (S only), CO				
Potential Impact 4.2.3-18. Effects on aquatic species from interactions among fish species due to continued operations of the Lower Klamath Project.								
	S	L		NP (S only), CO				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 4.2.3-19. Effects on freshwater mollusks populations due to continued operations of the Lower Klamath Project.								
	S	L		NP (S only), CO				
Potential Impact 4.2.3-20. Effects on fish species from alterations to benthic macroinvertebrates due to continued operations of the Lower Klamath Project.								
	S	L		NP (S only), CO				
Potential Impact 4.2.3-21. Alterations to aquatic habitat from implementation of California Klamath Restoration Fund/Coho Enhancement (IM2).								
Coho salmon, fall-run Chinook salmon, spring-run Chinook salmon, steelhead, Pacific lamprey, freshwater mussels, and benthic macroinvertebrates	S	L	NP (S only), CO					

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Redband trout, shortnose and Lost River suckers, green sturgeon, eulachon, and southern resident killer whales	S	L		NP (S only), CO				
Potential Impact 4.4.3-1 Effects on aquatic resources due to short-term noise disturbance and water quality alterations from fishway construction activities.								
	S				WQ-1, HZ-1	CO		
Phytoplankton and Periphyton								
Potential Impact 3.4-1 Short-term increase in growth of nuisance and/or noxious phytoplankton blooms due to increases in sediment-associated nutrients from release of sediments currently trapped behind the Lower Klamath Project dams.								
	S			PP, NP, PR, CO 2R, 3R, NH				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.4-2 Alterations in the spatial extent, temporal duration, transport, or concentration of nuisance and/or noxious phytoplankton blooms and concentrations of algal toxins due to dam removal and elimination of reservoir habitat.								
Hydroelectric Reach through the Klamath River Estuary	S	L	PP, PR, 2R, 3R, NH					
Pacific Ocean nearshore environment	S	L		PP, PR, 2R, 3R, NH				
Potential Impact 3.4-3. Short-term increase in growth of nuisance periphyton species due to increases in sediment-associated nutrients from release of sediments currently trapped behind the Lower Klamath Project dams.								
	S			PP, NP, PR, CO 2R, 3R, NH				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.4-4. Alterations in the growth of nuisance periphyton species in the Hydroelectric Reach due to increased nutrients and available low-gradient channel margin habitat formed by conversion of the reservoir areas to a free-flowing river and the elimination of hydropower peaking operations.								
Hydroelectric Reach from the Oregon-California state line to Copco No. 1 Reservoir	S	L		PP, PR, 2R, 3R, NH				
Hydroelectric Reach from Copco No. 1 Reservoir to Iron Gate Dam	S	L					PP, PR, 2R, 3R, NH	
Potential Impact 3.4-5. Alterations in biomass of nuisance periphyton species due to increased nutrients from upstream dam removal and conversion of the reservoir areas to a free-flowing river.								
Middle and Lower Klamath River and the Klamath River Estuary		L		PP, PR, 2R, 3R, NH				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 4.2.4-1 Variations in nuisance periphyton species abundance downstream of Iron Gate Dam due to implementation of 2017 court-ordered flushing and emergency dilution flows.								
Middle Klamath River from Iron Gate Dam to the Shasta River	S		NP					
Middle Klamath River downstream of the confluence with the Salmon River and the Lower Klamath River	S			NP				
Potential Impact 4.4.4-1 Long-term occurrence of nuisance and/or noxious phytoplankton blooms in the reservoirs.								
Hydroelectric Reach, Middle and Lower Klamath River, and the Klamath River Estuary		L		CO				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 4.4.4-2 Long-term colonization of nuisance periphyton in riverine reaches.								
Hydroelectric Reach		L		CO				
Middle Klamath River from Iron Gate Dam to the Shasta River		L	CO					
Middle Klamath River downstream of the confluence with the Salmon River and the Lower Klamath River		L		CO				
Terrestrial Resources								
Potential Impact 3.5-1 Construction-related impacts on wetland and riparian vegetation communities.								
	S			NP	TER-1	PP, PR, 2R, 3R, NH		
	S				TER-1 and TER-5	CO		

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.5-2 Short-term and long-term impacts on wetland and riparian vegetation communities along existing reservoir shorelines due to reservoir drawdown.								
	S	L		PP, NP (S only) PR, CO, 2R, 3R NH				
Potential Impact 3.5-3. Short-term and long-term impacts on wetland habitat downstream of the Lower Klamath Project dams due to erosion or sediment deposition.								
	S	L		PP, NP (S only) PR, CO, 2R, 3R NH				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.5-4. Effects on riparian habitat downstream of the Lower Klamath Project dams due to short-term and long-term erosion or sediment deposition.								
	S			PP, PR, 2R, 3R, NP, CO, NH				
		L	PP, PR, 2R, 3R, NH	CO				
Potential Impact 3.5-5. Short-term and long-term impacts on native vegetation due to increased invasive plant species establishment.								
	S	L		PP, NP (S only), CO		PR, 2R, 3R, NH		
Potential Impact 3.5-6. Short-term and long-term impacts on culturally significant species in riparian and wetland habitats.								
	S			NP	TER-1	PP, PR, 2R, 3R, NH, CO		
		L		PP, PR, 2R, 3R, NH, CO				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.5-7. Short-term impacts on special-status plants and rare natural communities from construction-related activities.*								
Rare natural communities	S			PP, NP, PR, CO, 2R, 3R, NH				
Special-status	S			NP			PP, PR, CO, 2R, 3R, NH	
Potential Impact 3.5-8. Short-term and long-term impacts on special-status plants from reservoir removal.*								
	S	L		NP (S only), CO			PP, PR, 2R, 3R, NH	
Potential Impact 3.5-9. Short-term impacts on special-status terrestrial invertebrates from construction-related activities.								
	S			PP, NP, PR, CO, 2R, 3R, NH				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.5-10. Short-term impacts on special-status amphibian, reptiles, and mammals from construction activities.*								
Amphibians, reptiles, and gray wolf	S			NP	TER-2, TER-3, and TER-6	PP, PR, CO, 2R, 3R, NH		
Bats and American badger	S			NP			PP, PR, CO, 2R, 3R, NH	
Potential Impact 3.5-11. Short-term impacts on nesting birds from construction-related noise and habitat alterations.*								
	S			NP			PP, PR, CO, 2R, 3R, NH	

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.5-12. Effects on willow flycatcher from short-term construction-related noise and short-term and long-term habitat alterations.*								
	S			NP			PP, PR, CO, 2R, 3R, NH	
Riparian habitat in the former location of Copco No. 1 and Iron Gate reservoirs		L	PP, PR, 2R, 3R, NH	CO				
Potential Impact 3.5-13. Short-term impacts on bald and golden eagles from construction-related noise and habitat alterations.								
	S			NP	TER-7	PP, PR, CO, 2R, 3R, NH		
Potential Impact 3.5-14. Short-term and long-term impacts on bats from construction noise and loss of roosting habitat.*								
	S	L		NP (S only)			PP, PR, CO, 2R, 3R, NH	

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.5-15. Short-term and long-term impacts on northern spotted owl and critical habitat from construction-related noise and habitat alterations.								
	S	L		PP, NP (S only) PR, CO, 2R, 3R, NH				
Potential Impact 3.5-16. Effects on special-status amphibians and reptiles in riverine habitats from short-term high suspended sediment concentrations and flows and long-term changes in water quality.								
Pacific tailed frog, southern torrent salamander, northern red-legged frog, and western pond turtle	S			PP, NP, PR, CO, 2R, 3R, NH				
Foothill yellow-legged frog egg masses, if present	S			CO, NP			PP, PR, 2R, 3R, NH	
All special-status amphibians and reptiles		L	PP, PR, 2R, 3R, NH	CO				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.5-17. Effects on benthic macroinvertebrates from short-term dewatering and sedimentation and long-term alterations to habitat.								
	S			PP, NP, PR, CO, 2R, 3R, NH				
		L	PP, PR, 2R, 3R, NH	CO				
Potential Impact 3.5-18. Short-term impacts on amphibian and reptile in riverine habitats from sedimentation.								
	S			PP, NP, PR, CO, 2R, 3R, NH				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.5-19. Impacts on native amphibians from loss of reservoir habitat.								
	S	L		PP, NP (S only), PR, CO, 2R, 3R, NH				
Potential Impact 3.5-20. Short-term and long-term impacts on western pond turtle and amphibians from reduced BMI populations.								
	S	L		PP, NP (S only), PR, CO, 2R, 3R, NH				
Potential Impact 3.5-21. Short-term and long-term impacts on birds and bats from loss of aquatic reservoir and shoreline vegetative habitat.								
	S	L		PP, NP (S only), PR, CO, 2R, 3R, NH				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.5-22. Short-term and long-term impacts on western pond turtle from loss of aquatic habitat.								
	S	L		NP (S only), CO	TER-4	PP, PR, 2R, 3R, NH		
Potential Impact 3.5-23. Long-term effects on deer from alterations to winter range habitat.								
		L	PP, PR, 2R, 3R, NH	CO				
Potential Impact 3.5-24. Effects on terrestrial species from herbicide use during reservoir restoration activities.								
Special-status plants and wildlife	S			PP, NP, PR, CO, 2R, 3R, NH				
Rare natural communities, wetlands, and riparian vegetation		L	PP, PR, 2R, 3R, NH	CO				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.5-25. Effects on wildlife from increased habitat for salmonids and changes in hatchery production.								
	S	L	PP, PR, 2R, 3R, NH	NP (S only), NH, CO				
Potential Impact 3.5-26. Impacts on special-status wildlife from Bogus Creek flow diversions.								
	S			NP, NH, CO	AQR-3	PP, PR, 2R, 3R		
Potential Impact 3.5-27. Impacts on special-status wildlife from Fall Creek flow diversions.								
	S			PP, NP, PR, CO, 2R, 3R, NH				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.5-28. Impacts on sensitive habitats and special-status terrestrial wildlife and plant species from construction activities on Parcel B lands.								
		L			WQ-1, TER-1, and TER-4			PP, PR, 2R, 3R, NH, CO
Potential Impact 3.5-29. Long-term effects on wildlife from alteration of wildlife movement corridors.								
Increased wildlife movement opportunities		L	PP, PR, 2R, 3R, NH	CO				
Wildlife-friendly fencing		L		PP, PR, 2R, 3R, NH				
Potential Impact 3.5-30. Long-term effect on terrestrial wildlife from an increase in the distribution of salmon-derived nutrients upstream of Iron Gate, Copco No. 1 and Copco No. 2 dams.								
		L	PP, PR, NH, CO	2R, 3R				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 4.2.5-1. Effects of 2017 court-ordered flushing and emergency dilution flows and 2019 BiOp flows released from Iron Gate Dam on foothill yellow-legged frog and western pond turtle breeding.								
Hydroelectric Reach (foothill yellow-legged frogs)	S						NP, CO	
Hydroelectric Reach (western pond turtles)	S			NP, CO				
Flood Hydrology								
Potential Impact 3.6-1 Reservoir drawdown and dam removal could result in short-term increases in downstream surface water flows and result in exposing people and/or structures to a substantial risk of damage, loss, injury, or death involving flooding.								
	S			PP, NP, PR, CO, 2R, 3R, NH				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.6-2 Under the Proposed Project recreational facilities currently located on the banks of the existing reservoirs would be removed following drawdown and could change flood hydrology.								
	S	L		PP, NP (S only), PR, CO, 2R, 3R, NH				
Potential Impact 3.6-3. The long-term FEMA100-year floodplain inundation extent downstream from Iron Gate Dam could change between river miles 193 and 174, potentially exposing people and/or structures to a substantial risk of damage, loss, injury, or death involving flooding.								
Exposing structures to a substantial risk of damage due to flooding		L					PP, PR, 2R, 3R, NH	
Exposing people and/or structures to a substantial risk of flooding related to flood forecasting		L		PP, PR, 2R, 3R, NH				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.6-4. The FEMA 100-year floodplain inundation extent downstream from J.C. Boyle Dam could change between the California-Oregon state line and Copco No. 1 Reservoir, potentially exposing people and/or structures to a substantial risk of damage, loss, injury, or death involving flooding.								
		L		PP, PR, 2R, 3R, NH				
Potential Impact 3.6-5. The release of sediment stored behind the Lower Klamath Project dams and resulting downstream sediment deposition under the Proposed Project could result in potentially exposing people and/or structures to a substantial risk of damage, loss, injury, or death involving flooding.								
	S	L		PP, NP (S only), PR, CO, 2R, 3R, NH				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.6-6. Dam failure could flood areas downstream of the Lower Klamath Project.								
	S			PP, NP, PR, 2R, 3R, NH, CO				
		L	PP, PR, 2R, 3R, NH	CO				
Potential Impact 4.2.6-1. The FEMA 100-year floodplain inundation extent downstream from Iron Gate Dam could change due to 2017 flow requirements, potentially exposing people and/or structures to a substantial risk of damage, loss, injury, or death involving flooding.								
	S	L		NP (S only), CO				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 4.2.6-2. The FEMA 100-year floodplain inundation extent downstream from J.C. Boyle Dam could change due to 2017 flow requirements between the California-Oregon state line and Copco No. 1 Reservoir, potentially exposing people and/or structures to a substantial risk of damage, loss, injury, or death involving flooding.								
	S	L		NP (S only), CO				
Groundwater Resources								
Potential Impact 3.7-1. Groundwater levels in existing wells adjacent to the reservoirs could decline in response to the decrease in reservoir surface-water elevations if the dams, and therefore reservoirs, are removed.								
	S	L		PP, NP (S only), PR, CO, 2R, 3R, NH				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.7-2. The Proposed Project could interfere with groundwater recharge and adversely affect surface water conditions in the Klamath River.								
	S	L		PP, NP (S only), PR, CO, 2R, 3R, NH				
Water Supply and Water Rights								
Potential Impact 3.8-1 Dam removal could change the amount of surface water flow available for diversion under existing water rights in the mainstem Klamath River within the Hydroelectric Reach and downstream from Iron Gate Dam.								
	S	L		PP, NP, PR, CO, 2R, 3R, NH				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.8-2. Dam removal could change the amount of surface water flow available for diversion from Upper Klamath Lake and/or Keno Reservoir to California water users in the USBR Klamath Irrigation Project.								
	S	L		PP, NP, PR, CO, 2R, 3R, NH				
Potential Impact 3.8-3. Release of stored sediment during reservoir drawdown could change Klamath River geomorphology and affect water intake pumps downstream from Iron Gate Dam.								
	S			NP, CO	WSWR-1	PP, PR, 2R, 3R, NH		
Potential Impact 3.8-4. Relocation of the City of Yreka water supply pipeline after drawdown of Iron Gate Reservoir could affect water supply.								
	S			NP, CO	WSWR-2	PP, PR, 2R, 3R, NH		

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.8-5. Removal and potential replacement of recreational facilities currently located on the banks of the existing reservoirs could affect water supply and/or water rights.								
	S	L		PP, NP (S only), PR, CO, 2R, 3R, NH				
Potential Impact 4.2.8-1. Water availability changes from coordinated operations under 2017 flow requirements.								
	S	L		NP (S only), CO				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Air Quality								
Potential Impact 3.9-1. Exceedance of the Siskiyou County Air Pollution Control District (SCAPCD) emissions thresholds in Rule 6.1 (Construction Permit Standards for Criteria Air Pollutants).								
	S			NP, CO	AQ-1, AQ-2, AQ-3, AQ-4, AQ-5		2R, 3R	PP, PR, NH
Potential Impact 3.9-2. Substantially conflict with or obstruct implementation of the California Regional Haze Plan.								
	S			NP, CO	AQ-1, AQ-2, AQ-3, AQ-4, AQ-5	PP, PR, NH	2R, 3R	
	L			PP, NP, PR, CO, 2R, 3R, NH				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.9-3. Short-term cumulative increase in criteria pollutants for which the Siskiyou County Air Pollution Control District (SCAPCD) is non-attainment.								
	S			PP, NP, PR, CO, 2R, 3R, NH				
Potential Impact 3.9-4. Short-term exposure of sensitive receptors to substantial toxic air contaminant concentrations.								
	S			NP, CO	HZ-1	PP, PR, NH	2R, 3R	
Potential Impact 3.9-5. Short-term exposure to objectionable odors near construction sites.								
	S			PP, NP, PR, CO, 2R, 3R, NH				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Greenhouse Gas Emissions								
Potential Impact 3.10-1. Generation of direct GHG emissions from construction activity and operations.								
	S			NP	ENR-1	PP, PR, NH	CO, 2R, 3R	
	L			PP, NP, PR, 2R, 3R, NH			CO	
Potential Impact 3.10-2. Generation of direct GHG emissions from reservoir sediments during drawdown that would exceed a no net increase threshold.								
	S			NP, CO			PP, PR, 2R, 3R, NH	
Potential Impact 3.10-3. Generation of direct GHG emissions from conversion of the reservoir areas to riverine, wetland, and terrestrial habitat types, that would exceed a no net increase threshold.								
	L			NP, CO			PP, PR, 2R, 3R, NH	

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.10-4. Generation of indirect GHG emissions from continued power production for the PacifiCorp PCA.								
	S, L			PP, NP, PR, CO, 2R, 3R, NH				
Potential Impact 3.10-5. Result in the wasteful, inefficient, or unnecessary consumption of energy resources during project construction or operations.								
	S, L			PP, NP, PR, CO, 2R, 3R, NH				
Potential Impact 3.10-6. Result in a substantial impact on local and regional energy supplies and/or on requirements for additional capacity.								
	S, L			PP, NP, PR, CO, 2R, 3R, NH				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.10-7. Conflict with or obstruct a state or local plan for renewable energy or energy efficiency.								
	S, L			NP, CO			PP, PR, 2R, 3R, NH	
Geology, Soils, and Mineral Resources								
Potential Impact 3.11-1. Reservoir drawdown could result in changes to geologic hazards, such as seismic or volcanic activity.								
	S	L		PP, NP (S only), PR, CO, 2R, 3R, NH				
Potential Impact 3.11-2. Soil disturbance associated with heavy vehicle use, excavation, and grading could result in erosion during removal activities.								
	S			PP, NP, PR, CO, 2R, 3R, NH				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.11-3. Reservoir drawdown could result in hillslope instability in reservoir rim areas.								
J.C. Boyle Reservoir	S			PP, NP, PR, CO, 2R, 3R, NH				
Copco No. 1 Reservoir	S			NP, CO	GEO-1	PP, PR, 2R, 3R, NH		
Iron Gate Reservoir	S			PP, NP, PR, CO, 2R, 3R, NH				
Potential Impact 3.11-4. Reservoir drawdown could result in short-term instability of embankments at the earthen dams (Iron Gate and J.C. Boyle).								
	S			PP, NP, PR, CO, 2R, 3R, NH				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.11-5. Reservoir drawdown could result in substantial short-term sediment deposition in the Klamath River downstream of Iron Gate Dam due to erosion of reservoir sediment deposits and a long-term change in sediment supply and transport due to dam removal.								
Middle Klamath River from Iron Gate Dam to Cottonwood Creek	S			NP, CO			PP, PR, 2R, 3R, NH	
Middle Klamath River downstream of Cottonwood Creek, Lower Klamath River, and Klamath River Estuary	S			PP, NP, PR, CO, 2R, 3R, NH				
Hydroelectric Reach, Middle and Lower Klamath River, and Klamath River Estuary		L	PP, PR, 2R, 3R, NH	NP, CO				
Pacific Ocean nearshore environment	S	L		PP, NP, PR, CO, 2R, 3R, NH				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.11-6. Reservoir drawdown could result in increased bank erosion in the Klamath River downstream of Iron Gate Dam.								
	S			PP, NP, PR, CO, 2R, 3R, NH				
Potential Impact 3.11-7. Reservoir removal could reduce or eliminate the availability of a known mineral resource or a locally important mineral resource recovery site.								
	S	L		PP, NP (S only), PR, CO, 2R, 3R, NH				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Historical Resources and Tribal Cultural Resources								
Potential Impact 3.12-1. Pre-dam-removal activities that involve disturbance of the landscape, including construction or improvement of associated roads, bridges, water supply lines, staging areas, disposal sites, hatchery modifications, recreation site removal and/or development, and culvert construction and improvements could result in potential exposure of or damage to known Tribal Cultural Resources through ground-disturbing construction and disposal activity and increased access to sensitive areas.								
	S	L		NP (S only)	TCR-1, TCR-2, TCR-3, TCR-4			PP, PR, CO, 2R, 3R, NH

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.12-2. Drawdown of Iron Gate, Copco No. 1, and Copco No. 2 reservoirs could result in shifting, erosion, and exposure of known or unknown, previously submerged Tribal Cultural Resources.								
	S	L		NP (S only), CO	TCR-1, TCR-2, TCR-3, TCR-4			PP, PR, 2R, 3R, NH
Potential Impact 3.12-3. Reservoir drawdown could result in erosion or flood disturbance to Tribal Cultural Resources located along the Klamath River.								
Hydroelectric Reach between J.C. Boyle Dam and Copco No. 1 Reservoir	S	L		PP, NP, PR, CO, 2R, 3R, NH				
Middle Klamath River from Iron Gate Dam to Humbug Creek	S	L		NP, CO	TCR-1, TCR-2, TCR-3			PP, PR, 2R, 3R, NH

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Middle Klamath River downstream of Humbug Creek and Lower Klamath River excluding the Yurok Reservation (approximately RM 0 to RM 45)	S	L		PP, NP, PR, CO, 2R, 3R, NH				
Yurok Reservation (approximately RM 0 to RM 45) along Lower Klamath River and Klamath River Estuary	S	L		NP, CO	TCR-5	PP, PR, 2R, 3R, NH		
Potential Impact 3.12-4. Project activities associated with removal of Iron Gate, Copco No. 1, and Copco No. 2 dams could result in physical disturbance to known or unknown Tribal Cultural Resources from blasting or other removal techniques.								
	S	L		NP (S only)	TCR-1, TCR-2, TCR-3, TCR-4			PP, PR, CO, 2R, 3R, NH

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.12-5. Ground disturbance associated with reservoir restoration, recreation site removal and/or development, and disposal site restoration could physically disturb known Tribal Cultural Resources. Additionally, ongoing road and recreation site maintenance has the potential to disturb known Tribal Cultural Resources.								
	S	L		NP (S only)	TCR-1, TCR-2, TCR-3, TCR-4			PP, PR, CO, 2R, 3R, NH
Potential Impact 3.12-6. During and following reservoir drawdown activities at Iron Gate, Copco No. 1, and Copco No. 2 reservoirs there is an increased potential for looting of Tribal Cultural Resources (short term and long term).								
Iron Gate Reservoir and Copco No. 1 Reservoir	S	L		NP, CO	TCR-2, TCR-4			PP, PR, 2R, 3R, NH
Copco No. 2 Reach	S	L		NP, CO	TCR-2, TCR-4			PP, PR, 3R, NH

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.12-7. Short-term erosion caused by high-intensity and/or duration precipitation events could cause exposure of or disturbance to known or unknown Tribal Cultural Resources within the reservoir footprints immediately following reservoir drawdown and prior to vegetation establishment/full stabilization of sediment deposits.								
	S			NP, CO	TCR-1, TCR-2, and TCR-3		PP, PR, 2R, 3R, NH	
Potential Impact 3.12-8. Long-term (post-removal) impacts to Tribal Cultural Resources as a result of dam removal from increased looting opportunities and from surface and subsurface erosion of Tribal Cultural Resources.								
Prior to land transfer		L		CO			PP, PR, 2R, 3R, NH	

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
After land transfer		L			TCR-1, TCR-2, TCR-3, TCR-6, TCR-7, and TCR-8	PP, PR, 2R, 3R, NH		
Potential Impact 3.12-9. Klamath Cultural Riverscape Contributing Aspect – Combined effects on the Klamath River fishery of dam removal, changes in hatchery production, and increased habitat for salmonids.								
	S			PP, NP, PR, CO, 2R, 3R			NH	
		L	PP, PR, 2R, 3R, NH	CO				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.12-10. Klamath Cultural Riverscape Contributing Aspect: Ability of tribes to use the Middle and Lower Klamath River for ceremonial and other purposes due to alterations in riverine water quality and changes in the extent of nuisance and/or noxious blue-green algae blooms.								
	S	L	PP, PR, 2R, 3R, NH	NP (S only), CO				
Potential Impact 3.12-11. Potential impacts to Copco No. 1 Dam, Copco No. 2 Dam, and Iron Gate Dam, their associated hydroelectric facilities, and the Klamath River Hydroelectric Project District as a whole.								
J.C. Boyle Reservoir and associated hydroelectric facilities	S	L		NP (S only)			PP, PR, CO, NH	
Copco No. 1 Dam and associated hydroelectric facilities	S	L		NP (S only)			PP, PR, CO, 2R, 3R, NH	
Copco No. 2 Dam and associated hydroelectric facilities	S	L		NP (S only)			PP, PR, CO, 3R, NH	

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Iron Gate Dam and associated hydroelectric facilities	S	L		NP (S only)			PP, PR, CO, 2R, 3R, NH	
Klamath River Hydroelectric Project District	S	L		NP (S only)			PP, PR, CO, 2R, 3R, NH	
Potential Impact 3.12-12. Potential impacts to submerged historic-period archaeological sites upon reservoir drawdown and exposure providing new access opportunities for artifact collecting and unauthorized excavation.								
	S	L		NP (S only), CO	TCR-2 and TCR-3			PP, PR, 2R, 3R, NH
Potential Impact 3.12-13. Drawdown of Iron Gate, Copco No. 1, and Copco No. 2 reservoirs could shift, erode, or expose historic-period archaeological resources resulting in increased potential for damage and looting.								
	S	L		NP (S only), CO	TCR-2 and TCR-3			PP, PR, 2R, 3R, NH

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.12-14. Reservoir drawdown could result in short-term erosion or flood disturbance to historic-period cultural resources located along the Klamath River.								
Middle Klamath River from Iron Gate Dam to Humbug Creek	S			NP, CO	TCR-3			PP, PR, 2R, 3R, NH
Hydroelectric Reach excluding Iron Gate Dam, Middle Klamath River downstream of Humbug Creek, Lower Klamath River, Klamath River Estuary	S			PP, NP, PR, CO, 2R, 3R, NH				
Potential Impact 3.12-15. Project activities associated with removal of Iron Gate, Copco No. 1, and Copco No. 2 dams could result in physical disturbance to historic-period cultural resources from blasting or other removal techniques.								
	S			NP	TCR-3			PP, PR, CO, 2R, 3R, NH

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.12-16. Ground disturbance associated with reservoir restoration, recreation site removal and/or development, and disposal site restoration could physically disturb historic-period cultural resources. Additionally, ongoing road and recreation site maintenance may have the potential to disturb known historic-period cultural resources.								
	S			NP	TCR-2 and TCR-3			PP, PR, CO, 2R, 3R, NH
Paleontologic Resources								
Potential Impact 3.13-1. The Proposed Project could result in substantial adverse effects on, or destruction of, High Potential Paleontologic Resources through exposure or slope failure.								
	S	L		PP, NP (S only), PR, CO, 2R, 3R, NH				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Land Use and Planning								
Potential Impact 3.14-1. Removal of the reservoirs, construction-related traffic, and/or land transfer could change connectivity between areas of a community.								
	S	L		PP, NP (S only), PR, CO, 2R, 3R, NH				
Potential Impact 3.14-2. The Proposed Project would not conflict with an applicable land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect in a manner that would prevent the avoidance or mitigation result sought to be achieved by the plan, policy, or regulation.								
	S	L		PP, NP (S only), PR, CO, 2R, 3R, NH				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Agriculture and Forestry Resources								
Potential Impact 3.15-1. Conversion of farmland to non-agricultural use or conflict with Williamson Act land or agricultural zoning.								
	S	L		PP, NP (S only), PR, CO, 2R, 3R, NH				
Potential Impact 3.15-2. Conversion of forest lands to non-forest use or conflict with forest zoning.								
	S	L		PP, NP (S only), PR, CO, 2R, 3R, NH				
Potential Impact 3.15-3. Indirect conversion of farmland to non-agricultural use or forest land to non-forest use.								
	S	L		PP, NP (S only), PR, CO, 2R, 3R, NH				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.15-4. Other changes in the existing environment that could result in conversion of farmland to non-agricultural use or conversion of forest land to non-forest use.								
	S	L		PP, NP (S only), PR, CO, 2R, 3R, NH				
Population and Housing								
Potential Impact 3.16-1. Inducing substantial unplanned population growth in an area, either directly or indirectly.								
	S	L		PP, NP (S only), PR, CO, 2R, 3R, NH				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.16-2. Displacement of substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere.								
	S	L		PP, NP (S only), PR, CO, 2R, 3R, NH				
Public Services								
Potential Impact 3.17-1. Increased public service response times for emergency fire, police, and medical services due to construction and demolition activities.								
	S			NP	HZ-1, TR-1	PP, PR, 2R, 3R, NH		CO

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.17-2. The Proposed Project's elimination of a long-term water source for wildfire services could substantially increase the response time for suppressing wildfires*	S			PP, NP, PR, CO, 2R, 3R, NH				
		L		NP, CO			PP, PR, 2R, 3R, NH	
Potential Impact 3.17-3. Potential effects on school services and facilities.								
	S	L		PP, NP, PR, CO, 2R, 3R, NH				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Utilities and Service Systems								
Potential Impact 3.18-1. The Proposed Project could result in the construction of new wastewater treatment facilities, or expansion of existing facilities, due to inadequate capacity to serve the Proposed Project's anticipated demand, and where the construction of such facilities could cause significant environmental impacts.								
	S	L		PP, NP, PR, CO, 2R, 3R, NH				
Potential Impact 3.18-2. The Proposed Project could require or result in the construction of new stormwater drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental impacts.								
	S	L		PP, PR, CO, 2R, 3R, NH				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.18-3. The Proposed Project could exceed permitted landfill capacity to accommodate the project's solid waste disposal needs.								
	S	L		PP, NP, PR, CO, 2R, 3R, NH				
Potential Impact 3.18-4. The Proposed Project could violate applicable statutes and regulations related to solid waste.								
	S	L		PP, NP, PR, CO, 2R, 3R, NH				
Aesthetics								
Potential Impact 3.19-1. Loss of Open Water Vistas.								
	S	L		PP, NP (S only), PR, CO, 2R, 3R, NH				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.19-2. Changes in Flows and Channel Morphology.								
	S	L		PP, NP (S only), PR, CO, 2R, 3R, NH				
Potential Impact 3.19-3. Changes in Visual Water Quality.								
Turbidity and reduced clarity	S			PP, NP, PR, CO, 2R, 3R, NH				
Reduced algal blooms		L	PP, PR, 2R, 3R, NH	CO				
Potential Impact 3.19-4. Visual changes resulting from reservoir drawdown and restoration including temporarily bare/unvegetated banks.								
	S			NP, CO			PP, PR, 2R, 3R, NH	
		L		PP, PR, CO, 2R, 3R, NH				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.19-5. Visual changes resulting from the removal of Lower Klamath Project dams and associated facilities and improvements to or construction of new infrastructure.								
Removal of Lower Klamath Project dams and associated facilities		L		PP, PR, 2R, 3R, NH, CO				
Improvements to and construction of new infrastructure		L		PP, PR, 2R, 3R, NH, CO				
Potential Impact 3.19-6. Short-term visual impacts of construction activities/equipment.								
	S			PP, NP, PR, CO, 2R, 3R, NH				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.19-7. The Project's construction or security lighting could result in new sources of substantial light or glare that would adversely affect nighttime views in the area.								
	S			NP, CO			PP, PR, CO, 2R, 3R, NH	
Recreation								
Potential Impact 3.20-1. Effects on existing recreational facilities and opportunities due to access restrictions, noise, dust, and/or sediment release resulting from construction activities.								
	S			PP, NP, PR, CO, 2R, 3R, NH				
Potential Impact 3.20-2. Long-term changes to or loss of reservoir-based recreation activities and facilities due to removal of Iron Gate and Copco No. 1 reservoirs.								
		L		PP, PR, CO, 2R, 3R, NH				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.20-3. Significant increase in the use of regional recreational facilities due to loss of Iron Gate and Copco No. 1 reservoirs, such that substantial physical deterioration or acceleration of deterioration of the regional facilities would occur.								
	S	L		PP, NP (S only), PR, CO, 2R, 3R, NH				
Potential Impact 3.20-5. Changes to or loss of river conditions that support whitewater boating.								
Middle and Lower Klamath River	S	L		PP, NP (S only), PR, CO, 2R, 3R, NH				
Hell's Corner Reach	S	L		NP (S only)			PP, PR, CO, 2R, 3R, NH	

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.20-6. Changes to or loss of other river-based recreation including fishing.								
Middle Klamath River between Iron Gate Dam (RM 193.1) and Humbug Creek (RM 174.3)	S	L		PP, NP (S only), PR, CO, 2R, 3R, NH				
Hydroelectric Reach, Middle Klamath River downstream of Humbug Creek (RM 174.3), and the Lower Klamath River	S	L	PP, PR, 2R, 3R, NH, CO	NP (S only)				
Potential Impact 3.20-7. Effects on Wild and Scenic River resources, designations, or eligibility for listing.								
Designated California Klamath River wild and scenic river segment, and eligible and suitable California Klamath River wild and scenic river section	S			PP, NP, PR, CO, 2R, 3R, NH				
Designated California Klamath River wild and scenic river segment, and eligible and suitable California Klamath River wild and scenic river section		L	PP, PR, 2R, 3R, NH	CO				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Hazards and Hazardous Materials								
Potential Impact 3.21-1. Proposed construction-related activities could result in substantial exposure to hazardous materials through the routine transport, use, or disposal of hazardous materials.								
	S			NP	HZ-1	PP, PR, CO, 2R, 3R, NH		
Potential Impact 3.21-2. Proposed construction-related activities could result in substantial exposure to hazardous materials through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment.								
	S			NP	HZ-1	PP, PR, CO, 2R, 3R, NH		

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.21-3. Proposed construction-related activities could result in substantial exposure to hazardous materials through emissions or handling of substances or waste within one-quarter mile of an existing or proposed school.								
	S			PP, NP, PR, CO, 2R, 3R, NH				
Potential Impact 3.21-4. The Proposed Project could be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, could result in substantial exposure to hazardous materials.								
	S			NP	HZ-1	PP, PR, CO, 2R, 3R, NH		

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.21-5. The Proposed Project could result in, for a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, a substantial safety hazard for people residing or working in the project area due to a risk of traffic accidents.								
	S	L		PP, NP, PR, CO, 2R, 3R, NH				
Potential Impact 3.21-6. The Proposed Project could result in, for a project within the vicinity of a private airstrip, a substantial safety hazard for people residing or working in the project area due to a risk of traffic accidents.								
	S	L		PP, NP, PR, CO, 2R, 3R, NH				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.21-7. Proposed construction-related activities could impair implementation of, or physically interfere with, an adopted emergency response plan or emergency evacuation plan.								
	S			NP	TR-1	PP, PR, 2R, 3R, NH	CO	
Potential Impact 3.21-8. Proposed construction-related activities and/or removal of the Lower Klamath Project reservoirs could substantially increase the public's risk of loss, injury or death associated with wildland fires.								
	S			PP, NP, PR, CO, 2R, 3R, NH				
		L		CO			PP, PR, 2R, 3R, NH	

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Transportation and Traffic								
Potential Impact 3.22-1. Proposed construction-related traffic could potentially result in a substantial increase in traffic in excess of the capacity or design of the road improvements or impairs the safety or performance of the circulation system, including transit, roadways, bicycle lanes and pedestrian paths.								
	S			NP	TR-1	PP, PR, 2R, 3R, NH	CO	
Potential Impact 3.22-2. Proposed construction-related traffic could potentially conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways that would result in increased risk of harm to the public.								

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
				NP	TR-1	PP, PR, 2R, 3R, NH	CO	
Potential Impact 3.22-3. Proposed construction-related traffic could result in substantially increasing hazards due to a design feature (e.g., sharp curves or narrow lanes) or incompatible uses (e.g., oversized construction equipment) that would result in an increased risk of harm to the public.								
	S			NP	TR-1	PP, PR, 2R, 3R, NH	CO	
Potential Impact 3.22-4. The Proposed Project could result in inadequate emergency access that would result in an increased risk of harm to the public.1								
	S			NP	TR-1	PP, PR, 2R, 3R, NH	CO	

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.22-5. Construction-related activities could potentially conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities resulting in an increased risk of harm to the public.								
	S			NP	TR-1	PP, PR, 2R, 3R, NH	CO	
Potential Impact 3.22-6. The Proposed Project could potentially result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks.								
	S	L		PP, NP, PR, CO, 2R, 3R, NH				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 4.4.22-1 Trap and haul operational traffic could potentially result in a substantial increase in traffic in excess of the capacity or design of the road improvements or impairs the safety or performance of the circulation system, including transit, roadways, bicycle lanes and pedestrian paths, or otherwise result in an increased risk of harm to the public due to an increase in traffic.								
		L		CO, 2R				
Noise								
Potential Impact 3.23-1. Use of standard construction equipment could exceed Siskiyou County General Plan criteria for maximum allowable noise levels from construction equipment.								
	S			NP			PP, PR, CO, 2R, 3R, NH	

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.23-2. Construction activities at Copco No. 1 Dam could cause short-term increases in daytime and nighttime noise levels affecting nearby residents.								
	S			NP			PP, PR, CO, 2R, 3R, NH	
Potential Impact 3.23-3. Construction activities at Copco No. 2 Dam could cause short-term increases in noise levels affecting nearby residents.								
	S			PP, NP, PR, CO, 2R, 3R, NH				
Potential Impact 3.23-4. Construction activities at Iron Gate Dam could cause short-term increases in nighttime noise levels affecting nearby residents.								
	S			NP			PP, PR, CO, 2R, 3R, NH	

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.23-5. Reservoir restoration activities at Copco No. 1 and Iron Gate could result in short-term increases in noise levels affecting nearby residents.								
	S			NP			PP, PR, CO, 2R, 3R, NH	
Potential Impact 3.23-6. Blasting activities at Copco No. 1, Copco No. 2, and Iron Gate Dams could increase daytime vibration levels affecting nearby residents.								
	S			NP			PP, PR, CO, 2R, 3R, NH	
Potential Impact 3.23-7. Transporting waste to off-site landfills and construction worker commutes could cause increases in traffic noise along haul routes affecting nearby residents.								
	S			PP, NP, PR, CO, 2R, 3R, NH				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.23-8. Construction activities associated with the Downstream Flood Control project component (moving or elevating legally established structures with flood risk) could produce noise and vibration associated with construction activities.								
	S			PP, NP, PR, CO, 2R, 3R, NH				
Potential Impact 3.23-9. Construction activities associated with implementation of Mitigation Measure WSWR-1 (modify water intakes) could produce noise and vibration associated with construction activities.								
	S			PP, NP, PR, CO, 2R, 3R, NH				

Geographic or Other Additional Information (as needed)	Time Frame[1]		Beneficial	No Significant Impact[2]	Mitigation	No Significant Impact with Mitigation	Significant and Unavoidable	Significant and Unavoidable with Mitigation
Potential Impact 3.23-10. Construction activities associated with the deepening or replacement of existing groundwater wells adjacent to the reservoirs could produce noise and vibration affecting nearby residents.								
	S			PP, NP, PR, CO, 2R, 3R, NH				
Potential Impact 4.5.23-1. Trap and haul-related noise.								
	S			2R				

[1] S = short-term potential impact; L = long-term potential impact; time frames for "S" and "L" are defined by alternative and resource area.

[2] No significant impact—potential effect either would not cause any adverse alterations to existing conditions or would cause alterations but they would not result in a significant adverse effect (includes determinations of no impact, less than significant impact, no change from existing adverse conditions, no change from existing conditions).

[3] * Indicates a Significant and Unavoidable Impact that would be reduced to No Significant Impact with Mitigation if one or more Recommended Measures were to be implemented. Due to federal preemption the State Water Board cannot guarantee the implementation of Recommended Measures. The associated significant and unavoidable impacts include Potential Impacts 3.5-7, 3.5-8, 3.5-10, 3.5-11, 3.5-12, 3.5-14, and 3.17-2.

References

References cited as part of text included in the Executive Summary list of revisions:

USBR. 2012. Hydrology, hydraulics and sediment transport studies for the Secretary's Determination on Klamath River dam removal and basin restoration, Klamath River, Oregon and California, Mid-Pacific Region. Technical Report No. SRH-2011-02. Prepared for Bureau of Reclamation, Mid-Pacific Region, Technical Service Center, Denver, Colorado.

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2 PROPOSED PROJECT

Volume I Section 2.2 Proposed Project – Project Location, Figure 2.2-5 Proposed Project Boundary – California Portion on page 2-7:

Since issuance of the Draft EIR, the KRRC has clarified that the Proposed Project "Limits of Work" include the following:

- 34 small areas ranging from 0.02 acres to 6.5 acres in size, with most parcels less than 0.03 acres, all of which are located within the altered 100-year floodplain of the Middle Klamath River between Iron Gate Dam (river mile [RM] 193) and Humbug Creek (RM 174) and have existing legally-established habitable structures that may require relocation or elevation prior to dam removal;
- 1,300 linear feet of the south shore of Copco No. 1 Reservoir inclusive of the adjacent twelve parcels that possess existing habitable structures, which potentially could be impacted by slope failure during or immediately following reservoir drawdown;
- 480 linear feet of Copco Road (unpaved) located on the north shore of Copco No. 1 Reservoir which has the potential to experience slope failure during or immediately following reservoir drawdown.

The EIR Project Boundary, which is inclusive of the Proposed Project Limits of Work, as well as PacifiCorp owned and managed lands immediately surrounding the Lower Klamath Project ("Parcel B lands") that would be transferred as part of the Proposed Project, has been updated accordingly. The proposed updates to the Limits of Work are relatively minor and are all included below in an updated Figure 2.2-7 *Proposed Project Boundary − California Portion*. The updated Proposed Project Boundary shown in Figure 2.2-7 applies to all figures in EIR Volume I that include the Project Boundary.

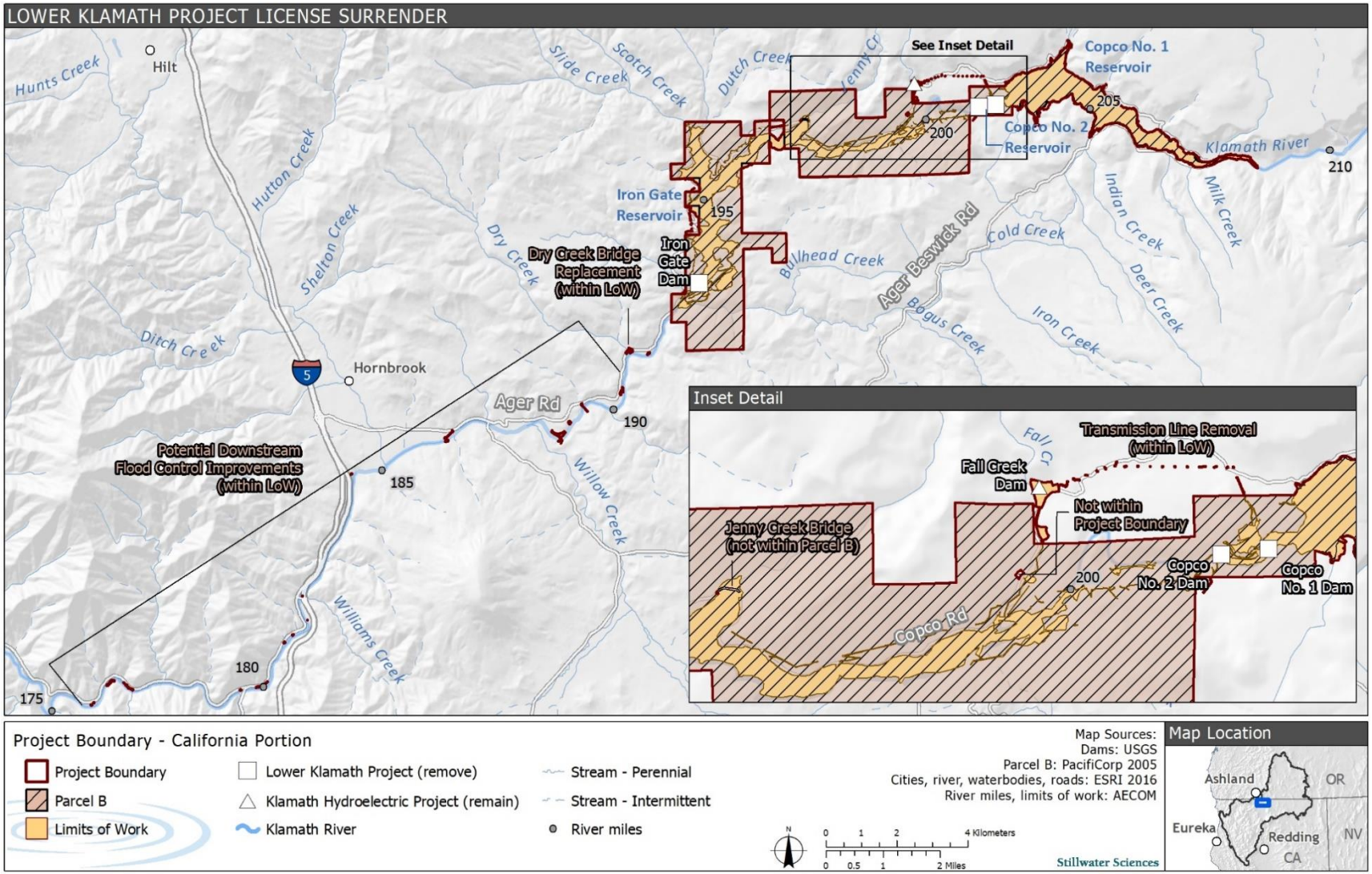

Figure 2.2-7. Proposed Project Boundary − California Portion.

2.3 Existing Lower Klamath Project Features

Volume I Section 2.3 Proposed Project – Existing Lower Klamath Project Features, Table 2.3-1. Lower Klamath Project Dam and Powerhouse Components on page 2-8:

Table 2.3-1. Lower Klamath Project Dam and Powerhouse Components.

	J.C. Boyle	Copco No. 1	Copco No. 2	Iron Gate
Dam type	Concrete and earthfill embankment	Concrete	Concrete	Earthfill embankment
Dam maximum height	68 feet	133 feet	32 feet	189 feet
Dam crest length	430 feet	410 feet	305 feet	740 feet
Reservoir surface area	350 acres	972 acres	~~N/A~~5.2 acres[1]	942 acres
Reservoir storage volume[2]	2,267 acre-feet	33,724 acre-feet	70 acre-feet	50,941 acre-feet
Type of facility to allow water to flow past dam under existing conditions	Overflow spillway with control gates ~~and diversion culvert~~	Overflow spillway with ~~larger~~ control gates ~~and modified diversion tunnel~~	Overflow spillway with control gates	Uncontrolled overflow spillway and diversion tunnel

Source: Appendix B: *Definite Plan* unless otherwise noted. Note that component dimensions have been adjusted from those reported in FERC 2007 and USBR 2012a based on available data (e.g., as-built drawings, aerial photographs, topographic information).

[1] PacifiCorp 2015.

[2] Volumes reflect the total storage volume following dam construction, and do not reflect only the active storage amounts.

2.6 Project Background

2.6.1 Water ~~Conflicts~~ History in the Klamath River Basin

Volume I Section 2.6.1 Proposed Project – Project Background – Water Conflicts in the Klamath River Basin, paragraph 1 on page 2-20:

Water-related disputes, including competing uses for water, water quality concerns, and impacted fisheries (commercial, tribal, and recreational) are difficult issues in the Klamath Basin. Below are some highlights of major water-related milestones and issues in the Klamath Basin over approximately the last few decades and are not intended to be a comprehensive history of water use and/or management in the basin:

1957	Klamath River Basin Compact between the states of Oregon and California, ratified by the states and consented to by Act of Congress including integrated and comprehensive development of water use for equitable distribution between the two states and the Federal Government, with uses identified for domestic, irrigation, protection and enhancement of fish, wildlife and recreational resources, industrial and hydroelectric power production, and for navigation and flood prevention.
1975	Comprehensive basin plan adopted for the Klamath River in California including multiple beneficial use designations such as cold freshwater habitat, aquatic organism migration, spawning, reproduction, and/or early development for protected fish, water contact recreation, agricultural supply, and hydropower generation.
1988	Lost River and shortnose sucker listed as endangered under the ESA
1996	Klamath River from the California/Oregon state line to Iron Gate Dam and from the confluence with the Scott River to the Klamath River Estuary added to the Clean Water Act Section 303(d) list for nutrients and temperature. Klamath River from its confluence with the Trinity River to the Klamath River Estuary added to the Clean Water Act Section 303(d) list for sediment. Klamath River from Iron Gate Dam to its confluence with the Scott River added to the Clean Water Act Section 303(d) list for organic enrichment/low dissolved oxygen.
1997	Coho salmon listed as Federally threatened under the Endangered Species Act (ESA).
~~1998~~	~~Lost River and shortnose sucker listed as endangered under the ESA.~~
1998	Klamath River from the California/Oregon state line to Iron Gate Dam and from the confluence with the Scott River to the Klamath River Estuary added to the Clean Water Act Section 303(d) list for organic enrichment/low dissolved oxygen. Klamath River from Iron Gate Dam to its confluence with the Scott River added to Clean Water Act Section 303(d) list for nutrients and temperature.
2001	(Spring) For the first time ever at a Federal reclamation (USBR) project, water deliveries from Upper Klamath Lake to Klamath Irrigation Project irrigators (and wildlife refuges) in California and Oregon did not occur in order to comply with requirements to protect ESA-listed fish (Lost River and shortnose suckers in the Upper Klamath Lake and coho salmon in the Lower Klamath River) during a severe drought (Braunworth et al. 2002).
2002	(Late summer/fall) Major fish die-off in in the Lower Klamath River of more than 33,000 adult salmon (primarily fall-run Chinook salmon) and steelhead during a disease outbreak (CDFG 2004).
2002	Coho salmon listed as threatened under the California ESA (CESA).

2003	Native American cultural use adopted as a beneficial use of the Klamath River from the Seiad Valley Hydrologic Subarea downstream to the Klamath Glen Hydrologic Subarea.
2004	First documented toxic bloom of the blue-green algae (cyanobacteria) *Microcystis aeruginosa* in Copco No. 1 Reservoir (Kann and Corum 2006).
2005	Public health warnings to avoid contact with water in Copco No. 1 and Iron Gate reservoirs due to toxic algae blooms began being posted annually.
2006	Low abundance of Klamath Basin Chinook salmon lead to severe restrictions on commercial and recreational harvest along 700 miles of the California and Oregon coast, as well as major reductions in Klamath River recreational and tribal fisheries. Broad commercial and recreational restrictions on the coast because of Klamath Basin Chinook returns were repeated in 2008, 2009, 2010, 2016, and 2017, including complete closure of commercial and recreational fisheries.
2006	Copco No. 1, Copco No. 2, and Iron Gate reservoirs identified by the USEPA for inclusion on the Clean Water Act Section 303(d) list for blue-green algae (cyanobacteria)-produced microcystin toxin as an additional cause of water quality impairment.
2010	Water deliveries from Upper Klamath Lake to Klamath Irrigation Project irrigators (and wildlife refuges) in California and Oregon significantly reduced in order to comply with requirements to protect ESA-listed suckers and provide flow augmentation for ESA-listed coho downstream of Iron Gate Dam, given dry hydrologic conditions.
2010	The Klamath Tribes limited their harvest of suckers to ceremonial use for the 25th consecutive year and experienced their 93rd ~~92nd~~ year without access to salmon.

2.7 Proposed Project

Volume I Section 2.7 Proposed Project – Proposed Project, paragraph 1 on page 2-26:

Table provides the proposed schedule for facilities drawdown and removal along with associated Proposed Project activities before and after removal. Drawdown timing for J.C. Boyle, Copco No. 1, and Iron Gate reservoirs was selected to minimize impacts to salmonids and other aquatic species. Based on the distribution and life-history timing of aquatic species in the Klamath Basin, only a portion of fish populations are likely to be present in the mainstem Klamath River during the reservoir drawdown period~~s of greatest sediment transport~~ between January and March (Figure 2.7-1), which is also the period of greatest sediment transport (see Section 3.2.5 *Water Quality – Potential Impacts and Mitigation* Potential Impact 3.2-3). During this time, ~~M~~most species are in tributaries which would be unaffected by the Proposed Project, or are further downstream ~~during this time~~ where river conditions would be less influenced by sediment transport by the Proposed Project due to dilution by tributary inflows. Additionally, the timing of drawdown coincides with periods of naturally high suspended sediment in the Klamath River, to which aquatic species have adapted through avoidance and tolerance.

Volume I Section 2.7 Proposed Project – Proposed Project, Table 2.7-1 Proposed Lower Klamath Project Schedule on page 2-27:

Table 2.7-1. Proposed Lower Klamath Project Schedule.

Task	Pre-dam Removal Years 1-3	Dam Removal Year 1												Dam Removal Year 2												Post-Dam Removal Year 1												Post-Dam Removal Years 2-5	Post-Dam Removal Years 6-10
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Pre-dam removal activities																																							
Seed collection, propagation, container plant material procurement																																							
Pre-construction activities (e.g., staging area preparation)[1]																																							
Invasive exotic vegetation (IEV) control																																							
Iron Gate Hatchery modifications including water supply replacement[2]																																							
Fall Creek Hatchery modifications including water supply[2]																																							
Construction access road, bridge, and culvert improvements[3]																																							
Recreation area facilities removal																																							
Flood improvements																																							
Yreka water supply[4]																																							
J.C. Boyle Dam																																							
~~Modify canal~~ pPrepare for drawdown[1]																																							
Power generation[1]																																							
Drawdown																																							
Dam removal																																							
Power generation facilities removal																																							
Transmission line demolition																																							
Copco No. 1 Dam																																							
Modify diversion tunnel, prepare for drawdown[1]																																							
Power generation[1]																																							
~~Dam modifications~~												--	--	--	--	--	--	--																							
Drawdown[5]																																							
Dam removal																																							
Power generation facilities demolition[1,6]												NEW				NEW																								
Transmission line demolition[7]																																							
Copco No. 2 Dam																																							
Power generation[1]																																							
Drawdown[1,8]																																							
Dam removal																																							
Power generation facilities demolition																																							
Transmission line demolition																																							
Iron Gate Dam																																							
Power generation[1]																																							
Dam modifications																																							
Drawdown[9]																																							
Dam removal																																							
Fish holding tanks and spawning building demolition[10]																																							
Power generation facilities demolition																																							
Transmission line demolition[11]																																							
Restoration																																							
Fluvial sediment and habitat[12]																																							
Revegetation activities																																							
Aerial pioneer crop seeding																																							
Salvage and plant existing riparian veg																																							
Pole cutting installation 2021																																							
Pole cutting installation 2022																																							
New recreation area facilities development																																							

Dark grey shading indicates planned activities. Stippled shading represents planning for activities still under development.

1 Definite Plan Section 8.6 Construction Schedule does not explicitly list these tasks. Timing for these tasks provided in KRRC (2018).

2 While the specific timeline is not proposed, Iron Gate Hatchery and Fall Creek Hatchery must be operational prior to reservoir drawdown.

3 Definite Plan - Section 8.6 Construction Schedule does not explicitly list all of the proposed road access improvement items, however they would occur before, during, and after dam removal, as needed.

4 Proposed pipeline relocation would have to occur before Iron Gate Dam removal. The KRRC proposes that the outage associated with the final connections would preferably occur during the winter to avoid disruption to Yreka's water supply.

5 Scheduled from November 3 to March 8.

6 Scheduled from September 30 to December 7.

7 Scheduled from June 18 to July 30.

8 Copco No. 2 Dam drawdown will occur on one day (May 1, ~~2021~~ 2022)

9 Scheduled from January 1 to March 2.

10 Scheduled from January 4 to June 7.

11 Scheduled for one week from June 1 to June 7.

12 Refers to movement of additional sediment in the reservoir footprints to provide tributary connectivity and create wetlands, floodplain and off-channel habitat features. Also includes placement of large woody debris (LWD) features.

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Volume I Section 2.7 Proposed Project – Proposed Project, Figure 2.7-1 Distribution and Life-History Timing of Aquatic Species in the Klamath Basin on page 2-29:

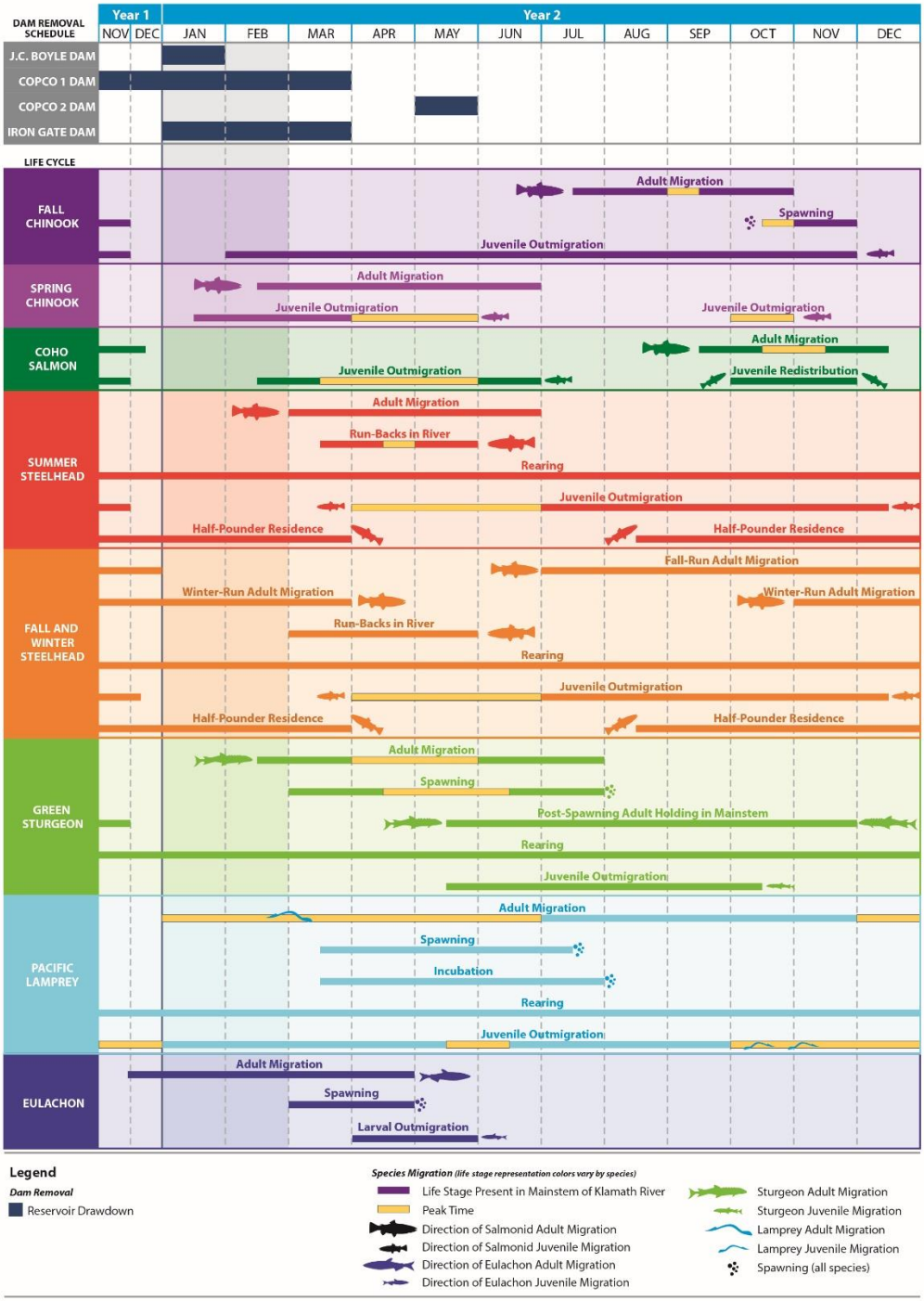

Figure 2.7-1. Dam Removal Schedule and Distribution and Life-History Timing of Aquatic Species in the Klamath Basin. Modified from CDM Smith.

2.7.1 Dam and Powerhouse Deconstruction

2.7.1.2 Copco No. 1 Dam and Powerhouse

Volume I Section 2.7.1.2 Proposed Project – Proposed Project – Dam and Powerhouse Deconstruction – Copco No. 1 Dam and Powerhouse, Table 2.7-2 Copco No. 1 Dam and Powerhouse Decommissioning and Removal Proposal on page 2-31:

Table 2.7-2. Copco No. 1 Dam and Powerhouse Decommissioning and Removal Proposal.

Feature[1]	KRRC Proposal
Concrete Dam	Remove to elevation 2,463.5 feet, which is 20 feet below original river channel bottom
Spillway Gates and Operators, Deck, Piers	Remove
Penstocks	Remove
Powerhouse Intake Structure	Remove
Gate Houses on Right Abutment	Remove
Diversion Control Structure	Remove[2]
Diversion Tunnel ~~Portals~~[3]	Retain ~~the tunnel~~ and plug ~~the tunnel portals~~ with reinforced concrete
Powerhouse (including mechanical and electrical equipment)	Remove
Powerhouse Hazardous Materials (transformers, batteries, insulation)	Remove
Four 69-kv Transmission Lines (3.03 miles total) (including poles and transformers)	Remove
Switchyard	Remove
Warehouse and Residence[4]	Remove

[1] Feature as presented in Appendix B: *Definite Plan – Table 5.3-1*.

[2] The existing diversion control structure sits just upstream of Copco No. 1 Dam and includes gate hoists, stems, and wire ropes, which would be demolished along with unstable concrete as part of modifying the existing diversion structure prior to reservoir drawdown. Proposed features to modify the existing diversion control structure (i.e., new downstream tunnel gate and portal, new upstream blind flanges) would be removed as part of reservoir drawdown and dam deconstruction.

[3] Refers to the Diversion Tunnel shown in Figure 2.7-2. The existing concrete plug in the diversion tunnel would be removed prior to reservoir drawdown. The tunnel would be retained for use as the low-level outlet during reservoir drawdown. Following reservoir drawdown, the tunnel portals would be plugged with reinforced concrete.

[4] Refers to the Maintenance Building and the North and South Residences shown in Figure 2.7-2.

Volume I Section 2.7.1.2 Proposed Project – Proposed Project – Dam and Powerhouse Deconstruction – Copco No. 1 Dam and Powerhouse – Construction Access and Road Improvements – Road and Bridge Improvements/Replacements, paragraph 4 on page 2-32:

- Access Road from Long Gulch Recreational Facility to Lakeview Road—some road surface rehabilitation during construction.
- ~~Access Road from Overlook Point Recreational Facility to Copco Road—some road surface rehabilitation during construction.~~

2.7.1.3 Copco No. 2 Dam and Powerhouse

Volume I Section 2.7.1.3 Proposed Project – Proposed Project – Dam and Powerhouse Deconstruction – Copco No. 2 Dam and Powerhouse – Deconstruction Activities, paragraph 2 on page 2-40:

The KRRC's Proposed Project would remove the Copco No. 2 Dam, the unnamed reservoir associated with the Copco No. 2 Dam (hereinafter referred to as Copco No. 2 Reservoir), the Copco No. 2 Powerhouse, and their associated structures and equipment (Table 2.7-4). Additional details are presented in the KRRC's Definite Plan *(*Appendix B: *Definite Plan – Section 5 Dam Removal Approach)*. The KRRC proposes to remove the Copco No. 2 ~~d~~Dam, the associated structures, and drain the reservoir in dam removal year 2 by lowering the reservoir water surface elevation, constructing

Volume I Section 2.7.1.3 Proposed Project – Proposed Project – Dam and Powerhouse Deconstruction – Copco No. 2 Dam and Powerhouse – Deconstruction Activities, Table 2.7-4. Copco No. 2 Dam and Powerhouse Removal Proposal on page 2-42:

Table 2.7-4. Copco No. 2 Dam and Powerhouse Removal Proposal.

Feature[1]	KRRC Proposal
Concrete Dam	Remove
Spillway Gates, Structure	Remove
Power Penstock Intake Structure and Gate	Remove
Conveyance and Overflow Spillway Tunnel~~Portals~~s[2]	Retain the tunnels, plug the tunnel portals with reinforced concrete
Embankment Section and Right Sidewall	Remove
Basin Apron and End Sill	Remove
Remnant Cofferdam Upstream of Dam	Remove
Wood-stave Penstock	Remove
Concrete Pipe Cradles	Remove
Steel Penstock, Supports, Anchors	Remove

Feature[1]	KRRC Proposal
Powerhouse (including mechanical and electrical equipment)	Remove
Powerhouse Hazardous Materials (transformers, batteries, insulation)	Remove
Powerhouse Control Center Building, Maintenance Building, Oil and Gas Storage Building	Remove
69-kV Transmission Line, 0.14 mile	Remove
Switchyard	Retain – the switchyard is not part of the Proposed Project
Tailrace Channel	Backfill
Copco Village (including former cookhouse/bunkhouse, garage/storage building, bungalow with garage, 3 modular houses, 4 ranch-style houses, and school house/community center)	Remove

[1] Feature as presented in Appendix B: *Definite Plan – Table 5.4-1*.
[2] Refers to Conveyance Tunnel and Overflow Spillway Tunnel shown in Figure 2.7-2.

Volume I Section 2.7.1.3 Proposed Project – Proposed Project – Dam and Powerhouse Deconstruction – Copco No. 2 Dam and Powerhouse – Construction Access and Road Improvements, paragraph 1 on page 2-43:

The KRRC proposes to return roads used for the Proposed Project to an acceptable state (i.e., their pre-project condition), including mitigating any potential reduction in function attributed to the dam removal work.

2.7.1.4 Iron Gate Dam and Powerhouse

Volume I Section 2.7.1.4 Proposed Project – Proposed Project – Dam and Powerhouse Deconstruction – Iron Gate Dam and Powerhouse – Deconstruction Activities, paragraph 1 on page 2-46:

The KRRC proposes to remove Iron Gate Dam and its associated facilities following spring runoff of dam removal year 2 (approximately June 1). The embankment dam crest would be retained at a level needed for flood protection, with a minimum flood release capacity of approximately 4,200 cfs in June, ~~7,000~~3,000 cfs in July (reservoir water surface elevation 2,242.3 feet) and 3,000 cfs in August and September (reservoir water surface elevation 2,194.3 feet), in order to accommodate the passage of at least a 1 percent probable flood for that time of year. Excavation of the embankment section at Iron Gate Dam would not begin before June 1 of dam removal year 2, and it would be complete by September 30 to minimize the risk of flood overtopping. During excavation,

rockfill would be temporarily stockpiled for placement on the downstream slope of a temporary cofferdam. Throughout excavation, access would be provided to the gate control house at the base of the intake tower for flow control.

2.7.2 Reservoir Drawdown

Volume I Section 2.7.2 Proposed Project – Proposed Project – Reservoir Drawdown, paragraph 3 on page 2-57:

According to the KRRC's Reservoir Drawdown and Diversion Plan (Appendix B: *Definite Plan*), the drawdown of Copco No. 1 and Iron Gate reservoirs would be managed through automated gate control systems with operator oversight, where inputs to determine the amount of gate opening at each reservoir would include continuous measurement of reservoir levels by remote sensor. The gate control system would incrementally open (or close) the gate to increase (or decrease) flow through the diversion tunnels (14-foot by 16-foot each) to maintain ~~the reservoir~~ drawdown of the reservoirs at an approximately constant rate. This ~~will~~ would allow the project to maintain embankment and reservoir rim stability even as reservoir inflows vary. For example, flows may vary due to storms or changes in upstream reservoir releases.

Volume I Section 2.7.2 Proposed Project – Proposed Project – Reservoir Drawdown, paragraph 4 on page 2-57:

Once the Copco No. 1 and Iron Gate reservoirs have been fully drawn down, the diversion control gates would remain in the fully open position to limit reservoir refilling during storm events. Any storm inflows large enough to cause ~~partial~~ complete refilling of these reservoirs would ~~pass through~~ activate the spillway at each dam. ~~, unless~~ If ~~spillway~~ outflows reach a pre-determined level (13,000 -cfs for Copco No. 1 and 15,000 cfs for Iron Gate), then ~~. If these levels are reached~~ the diversion control gates would be closed (or partially closed) until the flow drops below this level to avoid high water levels that would impact the Copco No. 2 Powerhouse (which could still be operating until May 1), or that would result in flows downstream of Iron Gate Dam that are greater than the 10-year peak flow.

As noted above, removal of Copco No. 1 Dam sections and Copco No. 2 Dam would begin after May 15 of dam removal year 2, and removal of Iron Gate would occur between June 1 and September 30 of dam removal year 2, such that during the spring snowmelt period the dams would retain their existing flood capacity. During ~~dam~~ removal of all four dams, ~~the drawdown of~~ Iron Gate Reservoir would need to maintain enough capacity to pass a 1 percent probable flood ~~for that time of year~~, in order to reduce the potential for flow to overtop the Iron Gate Dam embankment. The following minimum flood release capacities by month would be maintained during drawdown of Iron Gate Reservoir:

- June—approximately ~~7,700~~ 4,200 cfs
- July—approximately ~~7~~ 3,000 cfs
- August/September—approximately 3,000 cfs

Volume I Section 2.7.2 Proposed Project – Proposed Project – Reservoir Drawdown, paragraph 5 on page 2-57:

As noted above, removal of Copco No. 1 Dam sections and Copco No. 2 Dam would begin after May 15 of dam removal year 2, and removal of Iron Gate would occur between June 1 and September 30 of dam removal year 2. During ~~dam~~ removal of all four dams, ~~the drawdown of~~ Iron Gate Reservoir would need to maintain enough capacity to pass a 1 percent probable flood ~~for that time of year~~, in order to reduce the potential for flow to overtop the Iron Gate D~~d~~am embankment. The following minimum flood release capacities by month would be maintained during drawdown of Iron Gate Reservoir:

- June—approximately ~~7,700~~4,200 cfs
- July—approximately ~~7~~3,000 cfs
- August/September—approximately 3,000 cfs

Volume I Section 2.7.2 Proposed Project – Proposed Project – Reservoir Drawdown, paragraph 1 on page 2-58:

Drawdown of J.C. Boyle Reservoir would be initially controlled by the capacity of the opened spillway, followed by the capacity of the opened power intake. Once the reservoir stabilizes with spillway and intake fully open, the diversion culverts would be opened, and drawdown would only be controlled by the capacity of the diversion culverts, which is approximately 6,000 cfs at the spillway elevation. For storm flows that fully refill the reservoir before deconstruction, higher discharge rates would be experienced over the spillway. Removal of J.C. Boyle Dam itself (dam excavation) would begin in mid-June of dam removal year 2, such that the dam would retain its existing flood capacity during the peak snowmelt period. Drawdown of J.C. Boyle Reservoir would maintain a minimum flood release capacity of 3,500 cfs, in order to accommodate the passage of at least a 1 percent probable flood for May through September and prevent flood overtopping of the dam embankment during dam removal.

Volume I Section 2.7.2 Proposed Project – Proposed Project – Reservoir Drawdown, paragraph 2 on page 2-58:

The resulting range of release flows due to drawdown of the three larger reservoirs is provided in ~~Table 2.7-8~~ Table 2.7-9. Release flows would add water to the otherwise existing flows in the river (i.e., Keno Reservoir releases and tributary inflows). The percent increase in the Klamath River caused by the minimum average and maximum average release flows compared to the 2-year

and 10-year peak flows in the Klamath River at individual locations for each reservoir are also detailed in ~~Table 2-7.8~~ Table 2.7-9. The 2-year and 10-year peak flows are calculated from the available USGS flow gage data in the Klamath River below J.C. Boyle Dam for J.C. Boyle Reservoir, in the Klamath River downstream of Fall Creek at the upstream end of Copco No. 1 Reservoir, and in the Klamath River downstream of Iron Gate Dam for Iron Gate Reservoir. Details for the release flow modeling and the associated assumptions are provided in Section 3.6.5.1 *Flood Hydrology* of this EIR.

2.7.3 Reservoir Sediment Deposits and Erosion During Drawdown

Volume I Section 2.7.3 Proposed Project – Proposed Project – Reservoir Sediment Deposits and Erosion During Drawdown, paragraph 3 on page 2-60:

Sediment accumulated in the Lower Klamath Project reservoirs is primarily composed of silt-sized particles of organic material from dead algae, silt, and clay (fine sediment) with lesser amounts of cobble and gravel (coarse sediment) (USBR 2012a). Figures 2.7-7, 2.7-8, and 2.7-9 show the spatially distributed average sediment thickness in J.C. Boyle, Copco No. 1, and Iron Gate reservoirs, and Figures 2.7-5 and 2.7-6 show the associated bathymetry in Copco No.1 and Iron Gate reservoirs. ~~The distribution of sediment deposits varies within each of the reservoirs~~. Distance from the dam, water depth, and distance from the source (i.e., mainstem Klamath River and tributaries) explain the spatial distribution of sediment accumulated in each impoundment. In J.C. Boyle Reservoir, sediment accumulation occurs primarily ~~resides~~ in the area nearest the dam, with measured sediment thicknesses ranging from 0 to 2 feet in the middle and upper portions of the reservoir to over 18 to 20 feet near the dam (Figure 2.7-7). ~~Figure 2.7-7 presents the estimated average sediment thickness throughout the reservoir based on measurements.~~ J.C. Boyle Reservoir does not contain substantial reservoir sediment deposits upstream of approximately 4,000 feet of the dam, likely due to higher water velocities causing sediment to bypass this area (USBR 2010). The upper 5,000 feet of J.C. Boyle Reservoir, near the inlet, primarily hosts coarse grained sediment, with only local accumulations of fine-grained sediment (USBR 2010).

There is substantial sediment accumulation (8 to 10 feet) in Copco No. 1 Reservoir within approximately 4,000 feet of the dam (Figure 2.7-8). Less sedimentation occurs in shallower water in more upstream areas and around the reservoir periphery (Figure 2.7-8). Tributaries to the reservoir do not contribute substantial sediment (USBR 2010). This spatial pattern of sediment accumulation in Copco No. 1 Reservoir is affected by the historical river channel, with higher total accumulation in deeper water over the historical bed. Approximately 4,000 feet upstream of the dam, sediment accumulation reduces to 6 to 8 feet and then to 4 to 6 feet within about 3,000 feet of the reservoir inlet. These sediment accumulation patterns reflect a transition to shallower water (Figure 2.7-5). Only the upper 6,200 feet of the Copco No. 1 Reservoir has significant deposits of coarse-grained sediment (USBR 2010).

The sediment accumulation pattern in Iron Gate Reservoir (Figure 2.7-9) is similar to Copco No.1 Reservoir, with the highest total sediment accumulation (4 to 5 feet) in deeper water (Figure 2.7-6) within approximately 5,000 feet of the dam. Iron Gate Reservoir has numerous tributaries that discharge significant sediment volumes into the reservoir.~~Both Copco No. 1 and Iron Gate reservoirs have generally even distributions of sediment with thicknesses increasing towards the dams. Figures 2.7-8 and Figure 2.7-9 show the estimated average sediment thickness based on position in the reservoir. The measured thickness of Copco No. 1 Reservoir sediment ranges from approximately 1.2 feet to approximately 10 feet.~~ The maximum deposition within the thalweg (original river channel) of Iron Gate Reservoir is approximately ~~around~~ 5 feet, with a maximum measured deposition thickness of ~~nearly 10~~9.2 feet in the Jenny Creek arm of the reservoir (see Table 5-13 of USBR 2012b).~~, while t~~ The minimum measured sediment thickness is approximately 0.3 feet near the upstream end of the reservoir (see Table 5-12 of USBR 2012b). Similar to Copco No. 1, only the upper 6,000 feet of the reservoir has a significant percentage of sand (USBR 2010).

In February 2018, KRRC collected eleven sediment cores at Copco No. 1 Reservoir to characterize and analyze the stability of the sediment deposits present around much of the rim of the reservoir and within the reservoir bed, and three sediment cores at Iron Gate Reservoir to characterize past landslides and to inform design of the replacement water supply pipeline for the City of Yreka (EIR Appendix B: *Definite Plan – Appendix E*). No sediment cores were collected at J.C. Boyle Reservoir. Although the coring data were collected for a separate purpose, results from the 2018 subsurface investigations by KRRC confirm the results of prior studies (Shannon and Wilson 2006; USBR 2010) that characterized the reservoir sediment deposits as primarily fine materials (organics, silt, clay) including diatomite, with lesser amounts of coarse materials including sand, cobble, and gravel (Appendix B: *Definite Plan – Appendix E*). Results from KRRC's 2018 subsurface investigations indicate that the reservoir deposits are underlain by volcanic bedrock. Overall, the 2018 sediment core data do not change the estimates of reservoir sediment deposits under existing conditions or at the time of dam removal, nor do they change the anticipated degree or pattern of sediment erosion that would occur during drawdown, as discussed below.

Volume I Section 2.7.3 Proposed Project – Proposed Project – Reservoir Sediment Deposits and Erosion During Drawdown, paragraph 1 on page 2-65:

The current volume and weight of sediment for each reservoir is presented in Table 2.7-10~~9~~. The uncertainty in the sediment volume estimates is due to interpolation between the 28 to 31 drill holes in each reservoir (USBR 2012a). ~~While the uncertainty in the sediment volume estimate is noticeable, t~~The analysis of sediment erosion potential for the reservoirs is not sensitive to the

degree of uncertainty in the volume estimates. Whether the actual reservoir sediment volumes are on the higher end or the lower end of the uncertainty estimate, the dam removal approach and the significance of potential impacts due to sediment transport during reservoir drawdown would remain the same. Sediments as they are deposited in the reservoirs are generally presented in terms of volume, since the sediment volume was measured by the sediment cores taken in each reservoir. However, sediments are typically discussed in terms of mass once they are transported from the reservoir footprints, since the sediment mass would remain constant.

Volume I Section 2.7.3 *Proposed Project – Proposed Project – Reservoir Sediment Deposits and Erosion During Drawdown, paragraph 3 on page 2-65:*

Sediment jetting would be focused in the six areas where restoration actions are proposed within the Copco No. 1 Reservoir footprint (see enumerated areas for wetlands, floodplains, and off-channel habitat features, and associated yellow triangles depicting areas of tributary connectivity, in Figure 2.7-11) and the three areas where restoration actions are proposed within the Iron Gate Reservoir footprint (see enumerated areas for wetlands, floodplains, and off-channel habitat features, and associated yellow triangles depicting areas of tributary connectivity, in Figure 2.7-12).

Volume I Section 2.7.3 *Proposed Project – Proposed Project – Reservoir Sediment Deposits and Erosion During Drawdown, footnote 12 on page 2-65:*

[12] Since submitting the original application, KRRC has revised its projection for the year of primary drawdown to be ~~2021~~2022, rather than 2020 (KRRC 2019a). Between 2020 and ~~2021~~2022, the sediment volume present behind the dams is expected to increase by approximately 19,600 cubic yards per year (39,200 cubic yards for two years) in J.C. Boyle Reservoir, 81,300 cubic yards per year (162,600 cubic yards for two years) in Copco No. 1 Reservoir, and 100,000 cubic yards per year (200,000 cubic yards for two years)~~approximately 81,300 cubic yards in Copco No. 1 Reservoir and approximately 100,000 cubic yards in~~ Iron Gate Reservoir based on estimates of annual sedimentation rates for each reservoir (USBR 2012b). The expected increase in sediment volume between 2020 and ~~2021~~2022 is an order of magnitude less than the range of the 2020 total sediment volume estimates, so model results using the 2020 sediment volumes would still be applicable to the Proposed Project.

2.7.4 Restoration Within the Reservoir Footprint

2.7.4.2 Reservoir Restoration Features

Volume I Section 2.7.4.2 Proposed Project – Proposed Project – Restoration Within the Reservoir Footprint – Reservoir Restoration Features, paragraph 1 on page 2-72:

Sediment jetting would be focused in the six areas where restoration actions are proposed within the Copco No. 1 Reservoir footprint (see enumerated areas for wetlands, floodplains, and off-channel habitat features, and associated yellow triangles depicting areas of tributary connectivity, in Figure 2.7-11) and the three areas where restoration actions are proposed within the Iron Gate Reservoir footprint (see enumerated areas for wetlands, floodplains, and off-channel habitat features, and associated yellow triangles depicting areas of tributary connectivity, in Figure 2.7-12).

Volume I Section 2.7.4.2 Proposed Project – Proposed Project – Restoration Within the Reservoir Footprint – Reservoir Restoration Features, Figure 2.7-11 Restoration Actions Identified for the Copco No. 1 Reservoir Area (Appendix B: Definite Plan − Appendix H) caption on page 2-75:

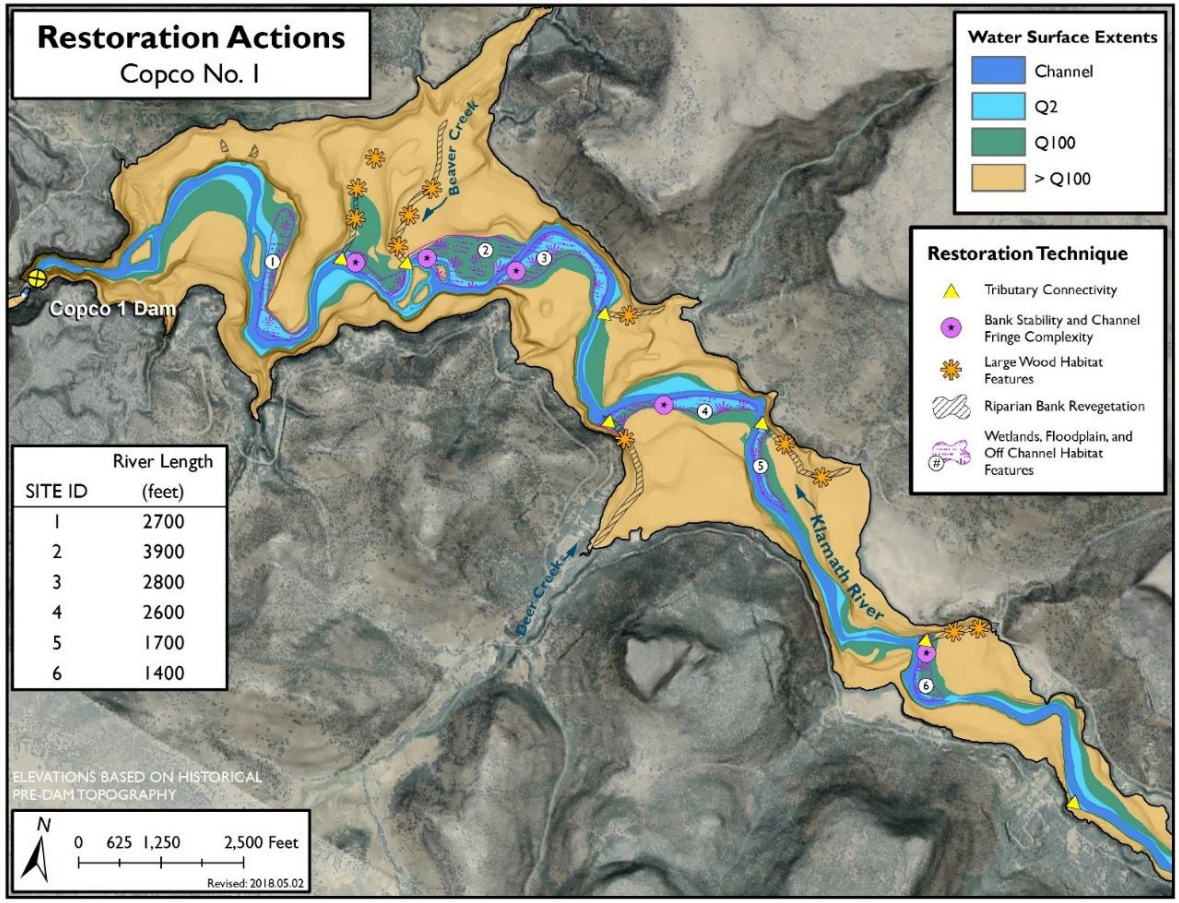

Figure 2.7-11. Conceptual Restoration Actions Identified for the Copco No. 1 Reservoir Area (Appendix B: *Definite Plan − Appendix H*).

Volume I Section 2.7.4.2 Proposed Project – Proposed Project – Restoration Within the Reservoir Footprint – Reservoir Restoration Features, Figure 2.7-12. Restoration actions identified for the Iron Gate Reservoir area (Appendix B: Definite Plan − Appendix H) caption on page 2-76:

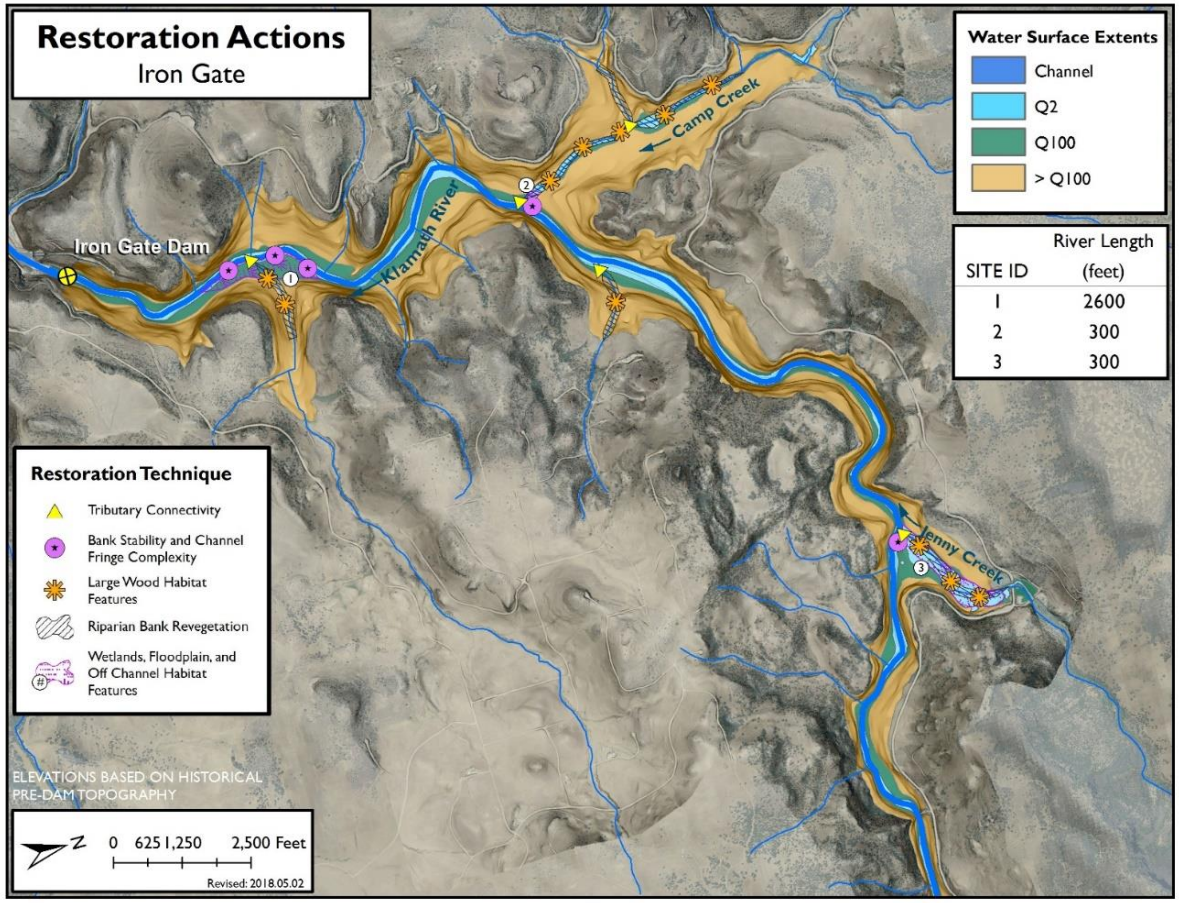

Figure 2.7-12. Conceptual Restoration Actions Identified for the Iron Gate Reservoir Area (Appendix B: *Definite Plan − Appendix H*).

2.7.6 Hatchery Operations

2.7.6.1 Iron Gate Hatchery

Volume I Section 2.7.6.2 Proposed Project – Proposed Project – Hatchery Operations – Iron Gate Hatchery, paragraph 1 on page 2-78:

This water would operate the Iron Gate Hatchery incubation building, two 300-foot adult holding ponds, three 400-foot raceway, and an auxiliary adult fish ladder and trap ~~(to replace the one removed from the base of Iron Gate Dam during demolition)~~.

2.7.6.2 Fall Creek Hatchery

Volume I Section 2.7.6.2 Proposed Project – Proposed Project – Hatchery Operations – Fall Creek Hatchery, paragraphs 1 and 2 on page 2-81:

The KRRC also proposes to reopen the nearby Fall Creek Hatchery, as directed by NMFS and CDFW (2018). The KRRC proposes to reopen Fall Creek Hatchery with upgraded facilities (e.g., install circular tanks, UV treatment system, renovate existing raceways, upgrade plumbing, etc.) for raising coho salmon and Chinook salmon yearlings within the existing facility footprint and an area adjacent to the upper raceways (Figure 2.7-15). Additional space requirements needed for most operations (e.g., vehicle parking, pertinent buildings, tagging trailer, etc.) can be accommodated on existing developed or disturbed areas around the hatchery and powerhouse, but the settling pond would need to be located outside of this area. The settling pond would be constructed on one of ~~two~~ three potential nearby sites located on Parcel B lands downstream of the Fall Creek Hatchery, including a location at the existing lower raceways at the hatchery, with a minimally buried or at-grade conveyance pipeline transporting flows from the hatchery to the settling pond. Selection of the settling pond site is pending cultural resources investigations and consultation with tribes with historical and cultural connection to the area.

To operate the Fall Creek Hatchery, up to 10 cfs of water would be diverted from the PacifiCorp Fall Creek powerhouse return canal downstream of the City of Yreka's diversion facility at Fall Creek Dam A. Hatchery water would be diverted from Fall Creek Dam B through a pipeline to Dam A during periods when the powerhouse return canal is not flowing. The KRRC has proposed to use 0.33 cfs from the optional diversion point located upstream of the City of Yreka's Dam B on Fall Creek. The KRRC proposes to use water from the optional diversion for egg incubation at Fall Creek Hatchery and proposes that this diversion would be part of the 10 cfs maximum diversion for operation of the hatchery. While the Definite Plan specifies diverted water would be returned to Fall Creek at the fish ladder located in the lower tank area or the settling pond location (Appendix B: *Definite Plan −Section 7.8.3*), an October 2018 update specifies the upper rearing tank would discharge diverted water directly to Fall Creek, the lower

rearing tank would discharge to the fish ladder adjacent to the tank, and the settling pond would discharge to Fall Creek further down, but upstream of the USGS 11512000 gage on Fall Creek (S. Leonard, AECOM as KRRC Technical Representative, pers. comm., ~~October~~ November 2018). Fall Creek diverted water would be gravity fed and plumbed to each rearing location and all circular tanks. Specific diversion rates from Fall Creek would be as follows:

Volume I Section 2.7.6.2 Proposed Project – Hatchery Operations – Fall Creek Hatchery, paragraph 3 on page 2-81:

Fall Creek from the three hatchery discharge points (i.e., upper tank, fish ladder near the lower tank, and settling pond) upstream of the compliance point for the City of Yreka diversion, the USGS 11512000 gage on Fall Creek approximately 1,000 feet upstream of Daggett Road (S. Leonard, AECOM as KRRC Technical Representative, pers. comm., ~~October~~ November 2018).

Volume I Section 2.7.6.2 Proposed Project – Proposed Project – Hatchery Operations – Fall Creek Hatchery, paragraph 1 on page 2-82:

Total hatchery production goals for Fall Creek Hatchery are presented in Table 2.7-13. Following the eight-year period, Fall Creek Hatchery would cease operations. ~~As Fall Creek Hatchery is part of PacifiCorp's Klamath Hydroelectric Project No. 2082, the existing Fall Creek hatchery facilities are subject to the terms of any new FERC action for Project No. 2082.~~ It is currently unclear whether the Fall Creek Hatchery facility would be decommissioned in place, demolished, or partly or fully repurposed after the eight-year operational period. If Fall Creek Hatchery is opened as currently proposed, its modifications and operations would fall within the terms of any FERC decommissioning license.

Volume I Section 2.7.6.2 Proposed Project – Proposed Project – Hatchery Operations – Fall Creek Hatchery, Figure 2.7-15 on page 2-83:

Figure 2.7-15. Fall Creek Hatchery Existing Features and Proposed Modifications. Specific details regarding the location of facilities at the re-opened hatchery are subject to minor changes within the Limits of Work.

2.7.7 City of Yreka Water Supply Pipeline Relocation

Volume I Section 2.7.6 Proposed Project – Proposed Project – Hatchery Operations – Fall Creek Hatcher, Figure 2.7-15 on page 2-83:

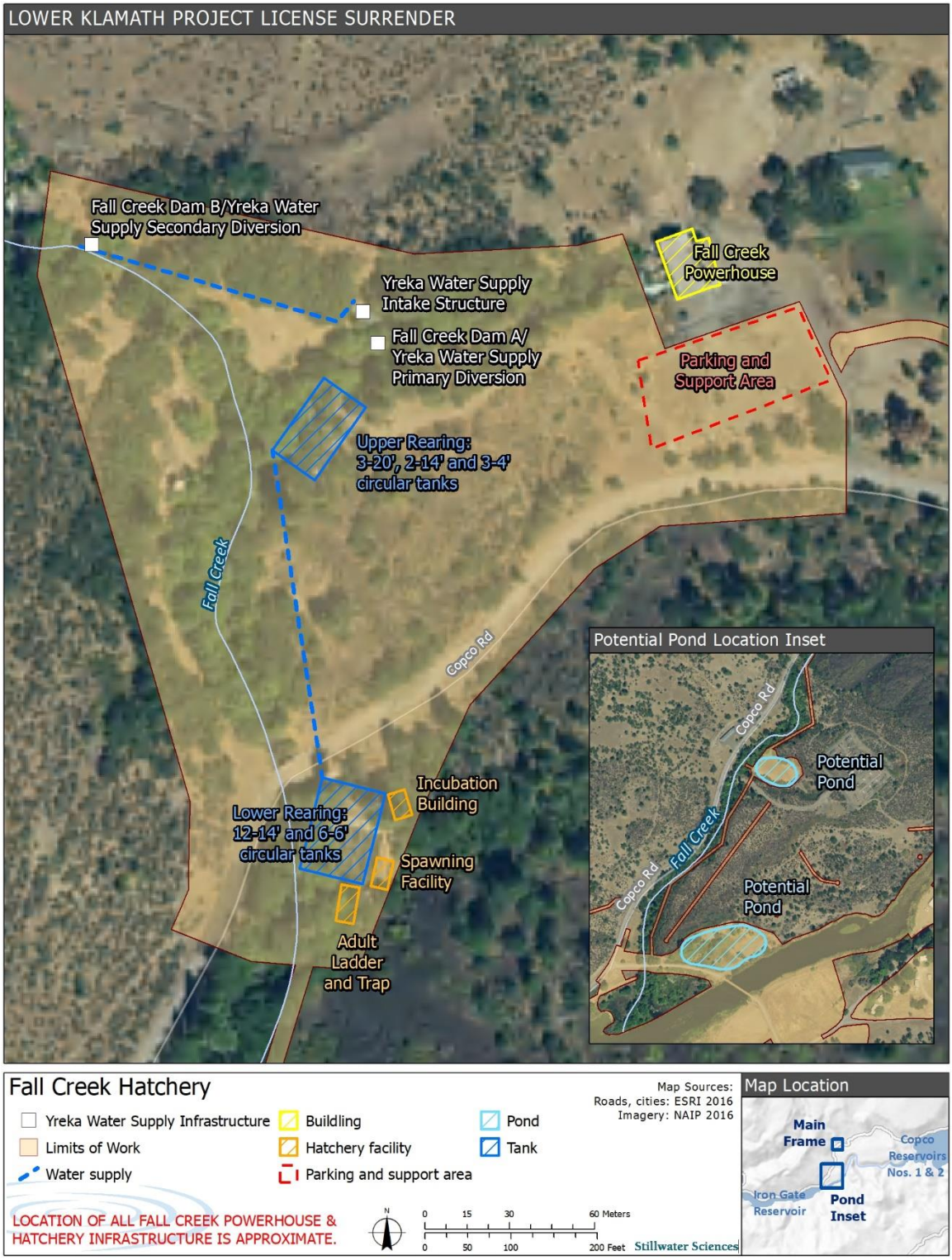

Figure 2.7-15. Fall Creek Hatchery Existing Features and Proposed Modifications. Specific details regarding the location of facilities at the re-opened hatchery are subject to minor changes within the Limits of Work.

Volume I Section 2.7.7 Proposed Project – Proposed Project – City of Yreka Water Supply Pipeline Relocation, paragraphs 1 and 2 on page 2-85:

Additionally, the existing flat panel fish screens for the water supply intakes at Dams A and B may not meet current regulatory agency screen criteria for anadromous fish (USBR 2012a). These fish screens would have to meet the criteria from NMFS, USFWS, and CDFW, and would require updates, if found to be non-compliant. The KRRC recently has proposed to include a permanent fish passage barrier at the Fall Creek Hatchery, located approximately 200 to 300 feet downstream of both Dams A and B (KRRC 2019b), such that there would be no need for updates to the City of Yreka's Dam A or B existing diversion intake structures.

Conceptual level buried and aerial relocation crossings of the pipeline across the Klamath River have been identified for feasibility and further evaluation. It is desired that any buried crossing should have adequate cover to compensate for the vertical scour during dam removal and the subsequent variations in the river flows and longitudinal profile. As the construction of the relocated crossing needs to happen prior to Iron Gate Dam removal, the cover over the pipe would likely have to exceed 12 feet. An open-cut construction approach would therefore, potentially require significant sediment and rock excavation under water and is not considered as a viable option. Considering this, the KRRC has identified and is proposing one of the following three options for the reconstruction of the Klamath River crossing of the Yreka pipeline:

1. A new buried pipeline by micro-tunneling in the immediate vicinity of the existing waterline crossing.
2. A new aerial pipeline on a dedicated utility pipe crossing in the immediate vicinity of the existing waterline crossing.
3. A new buried pipeline and an aerial pipeline crossing on a new ~~the existing timber traffic~~ bridge along Daggett Road located approximately 2,000 feet upstream of the existing waterline crossing. The new bridge would be of similar length and width as the existing bridge and would be located adjacent to the existing bridge on a revised road alignment.

The alignments for the three options are illustrated in Figure 2.7-17 and detailed in Appendix B: *Definite Plan*.

2.7.8 Other Project Components

Volume I Section 2.7.8 Proposed Project – Proposed Project – Other Project Components, Table 2.7-14. Summary of Other Project Components on page 2-52:

Framework and initial requirements; Phase ~~1~~I assessment in 2018

Volume I Section 2.7.8.5 Proposed Project – Proposed Project – Other Project Components – Cultural Resources, paragraph 3 on page 2-95:

The Draft Cultural Resources Plan, submitted with the Definite Plan ~~CITE~~, describes Section 106 consultation completed by the date of submission and led by KRRC, ~~and PacifiCorp,~~ acting as FERC's non-federal representatives~~,~~ for carrying out consultation pursuant to Section 106, ~~and~~ as well as the status of consultation with affected tribes and other tribal organizations. PacifiCorp is also a non-federal representative for FERC, but has not been actively involved in the consultation process.

Volume I Section 2.7.8.7 Proposed Project – Proposed Project – Other Project Components – Water Quality Monitoring and Construction BMPs, paragraph 1 on page 2-98:

The water quality parameters measured at each of the monitoring locations in the Water Quality Monitoring Plan is summarized in Table 2.7-18. Time-series (continuous) water quality and stream discharge data along with discrete water quality samples would be collected to assess the water quality impacts of the Proposed Project. The Water Quality Monitoring Plan also contains laboratory testing of reservoir sediment samples collected ~~in~~ by KRRC from November 28, 2017 to December 1, 2017 ~~by the USGS~~ to develop an SSC versus turbidity relationship for the reservoir sediments, including a laboratory protocol for the SSC/turbidity relationship to identify the accuracy and reliability of the relationship along with any uncertainties and specific field verification testing necessary during dam removal.

2.7.9 KHSA Interim Measures

Volume I Section 2.7.9 Proposed Project – Proposed Project – KHSA Interim Measures, Table 2.7-19. KHSA Interim Measures Relevant to California Under Existing Conditions and the Proposed Project, row 1 (IM1 – Interim Measures Implementation Committee [IMIC]) column 5 (Proposed Project) on page 2-103:

Would not continue and cease to exist when the KHSA is fully implemented
~~Would continue separate from the Proposed Project~~[2]

2.7.10 Land Disposition and Transfer

Volume I Section 2.7.10 Proposed Project – Proposed Project – Land Disposition and Transfer, paragraph 1 on page 2-108:

The Proposed Project includes the transfer of PacifiCorp lands immediately surrounding the Lower Klamath Project ("Parcel B lands") (Figure 2.7-18) from PacifiCorp to the KRRC prior to dam removal (this transfer is the subject of the KRRC's ~~*a separate*~~ *Joint Application for Approval of License Amendment and License Transfer* submitted to FERC ~~application~~ on September 23, 2016). The

Proposed Project then provides that following dam removal, the KRRC would transfer Parcel B lands to the states, or to a designated third-party transferee. The lands would thereafter be managed for public interest purposes (e.g., tribal mitigation, river-based recreation, wetland restoration, etc.) (KHSA Section 7.6.4). Pursuant to the KHSA, decisions about the land transfer would occur following dam removal, and the outcome of who the lands will ultimately be transferred to and what they will be used for is uncertain. While this draft EIR analyzes the disposition and transfer of Parcel B lands at a general level, the specific impacts associated with the transfers and any future land uses remain uncertain.

2.9 References

Volume I Section 2.9 Proposed Project – References, pages 2-111 through 2-113, includes the following revisions:

Braunworth, W. S., and T. Welch, R. Hathaway. 2002. Water allocation in the Klamath Reclamation Project, 2010: an assessment of natural resource, economic, social, and institutional issues with a focus on the Upper Klamath Basin. Special Report 1037 dated December 2002.

CDFG (California Department of Fish and Game). 2004. September 2002 Klamath River fish-kill: final analysis of contributing factors and impacts. Northern California-North Coast Region. Redding, California.

Kann, J., and S. Corum. 2006. Summary of 2005 toxic Microcystis aeruginosa trends in Copco and Iron Gate reservoirs on the Klamath River, CA. Technical Memorandum. Prepared by Aquatic Ecosystem Sciences, LLC, Ashland, Oregon and the Karuk Tribe Department of Natural Resources for the Karuk Tribe Department of Natural Resources, Orleans, California.

KRRC (Klamath River Renewal Corporation). 2019a. Preliminary wetland impacts and restoration schedule – Copco and Iron Gate. Prepared by KRRC Technical Representatives: AECOM Technical Services Inc., Oakland, California, CHM Smith, Portland, Oregon, and River Design Group, Corvallis, Oregon.

KRRC. 2019b. Request for section 401 water quality certification; application for surrender of license for major project and removal of project works; FERC Project No. 2082-063 and 14803-001 (Lower Klamath Project). Prepared by KRRC, Berkeley, California for State Water Resource Control Board, Sacramento, California.

NMFS (National Marine Fisheries Service). 2006. Decision in the matter of Klamath Hydroelectric Project, FERC Project Number 2082. Docket Number 2006-NOAA Fisheries Service-0001, September 27, 2006. Alameda, California.

Available at:
http://www.fws.gov/yreka/P2082/20060927/2Klamath_DNO_Final.pdf.

PacifiCorp. 2015. Licensed hydropower development recreation reports, FERC Form 80. Docket no. P-2082. Prepared for FERC.

USBR (U. S. Bureau of Reclamation). 2010. Klamath River Sediment Sampling Program, Phase I – Geologic Investigations. September.

Other references cited as part of text included in the Section 2 list of revisions:

FERC (Federal Energy Regulatory Commission). 2007. Final Environmental Impact Statement for Hydropower License, Klamath Hydroelectric Project, FERC Project No. 2082-027, FERC/EIS-0201F. Washington, D.C., Federal Energy Regulatory Commission, Office of Energy Projects, Division of Hydropower Licensing. https://www.ferc.gov/industries/hydropower/enviro/eis/2007/11-16-07.asp

KRRC (Klamath River Renewal Corporation). 2018. Comments on Draft Water Quality Certification for Klamath River Renewal Corporation's Lower Klamath Project, Federal Energy Regulatory Commission Project No. 1480. Prepared by KRRC, San Francisco, California for State Water Resources Control Board, Sacramento, California.

NMFS and CDFW (National Marine Fisheries Service and California Department of Fish and Wildlife). 2018. Technical Staff Recommendation for Klamath River Hatchery Operations in California Post-Dam Removal. Arcata, California.

USBR (U. S. Bureau of Reclamation). 2012a. Detailed Plan for Dam Removal – Klamath River Dams, Klamath Hydroelectric Project, FERC License No. 2082, Oregon – California. July 2012. Available from: https://www.fws.gov/yreka/klamrest.html.

USBR. 2012b. Hydrology, Hydraulics and Sediment Transport Studies for the Secretary's Determination on Klamath River Dam Removal and Basin Restoration, Technical Report No. SRH-2011-02. Prepared for Mid-Pacific Region, Bureau of Reclamation, Technical Service Center, Denver, Colorado. Available from: https://www.fws.gov/yreka/klamrest.html.

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3 ENVIRONMENTAL SETTING, IMPACTS, AND MITIGATION

3.1 Introduction

3.1.6 Summary of Available Hydrology Information for the Proposed Project

After circulation of the Draft EIR, the applicable biological opinion and the operational flow requirements for the Klamath River changed and changes to this section to address those changes are printed in this Final EIR section. None of the changes result in significant new information in the EIR under the meaning of CEQA Guidelines, section 15088.5, subdivision (a):

> New information added to an EIR is not 'significant' unless the EIR is changed in a way that deprives the public of a meaningful opportunity to comment upon a substantial adverse environmental effect of the project or a feasible way to mitigate or avoid such an effect (including a feasible project alternative) that the project's proponents have declined to implement.

However, the changes were numerous enough that reprinting the section rather than simply including a list of revisions was warranted to improve clarity and readability of the document.

The 2012 KHSA EIS/EIR evaluated the potential environmental impacts of removing J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate dams. As part of the analyses, Klamath River flows were modeled for periods before, during, and after dam removal in a number of technical studies referenced in the 2012 KHSA EIS/EIR[1], as well as in the environmental document itself. Flow assumptions for the model largely were based on the forecasted operations of the USBR's Klamath Irrigation Project, located in the Upper Klamath Basin. In the 2012 KHSA EIS/EIR, implementation of the Klamath Basin Restoration Agreement (KBRA) (see Section 2.6.3 *Klamath Settlement Agreements*) was considered to be a "connected action" to dam removal. Thus, the model used NMFS 2010 Biological Opinion flows (2010 BiOp Flows) for analysis of the scenario where dams would remain in place, and it modified 2010 BiOp flows based on KBRA operations criteria for the Klamath Irrigation Project (KBRA Flows) for analysis of the scenario where dams would be removed (USBR and CDFG 2012). The KBRA expired on December 31, 2015 due to a lack of Congressional authorization.

[1] Key technical studies are the Klamath River total maximum daily loads (TMDL) Final Staff Report (North Coast Regional Board 2010) and the Hydrology, Hydraulics, and Sediment Transport Studies for the Secretary's Determination on Klamath River Dam Removal and Basin Restoration (USBR 2012a).

Separate and independent of the Proposed Project, the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) issued a Joint Biological Opinion for the Klamath Irrigation Project in 2013 specifying the hydrology requirements for the Klamath River (2013 BiOp Flows) and the standard to which the USBR Klamath Irrigation Project operated at that time (NMFS and USFWS 2013). Accordingly, the 2013 BiOp Flows served as the USBR Klamath Irrigation Project operational flow requirements for the Klamath River and specified the minimum flow requirements downstream of Iron Gate Dam at the time of the Notice of Preparation for the Lower Klamath Project EIR (i.e., December 22, 2016) and the Draft EIR considered the potential effects of dam removal using the 2013 BiOp Flows to represent existing hydrology for the period May 2013 to March 2019.

The estimated Klamath River flows under 2013 BiOp operations criteria (2013 BiOp Flows) were compared to the flows modeled for the 2012 KHSA EIS/EIR, which adopted KBRA operations criteria (KBRA Flows), to determine whether 2013 BiOp Flows were sufficiently similar that hydrologic model outputs developed for the 2012 KHSA EIS/EIR would still be applicable. The comparison references and builds upon an analysis conducted in the 2012 KHSA EIS/EIR Supplemental Information Report (SIR) (USBR 2016) for the same purpose. USBR (2016) concluded that the relatively small flow differences between 2013 BiOp and KBRA Flows would not substantively alter the conclusions in the 2012 KHSA EIS/EIR for those environmental resources that would be affected by flows (i.e., water quality, aquatic resources, flood risk, recreation). While the specific timing of flows and the likelihood of exceeding a specific flow during individual months changes between the 2013 BiOp and KBRA flows, the range of 2013 BiOp Flows is within the range of modeled KBRA Flows approximately 99.9 percent of the time at Keno and Iron Gate dams, so the previously modeled results are sufficiently representative of the range of flow conditions under 2013 BiOp Flows. Modeled 2013 BiOp Flows less than or greater than modeled KBRA Flows would occur too infrequently (i.e., 0.01 percent of the time or less) to substantially alter the range of flow conditions in the Klamath River or previous model results using KBRA Flows. Additional details are provided in Section 3.1.6.2 *Comparison of Klamath River Flows under 2013 BiOp Operational Criteria versus KBRA Operational Criteria*.

In 2017, a court order required USBR to implement three specific flows in the Klamath River in addition to the 2013 BiOp Flows, as measured immediately downstream of Iron Gate Dam: annual winter-spring surface flushing flows, biennial winter-spring deep flushing flows, and spring-summer emergency dilution flows (U.S. District Court 2017). The court also required that USBR re-initiate consultation with NMFS and the USFWS regarding the effects of the Klamath Irrigation Project operations on coho salmon in the Klamath River and Lost River and shortnose suckers in the Upper Klamath Basin (U.S. District Court 2017).

The flow-related analyses in this EIR acknowledge the re-initiation of consultation on the 2013 BiOp Flows by considering the 2017 court-ordered flushing and emergency dilution flow requirements downstream of Iron Gate Dam as interim flow requirements until completion of formal consultation. The 2017 court-ordered flushing and emergency dilution flows were not modeled as part of existing hydrology conditions for the Proposed Project, because they went into effect in February 2017, after the December 2016 Notice of Preparation was filed. The 2017 court-ordered flushing and emergency dilution flows are analyzed in several locations in this EIR, including, but not limited to, Section 3.24 *Cumulative Effects*, Section 4.2 *No Project Alternative*, and Section 4.4 *Continued Operations with Fish Passage Alternative*, where the aforementioned two alternatives assume that Iron Gate Dam would remain in place.

After the issuance of the Lower Klamath Project Draft EIR on December 27, 2018, the applicable biological opinion and the operational flow requirements for the Klamath River changed again in March 2019, when the new biological opinions were issued by NMFS (2019) and USFWS (2019). The 2019 Biological Opinion flows (2019 BiOp Flows) are now the current operational flow requirement for the Klamath River. The 2019 BiOp Flows are analyzed in the Lower Klamath Project Final EIR as a second CEQA baseline, representing flows under newly defined existing conditions. Inclusion of two existing conditions (i.e., baseline) hydrology regimes in the Lower Klamath Project Final EIR is consistent with CEQA Guidelines section 15125, subdivision (a).

The estimated Klamath River flows under the 2019 BiOp Flows were also compared to the previously modeled KBRA Flows to determine whether 2019 BiOp Flows were sufficiently similar that hydrologic model outputs developed for the 2012 KHSA EIS/EIR would still be applicable. While the specific timing of flows and the likelihood of exceeding a specific flow during individual months changes between the 2019 BiOp and KBRA flows, the range of 2019 BiOp Flows is within the range of modeled KBRA Flows approximately 99.0 percent of the time at Keno Dam and approximately 99.9 percent of the time at Iron Gate Dam, so the previously modeled results are sufficiently representative of the range of flow conditions under 2019 BiOp Flows. Modeled 2019 BiOp Flows outside the range of modeled KBRA Flows at Keno Dam are exclusively due to 2019 BiOp Flows being less than minimum KBRA Flows, with 2019 BiOp Flows never exceeding KBRA Flows. Modeled 2019 BiOp Flows outside the range modeled KBRA Flows would occur too infrequently (i.e., 0.1 percent of the time or less at Keno Dam and 0.01 percent of the time or less at Iron Gate Dam) to substantially alter the range of flow conditions in the Klamath River or previous model results using KBRA Flows.

Based on the above discussion, the sediment transport model developed for the 2012 KHSA EIS/EIR would produce nearly identical suspended sediment concentrations during the main drawdown period between January and May if it was run using 2013 BiOp Flows or 2019 BiOp Flows, because the 2013 BiOp,

2019 BiOp, and KBRA Flows are similar for all water year types (generally within a few percentage points). The detailed analysis presented below assesses the magnitude, timing, and distribution of flows across multiple water years to verify that the range of flows modeled under KBRA Flows are still appropriate for analyses in this EIR.

3.1.6.1 Klamath River Flows under the 2013 BiOp Operations Criteria for the Klamath Irrigation Project

Under the 2013 BiOp Flows, current and future (2013 to 2023) operations of the Klamath Irrigation Project in the Upper Klamath Basin include irrigation deliveries consistent with historic operations (subject to water availability), while maintaining Upper Klamath Lake and Klamath River hydrologic conditions that avoid jeopardizing the continued existence of listed species and adverse modification of designated critical habitat (NMFS and USFWS 2013). Operations under the 2013 BiOp Flows include two distinct, real-time water management approaches during the fall/winter (October through February) and spring/summer (March through September) periods. The fall/winter and spring/summer water management approaches prioritize different goals during the two periods, but they are designed to meet the ecological needs of the Upper Klamath Lake ESA-listed Lost River sucker and shortnose sucker and ESA-listed coho salmon downstream of Iron Gate Dam, while also maintaining full irrigation deliveries in accordance with existing contracts, contingent upon available water supplies.

In general, Klamath River flows during fall/winter and spring/summer are formulaically calculated as specified in the 2013 BiOp to create variable river flows downstream of Iron Gate Dam that approximates the natural hydrology, while ensuring minimum flows are met. The 2013 BiOp Flow requirements are expressed as flows at Iron Gate Dam because the dam is the compliance point for Klamath River flows under the 2013 BiOp. Flows at Iron Gate Dam during fall/winter are determined based on hydrologic indicators of upper Klamath Basin conditions and 2013 operational criteria (e.g., ecological requirements). At the beginning of the spring/summer period (i.e., March 1), an Environmental Water Account (EWA) is calculated to determine the volume of water available from Upper Klamath Lake for Klamath River flows between March 1 and September 30. The EWA volume is updated on the first of April, May, and June to refine the estimate of water volume available for Klamath River flows from July through September. During the later portion of the spring/summer period (i.e., July through September), Klamath River flows are based on the remaining EWA volume and 2013 BiOp operational criteria, including maintaining minimum flows downstream of Iron Gate Dam. Minimum flows downstream of Iron Gate Dam under the 2013 BiOp Flows are presented in Table 3.1-1.

Table 3.1-1. Minimum Klamath River Discharge below Iron Gate Dam under the 2013 BiOp Flows.

Month	Iron Gate Dam Average Daily Minimum Target Flows (cfs)
January	950
February	950
March	1,000
April	1,325
May	1,175
June	1,025
July	900
August	900
September	1,000
October	1,000
November	1,000
December	950

Source: NMFS and USFWS 2013

The 2013 BiOp Flows are primarily formulaically determined by the 2013 BiOp operations criteria, but the 2013 BiOp also includes provisions to vary from the formulaic approach for determining the Klamath River flows to address high flow events, emergency situations, high disease rates, or high water temperatures in the Klamath River downstream of Iron Gate Dam. The 2013 BiOp includes a process for deviations from the 2013 BiOp formulaic use of EWA water, but it does not specify changes in flows that would occur to address ecological objectives, and it requires each proposed deviation to show that it would result in improved ecological conditions for listed species and would not cause an adverse effect to listed species or critical habitat (NMFS and USFWS 2013).

3.1.6.2 Comparison of Klamath River Flows under the 2013 BiOp Operational Criteria and the KBRA Operational Criteria

In the 2012 KHSA EIS/EIR, the projected Klamath River flows were modeled using the Water Resources Integrated Modeling System (WRIMS) coupled with a RiverWare-based model called the Klamath Dam Removal Model (KDRM) (USBR 2012a, 2016). The coupled model was used to analyze the Klamath River conditions using either the 2010 BiOp Flows or the KBRA Flows based on the KBRA operations criteria for the Klamath Irrigation Project. The 2010 BiOp and the KBRA Flows are generally very similar, particularly from January through May when flows are effectively the same between the two flow scenarios (USBR 2012a). The estimated Klamath River flows under the 2013 BiOp Flows were modeled using an updated and modified WRIMS model (USBR 2012b). The WRIMS model used to evaluate the 2013 BiOp Flows is also known as the

Klamath Basin Planning Model (KBPM) and the modeled flow results are sometimes referred to as the "2013 BO" in USBR documents (USBR 2012b, 2016).

In the Draft Environmental Impact Report (EIR), modeled Klamath River flows under the 2013 BiOp and the KBRA operations criteria are compared based on the time period analyzed by USBR (2016), with monthly flow exceedances downstream of Iron Gate Dam and Keno Dam calculated for the 29-year period from 1980 to 2009. However, modeled KBRA Flows from the USBR sediment transport modeling (USBR 2012a) overlap with 2013 BiOp Flows for a longer period, with a 31-year analysis period from 1980 to 2011. The range of potential flow conditions in the Klamath River is better represented by a longer analysis period, so the following comparison of modeled 2013 BiOp and KBRA flows is updated from the Draft EIR to use the 1980 to 2011 modeled KBRA Flows from the USBR sediment transport modeling (USBR 2012a) along with the corresponding 1980 to 2011 modeled 2013 BiOp Flows. As a result, the specific values of annual and monthly average 2013 BiOp and KBRA flows and the monthly flow exceedances below are slightly different from those presented in the Draft EIR, but the overall trends and conclusions of the comparison between 2013 BiOp and KBRA flows remain the same.

Modeled Klamath River flows under the 2013 BiOp and the KBRA operations criteria are nearly identical (i.e., less than 30 cfs different) when examined on an average annual basis, with flows downstream of Iron Gate Dam averaging approximately 1,896 cfs and 1,923 cfs, respectively, during the 1980 to 2011 comparison period when both modeled 2013 BiOp and KBRA Flows are available. The average annual 2013 BiOp and KBRA Flows downstream of Keno Dam from 1980 to 2011 are also nearly identical (i.e., less than 15 cfs different), averaging approximately 1,401 cfs and 1,387 cfs, respectively. While the modeled flows upstream and downstream of the Hydroelectric Reach are within 1.0 to 1.4 percent on an average annual basis, there is a larger difference between the average monthly 2013 BiOp and KBRA flows over the entire 1980 to 2011 comparison period (Tables 3.1-2 and 3.1-3). The most prominent difference is that the 2013 BiOp Flows when compared to KBRA Flows generally require higher flows in the fall months (October through December) and allow lower flows in the summer months (June through August). Downstream of Iron Gate Dam, fall 2013 BiOp Flows average approximately 200 cfs (8 to 19 percent) more than fall KBRA Flows; summer 2013 BiOp Flows average approximately 100 cfs (6 to 16 percent) less than summer KBRA Flows (Tables 3.1-2 and 3.1-3).

Variations in the average monthly 2013 BiOp and KBRA Flows between years are also compared using statistical tests (i.e., paired heteroscedastic t-tests) of the average monthly 2013 BiOp and KBRA Flows for the 31-years between 1980 and 2011, with probability values (p-values) less than 0.05 indicating a significant difference and p-values and less than 0.01 indicating a highly significant

difference. (Note: heteroscedastic refers to a dataset with unequal variability or scatter across a set of predictor variables and is generally appropriate for flow data.) At both Iron Gate and Keno dams, p-values demonstrate the average monthly 2013 BiOp and KBRA Flows are statistically different during multiple months throughout the year, especially during fall months (Tables 3.1-2 and 3.1-3). Consistent with the average monthly flow comparison for all years above (i.e., the 31-year average of the average monthly flows), the calculated p-values show that differences between average monthly 2013 BiOp and KBRA Flows at Iron Gate Dam are highly significant during the fall months of October and November and range from highly significant to significant during the summer months of July and August, respectively. P-values also indicate average monthly 2013 BiOp and KBRA Flows at Iron Gate Dam are significantly different during February and highly significantly different during April. There are also highly significant and significant changes in the average monthly 2013 BiOp and KBRA Flows at Keno Dam, but these changes primarily occur during fall months (October through December) (Table 3.1-3). The calculated p-values document differences between average monthly 2013 BiOp and KBRA Flows at Keno Dam are highly significant in October and November and significant in December. Average monthly 2013 BiOp and KBRA Flows at Keno Dam also are highly significantly different in April, but there is no significant difference between average monthly 2013 BiOp and KBRA Flows at Keno during other months (i.e., January through March and May through September). The differences in 2013 BiOp Flows versus KBRA Flows reflect the joint goal of NMFS and USFWS to protect ESA-listed fish that rely on a shared but finite aquatic resource (most notably, the two endangered sucker species in Upper Klamath Lake and threatened coho salmon in the Klamath River below Iron Gate Dam) (NMFS and USFWS 2013).

Table 3.1-2. Average Monthly Flow at Iron Gate Dam From 1980 to 2011 for 2013 Joint Biological Opinion and KBRA Operations Criteria.

Month	Average Monthly Flow Downstream of Iron Gate Dam		Differences (2013 BiOp vs. KBRA Flows)		p-value
	KBRA Operations Criteria	2013 BiOp Operations Criteria			
	(cfs)	(cfs)	(cfs)	(percent)	--
Oct	1069	1260	190	18	2.0E-07
Nov	1147	1367	220	19	2.2E-05
Dec	1579	1699	120	8	0.089
Jan	2032	2021	-10	-1	0.87
Feb	2590	2446	-144	-6	0.042
Mar	3384	3290	-94	-3	0.32
Apr	3344	3072	-272	-8	0.0024
May	2461	2524	63	3	0.48
Jun	1924	1804	-119	-6	0.20

Month	Average Monthly Flow Downstream of Iron Gate Dam		Differences (2013 BiOp vs. KBRA Flows)		p-value
	KBRA Operations Criteria	2013 BiOp Operations Criteria			
	(cfs)	(cfs)	(cfs)	(percent)	--
Jul	1299	1095	-203	-16	0.0037
Aug	1122	1054	-68	-6	0.023
Sep	1190	1163	-27	-2	0.27

Data source: USBR 2010, 2019a.

Table 3.1-3. Average Monthly Flow at Keno Dam From 1980 to 2011 for 2013 Joint Biological Opinion and KBRA Operations Criteria.

Month	Average Monthly Flow Downstream of Keno Dam		Differences (2013 BiOp vs. KBRA Flows)		p-value
	KBRA Operations Criteria	2013 BiOp Operations Criteria			
	(cfs)	(cfs)	(cfs)	(percent)	--
Oct	684	885	200	29	2.9E-07
Nov	743	966	223	30	1.6E-04
Dec	1040	1204	165	16	0.018
Jan	1437	1409	-28	-2	0.67
Feb	1843	1768	-75	-4	0.23
Mar	2601	2548	-53	-2	0.50
Apr	2607	2394	-213	-8	0.0033
May	1835	1952	117	6	0.15
Jun	1456	1374	-82	-6	0.38
Jul	886	772	-114	-13	0.11
Aug	745	749	4	1	0.90
Sep	814	825	11	1	0.69

Data source: USBR 2010, 2019a.

Figures 3.1-1 and 3.1-2 present monthly flow exceedances for modeled 2013 BiOp and KBRA Flows downstream of Iron Gate Dam and Keno Dam, respectively, for the 31-year period from 1980 to 2011, where this period encompasses water year types ranging from very dry to very wet. Flows with a 1 to 99 percent probability of occurring at Iron Gate or Keno dam are shown in the monthly flow exceedance curves, but they do not display the upper maximum flows (i.e., exceedance probability less than 1 percent) or lower minimum flows (i.e., exceedance probability greater than 99 percent) that may occur under 2013

BiOp and KBRA operations criteria. Figures 3.1-1 and 3.1-2 also present the results of the paired heteroscedastic t-tests of the average monthly 2013 BiOp and KBRA Flows for the period 1980 to 2011, with highly significant differences between the average monthly 2013 BiOp and KBRA Flows shown in bright yellow and significant differences between the average monthly 2013 BiOp and KBRA Flows shown in light yellow. Monthly flow exceedance plots are particularly useful for comparing differences between modeled 2013 BiOp and KBRA Flows for different water year types (i.e., wet, median, and dry year types) since exceedance curves present the probability a flow would occur. Here, a wet year type is defined as the highest 10 percent of flows, such that wet year flows are characterized by those at the 10 percent exceedance point in Figures 3.1-1 and 3.1-2 (i.e., typical wet year flows would be exceeded 10 percent of the time). Similarly, a median year is characterized by flows at the 50 percent exceedance point, while a dry year is characterized by flows at the 90 percent exceedance point. While Table 3.1-2 and Table 3.1-3 summarize modeled *average* monthly flows and the significance of the differences between these flows under the 2013 BiOp and KBRA operations criteria, the monthly flow exceedance plots in Figures 3.1-1 and 3.1-2 present a more in-depth comparison of the range of possible flows by month and their probability of occurring under the two operations scenarios.

The overall range of 2013 BiOp and KBRA Flows is generally similar between the two curves such that modeling using KBRA Flows would typically simulate a similar range of flows, but the monthly flow exceedance plots indicate there is either a temporal shift in the distribution of flows expected within a given month or a shift in the water year type distribution between 2013 BiOp and KBRA Flows (Figures 3.1-1 and 3.1-2). A temporal shift in the distribution of flows expected within a given month is indicated by comparing modeled 2013 BiOp and KBRA Flows across different months. For example, the first panel in Figure 3.1-1 shows that flows in the Klamath River downstream of Iron Gate Dam in October under the 2013 BiOp Flows would be 50 to 400 cfs greater than under the KBRA Flows, regardless of whether it is a wet year (i.e., 10 percent exceedance), a median year (i.e., 50 percent exceedance), or a dry year (i.e., 90 percent exceedance). In October, the modeled 2013 BiOp Flows at Iron Gate Dam range from slightly less than 2,000 cfs to approximately 1,000 cfs, which is different from the range of modeled KBRA Flows in October, but similar to the range of modeled KBRA Flows in September. The KBRA Flow exceedance curve for the month of September ranges from slightly less than 1,600 cfs to slightly less than 1,000 cfs with a similar shape as the October 2013 BiOp Flows, except during wetter years (i.e., less than 10 percent exceedance) when the September KBRA Flows remain fairly similar, but October 2013 BiOp Flows continue to increase. Thus, the October 2013 BiOp Flows typically represent a one-month temporal shift of the September KBRA Flows. Similar shifts in the monthly distribution of flows also occur in July and August downstream of Iron Gate Dam where the range and shape of the July 2013 BiOp Flows are within approximately 150 cfs or less of the August KBRA Flows (Figure 3.1-1).

The shift in the distribution of flows by water year type is characterized by whether the flow within individual months is higher during some water year types and lower during other water year types when comparing between 2013 BiOp and KBRA Flows. Variations between the modeled 2013 BiOp and KBRA Flows during different water year types is evaluated by comparing the flows at the 10 percent exceedance for wet years, 50 percent exceedance for median years, and 90 percent exceedance for dry years. At both Iron Gate and Keno dams from July through September, the modeled 2013 BiOp Flows are less than modeled KBRA Flows during wet years (i.e., 10 percent exceedance), while the 2013 BiOp Flows are greater than or similar to KBRA Flows during dry years (i.e., 90 percent exceedance) (Figures 3.1-1 and 3.1-2). The lower middle left panel of Figure 3.1-1 highlights this trend during July at Iron Gate Dam where the wet year 2013 BiOp Flow is approximately 700 cfs less than the KBRA Flow, the median year 2013 BiOp Flow is approximately 100 cfs less than the KBRA Flow, and the dry year 2013 BiOp Flow is approximately 150 cfs greater than the KBRA Flow. At both Iron Gate and Keno dams, June is a unique month where there is both a monthly temporal shift in the range of flows (i.e., KBRA Flows in May range from approximately 1,100 to 6,000 cfs, while 2013 BiOp Flows in June range from approximately 5,600 cfs to 1,000 cfs) and a water year type shift (i.e., 2013 BiOp Flows are greater than KBRA Flows in wet years [e.g. 10 percent exceedance], less in median years [e.g., 50 percent exceedance], and approximately the same in dry years [e.g., 90 percent exceedance]).

While a temporal shift in flow across months or a shift in the distribution of flow by water year type indicates 2013 BiOp Flows during wet, median, and dry years are typically within the range of KBRA Flows, peak 2013 BiOp Flows are potentially greater than peak KBRA Flows during extremely wet years (i.e., exceedance probability less than 2 percent). During January and February, the peak 2013 BiOp Flows are approximately 850 to 1,000 cfs (i.e., 7 to 8 percent) greater than peak KBRA Flows (Figures 3.1-1 and 3.1-2). The peak 2013 BiOp Flows would be outside of the range of KBRA Flows and modeling using KBRA Flows would not characterize these peak flows, but these flows would be unlikely to occur (i.e., exceedance probability less than 2 percent) so their potential influence on Klamath River hydrology would be limited. The range of 2013 BiOp Flows, including peak flows, during March through December is within the range of KBRA Flows, so modeling using KBRA Flows would represent the range of 2013 BiOp Flows during these months.

Despite the aforementioned differences between the modeled 2013 BiOp and KBRA Flows, the KBRA Flows represent 99.9 percent of 2013 BiOp Flows in the Klamath River at Iron Gate and Keno dams. Modeled 2013 BiOp Flows outside the range modeled KBRA Flows occur too infrequently (i.e., 0.01 percent of the time or less at Keno and Iron Gate dam) to substantially alter the range of flow conditions in the Klamath River. While flow exceedance curves representing typical flow conditions (i.e., 1 to 99 percent exceedance) would not capture the

extremely infrequent modeled 2013 BiOp Flows outside the range modeled KBRA Flows, a comparison of the 2013 BiOp and KBRA maximum and minimum monthly flow exceedance further highlights that typical 2013 BiOp Flows are sufficiently represented by KBRA Flows. Modeled 2013 BiOp Flows are generally within the range of KBRA Flows except for extremely wet years (i.e., exceedance probability less than 2 percent) since maximum monthly KBRA Flows are similar to or slightly greater than the maximum monthly 2013 BiOp Flows for flow exceedances of 2 to 10 percent (representing wetter water years), and the minimum monthly KBRA Flows during drier years (i.e., greater than 90 percent exceedance) are less than the corresponding minimum monthly 2013 BiOp Flows (Figures 3.1-3(a) and (b)). Flow exceedances where the minimum 2013 BiOp Flows are less than minimum KBRA Flows (e.g., minimum flow exceedances 20 percent or less at Iron Gate Dam) or the maximum 2013 BiOp Flows are greater than the maximum KBRA Flows (e.g., maximum flow exceedances 25 to 10 percent at Keno and Iron Gate dams) are due to shifts in the distribution of flows by water year type as previously discussed. Differences between the minimum or maximum monthly 2013 BiOp and KBRA Flows between flow exceedances less than 5 percent or greater than 95 percent would be contained within the overall range of KBRA Flows, thus the range of 2013 BiOp Flows is still typically bracketed by the range of KBRA Flows.

It is reasonable to assume the outputs of hydrologic models using the KBRA Flows represent the majority of the range of results of hydrologic models using the 2013 BiOp Flows because 99.9 percent of modeled 2013 BiOp Flows at Iron Gate and Keno dams are within the range of modeled KBRA Flows. Peak 2013 BiOp Flows during January and February would not be captured by modeled KBRA Flows due to peak 2013 BiOp Flows during these months being greater than modeled KBRA Flows, but the probability of these flows occurring is low (i.e., less than 2 percent). Farther downstream of Iron Gate Dam, Klamath River flow estimates are only affected by assumptions regarding tributary inflows (accretions) that are not affected by operations of the Klamath Irrigation Project[2]. While variations may exist in timing between 2013 BiOp and KBRA Flows, the range of model results would be similar if the 2013 BiOp Flows were used in the hydrologic model rather than the KBRA Flows, since the KBRA Flows typically bracket the 2013 BiOp Flows.

In summary, the hydrologic model outputs previously developed using the KBRA Flows for the 2012 KHSA EIS/EIR are sufficient to estimate conditions under 2013 BiOp Flows. As explained above, the primary differences are temporal shifts in the flow distribution within some months and changes in expected flows

[2] PacifiCorp coordinates operations with the USBR and operates the Lower Klamath Project in compliance with the 2013 BiOp for the Klamath Irrigation Project. The 2013 BiOp does not require independent releases from the Lower Klamath Project to supply the minimum flow requirements downstream of Iron Gate Dam.

in different water year types. The previous KBRA Flows typically bracket the range of 2013 BiOp Flows, supporting the conclusion that the prior modeling using the KBRA Flows sufficiently represents the range of potential effects of Klamath River flows under the 2013 BiOp Flows.

Consequently, this EIR considers the potential effects of dam removal under the Proposed Project by applying existing hydrology information presented in the 2012 KHSA EIS/EIR, as well as in the numerous technical studies that were foundational to that effort. However, potential changes in the previous analysis and technical studies resulting from the differences between 2013 BiOp and KBRA Flows are evaluated and discussed, as necessary.

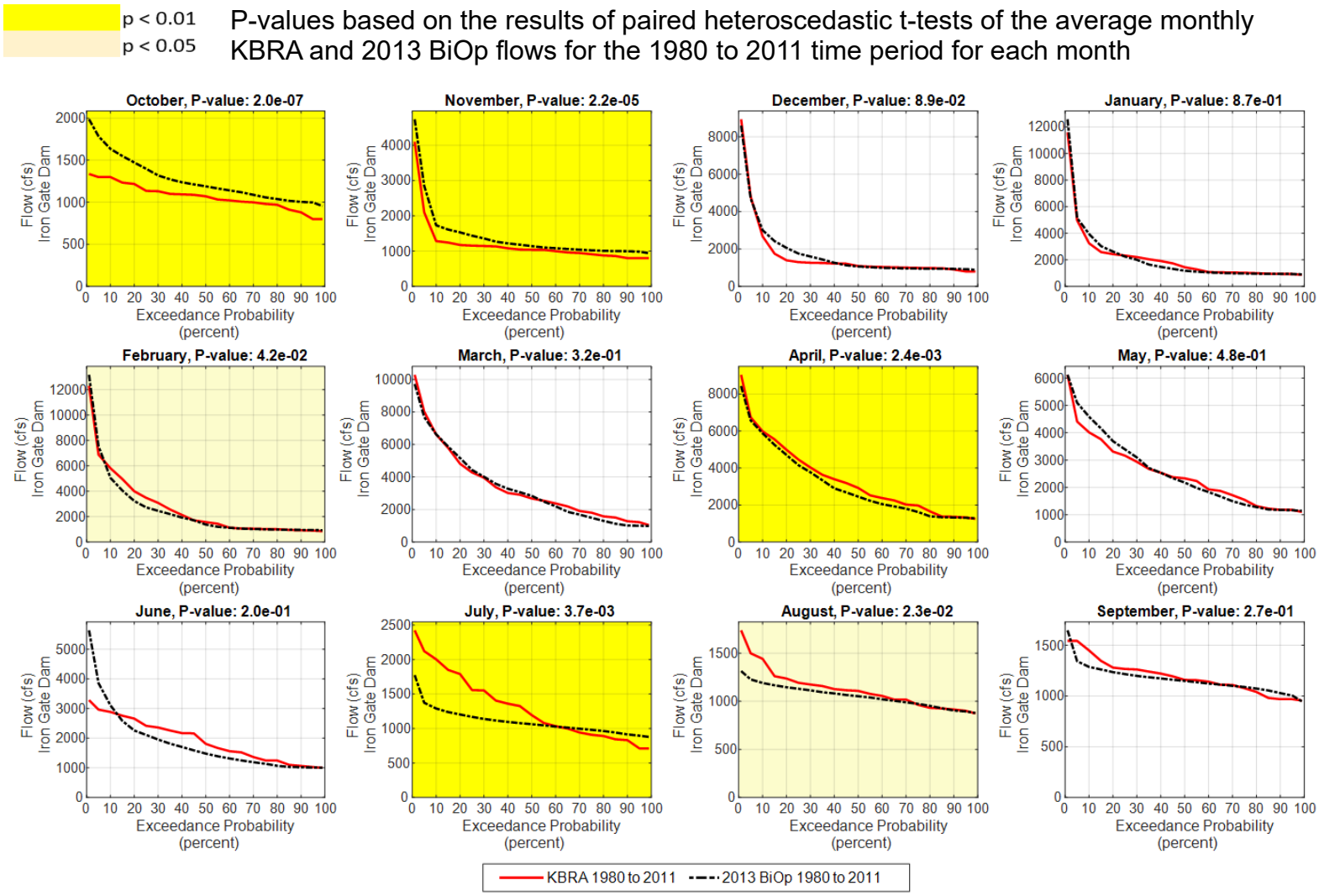

Figure 3.1-1. Monthly Flow Exceedance Curves at Iron Gate Dam for the KBRA Flows (KBRA) and 2013 Joint Biological Opinion Flows (2013 BiOp) Based on Modeled Flows from 1980 to 2011. Data Source: USBR 2010, 2019a. Note: The Scale of the Y-Axis (Flow in cfs) Varies Significantly Between Months. Wet, Median, and Dry Water Year Types Are Characterized by Flows at the 10, 50, 90 Percent Exceedance, Respectively.

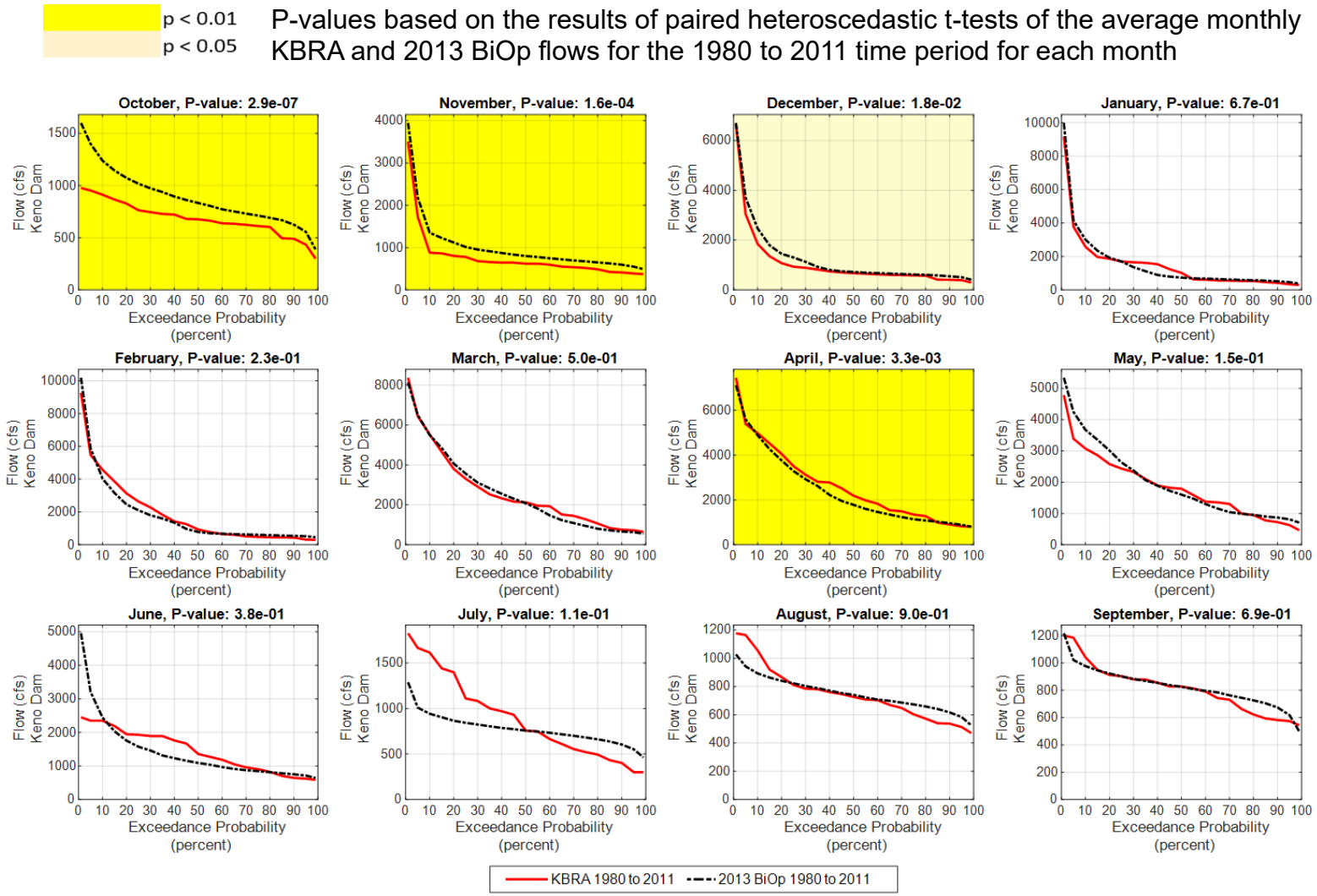

Figure 3.1-2. Monthly Flow Exceedance Curves at Keno Dam for the KBRA Flows (KBRA) and 2013 Joint Biological Opinion Flows (2013 BiOp) Based on Modeled Flows from 1980 to 2011. Data Source: USBR 2010, 2019a. Note: The Scale of the Y-Axis (Flow in cfs) Varies Significantly Between Months. Wet, Median, and Dry Water Year Types Are Characterized by Flows at the 10, 50, 90 Percent Exceedance, Respectively.

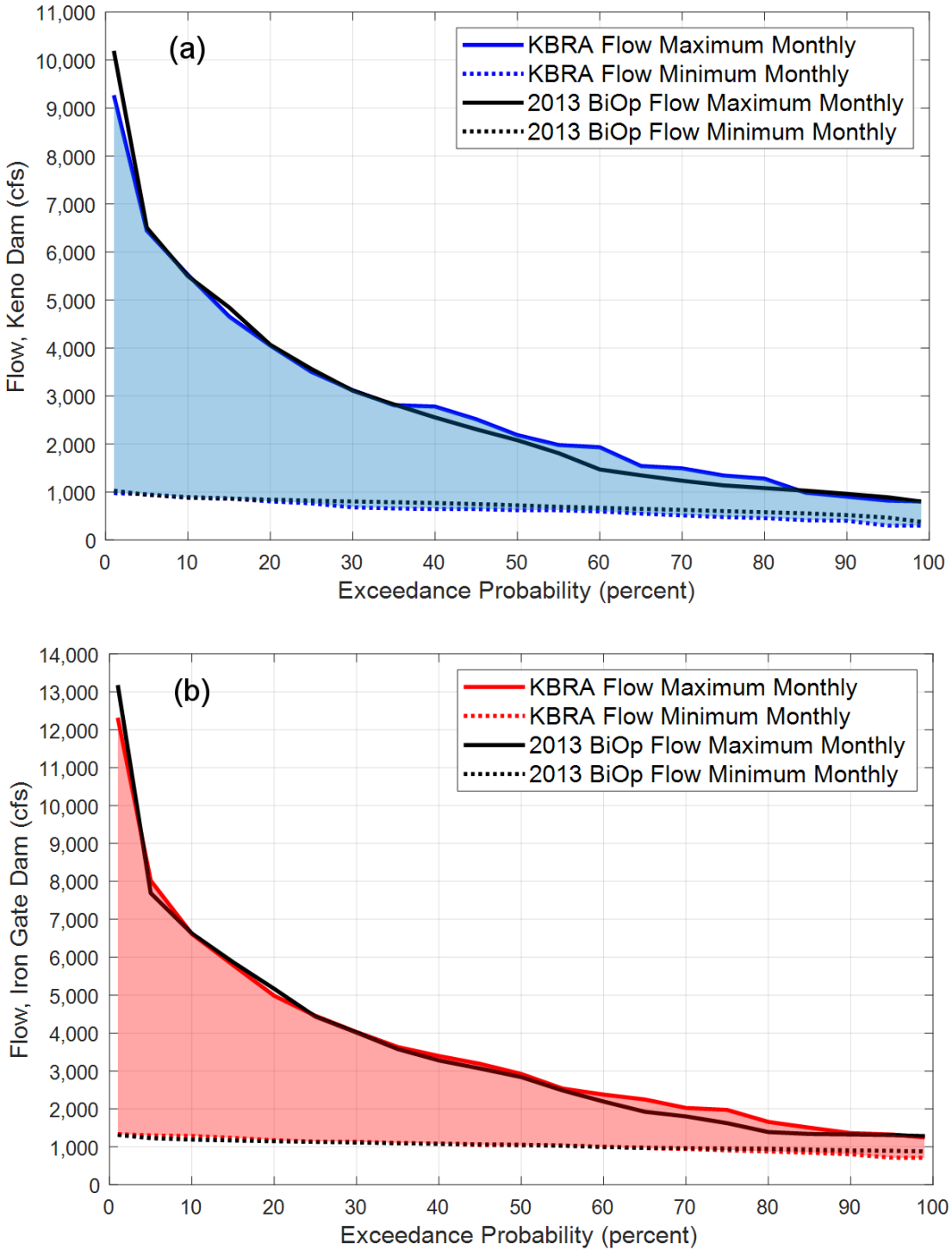

Figure 3.1-3. Comparison of the Maximum and Minimum Monthly Exceedance Curves for the 2013 Joint Biological Opinion (2013 BiOp) and KBRA Flows From 1 to 99 Percent Exceedance Flows at (a) Keno Dam (b) Iron Gate Dam. Data Source: USBR 2010, 2019a.

3.1.6.3 Klamath River Flows under the 2019 BiOp Operations Criteria for the Klamath Irrigation Project

Under the 2019 BiOp Flows, current and future (2019 to 2024) operations of the Klamath Irrigation Project in the Upper Klamath Basin include irrigation deliveries consistent with historical operations (subject to water availability) and flood control purposes, while maintaining Upper Klamath Lake and Klamath River hydrologic conditions that avoid jeopardizing the continued existence of listed species and adverse modification of designated critical habitat (NMFS 2019; USFWS 2019). Operations under the 2019 BiOp Flows include two distinct, real-time water management approaches during the fall/winter and spring/summer periods. The specific time frame associated with the two periods varies slightly between management of flows in the Klamath River and water deliveries by the Klamath Irrigation Project, with fall/winter corresponding to October through February and spring/summer corresponding to March through September for the Klamath River flows. The seasonal time periods for the Klamath Irrigation Project would not alter the management of the Klamath River flows, so they are not discussed further. The fall/winter and spring/summer water management approaches prioritize different goals during the two periods, but they are designed to meet the ecological needs of the Upper Klamath Lake ESA-listed Lost River sucker and shortnose sucker and ESA-listed coho salmon downstream of Iron Gate Dam, while also maintaining full irrigation deliveries in accordance with existing contracts, contingent upon available water supplies.

In general, Klamath River flows during fall/winter and spring/summer are formulaically calculated as specified in the 2019 BiOp to create a hydrograph downstream of Iron Gate Dam that approximates a natural flow regime, while ensuring minimum flows are met. The 2019 BiOp Flow requirements are expressed as flows at Iron Gate Dam because the dam is the compliance point for Klamath River flows under the 2019 BiOp. Flows at Iron Gate Dam during fall/winter and the beginning of spring/summer are determined based on hydrologic indicators of upper Klamath Basin conditions and 2019 operational criteria (e.g., ecological requirements). During the beginning of the spring/summer period (i.e., the first of the month from March through June), an Environmental Water Account (EWA) also is calculated to determine the volume of water available from Upper Klamath Lake for Klamath River flows between March 1 and September 30, including flow releases to manage disease or improve habitat for aquatic resources downstream of Iron Gate Dam. During the later portion of the spring/summer period (i.e., July through September), Klamath River flows are based on the remaining EWA volume and 2019 BiOp operational criteria, including maintaining minimum flows downstream of Iron Gate Dam. Minimum flows downstream of Iron Gate Dam under the 2019 BiOp are presented in Table 3.1-4 and are the same as those specified under the 2013 BiOp.

Table 3.1-4. Minimum Klamath River Discharge below Iron Gate Dam under the 2019 BiOp Flows.

Month	Iron Gate Dam Average Daily Minimum Target Flows (cfs)
January	950
February	950
March	1,000
April	1,325
May	1,175
June	1,025
July	900
August	900
September	1,000
October	1,000
November	1,000
December	950

Source: NMFS 2019; USFWS 2019.

The 2019 BiOp also includes provisions to vary from the formulaic approach for determining the Klamath River flows to address high flow events, emergency situations, or specific ecological objectives. The 2019 BiOp Flows include specific provisions for disease mitigation and habitat flows:

- Releasing approximately 50,000 acre-feet from Iron Gate Dam in a manner that best meets coho salmon needs (e.g., disease mitigation, habitat) in below average to dry years, as defined by the March 1 and/or April 1 EWA volume.
- Releasing an “opportunistic” surface flushing flow from Iron Gate Dam of at least 6,030 cfs for a 72-hour period during the spring period (March 1 to April 15) if hydrologic conditions allow in average to wet years, as defined by the March 1 and April 1 EWA volume.
- Attempting to release deep flushing flows (i.e., 11,250 cfs for 24 hours) when hydrologic conditions and public safety allow, including, but not limited to, Upper Klamath Lake storage to allow for sufficient Link River Dam release capacity, Upper Klamath Lake storage sufficient to protect sucker needs, substantial accretions, and Klamath River tributary discharge that does not result in public safety or property concerns.
- Releasing an additional volume of 20,000 acre-feet for enhanced May/June flows in years in which the April 1 EWA is greater than 400,000 acre-feet (407,000 acre-feet in years 2020, 2022, and 2024) and less than 576,000 acre-feet.

3.1.6.4 Comparison of Klamath River Flows under the 2019 BiOp Operational Criteria and the KBRA Operations Criteria

In the 2012 KHSA EIS/EIR, the projected Klamath River flows were modeled using the Water Resources Integrated Modeling System (WRIMS) coupled with a RiverWare-based model called the Klamath Dam Removal Model (KDRM) (USBR 2012a, 2016). The coupled model was used to analyze the Klamath River conditions using either the 2010 BiOp Flows or the KBRA Flows based on the KBRA operations criteria for the Klamath Irrigation Project. The 2010 BiOp and the KBRA Flows are generally very similar, particularly from January through May when flows are effectively the same between the dams remaining in place (i.e., "dams in") and dams removed (i.e., "dams out") flow scenarios (USBR 2012a). The estimated Klamath River flows under the 2019 BiOp Flows were modeled using the Klamath Basin Planning Model (KBPM), an updated and modified WRIMS model (USBR 2019b).

Modeled Klamath River flows under the 2019 BiOp and the KBRA operations criteria are nearly identical (i.e., less than 30 cfs different) when examined on an average annual basis, with flows downstream of Iron Gate Dam averaging approximately 1,898 cfs and 1,924 cfs, respectively, during the 1980 to 2011 comparison period when both modeled 2019 BiOp and KBRA Flows are available. The average annual 2019 BiOp and KBRA Flows downstream of Keno Dam from 1980 to 2011 are also nearly identical (i.e., less than 20 cfs different), averaging approximately 1,403 cfs and 1,387 cfs, respectively. While the modeled flows upstream and downstream of the Hydroelectric Reach are within 1.2 to 1.4 percent on an average annual basis, there is a larger difference between the average monthly 2019 BiOp and KBRA Flows over the entire 1980 to 2011 comparison period (Table 3.1- and Table **3.1-6**). The most prominent difference is that the 2019 BiOp Flows when compared to KBRA Flows generally require higher flows in the fall months (October through November) and allow lower flows in the summer months (June through July). Downstream of Iron Gate Dam, fall average monthly 2019 BiOp Flows are approximately 150 cfs more than fall average monthly KBRA Flows (i.e., 10 to 29 percent); summer average monthly 2019 BiOp Flows are approximately 275 cfs less than summer average monthly KBRA Flows (i.e., 19 to 22 percent) (Table 3.1- and Table **3.1-6**). During the other months of the year, average monthly 2019 BiOp Flows are less than 10 percent different from the average monthly KBRA Flows.

Variations in the average monthly 2019 BiOp and KBRA Flows between years are also compared using paired heteroscedastic t-tests of the average monthly 2019 BiOp and KBRA Flows for the 31-years between 1980 and 2011, with probability values (p-values) less than 0.05 indicating a significant difference and p-values and less than 0.01 indicating a highly significant difference. At both Iron Gate and Keno dams, p-values demonstrate the average monthly 2019 BiOp and KBRA Flows are statistically different during multiple months throughout the year, especially during fall and summer (Tables 3.1-5 and 3.1-6) Similar to the average monthly flow comparison for all years above (i.e., the 31-year average of

the average monthly flows), the calculated p-values show differences between average monthly 2019 BiOp and KBRA Flows at Iron Gate Dam are highly significant during September, October, and November (i.e., fall months) and range from highly significant in June and July to significant in August (i.e., summer months). P-values also indicate average monthly 2019 BiOp and KBRA Flows at Iron Gate Dam are significantly different during March, which are likely due to implementation of surface flushing flow releases by the 2019 BiOp. There also are highly significant and significant changes in the average monthly 2019 BiOp and KBRA Flows at Keno Dam. The calculated p-values indicate differences between average monthly 2019 BiOp and KBRA Flows at Keno Dam are highly significant in October and November (i.e., fall months) and range from highly significant in June to significant in July (i.e., summer months). Average monthly 2019 BiOp and KBRA Flows at Keno Dam also are significantly different in February and highly significantly different in March. The highly significant difference in March is likely due increases in Keno Dam flow releases to meet the 2019 BiOp surface flushing flow requirement downstream of Iron Gate Dam. The differences in 2019 BiOp Flows versus KBRA Flows reflect the joint goal of NMFS and USFWS to protect ESA-listed fish that rely on a shared but finite aquatic resource (most notably, the two endangered sucker species in Upper Klamath Lake and threatened coho salmon in the Klamath River below Iron Gate Dam) (NMFS 2019; USFWS 2019).

Table 3.1-5. Average Monthly Flow at Iron Gate Dam From 1980 to 2011 for 2019 Biological Opinion and KBRA Operations Criteria.

Month	Average Monthly Flow Downstream of Iron Gate Dam		Differences (2019 BiOp vs. KBRA Flows)		p-value
	KBRA Operations Criteria	2019 BiOp Operations Criteria			
	(cfs)	(cfs)	(cfs)	(percent)	--
Oct	1069	1179	109	10	8.7E-04
Nov	1147	1348	201	17	8.6E-08
Dec	1579	1655	76	5	0.300
Jan	2032	2168	136	7	0.071
Feb	2590	2698	108	4	0.120
Mar	3384	3599	215	6	0.029
Apr	3344	3086	-259	-8	0.056
May	2461	2348	-113	-5	0.097
Jun	1924	1557	-367	-19	1.5E-04
Jul	1299	1050	-249	-19	4.9E-04
Aug	1122	1042	-80	-7	0.011
Sep	1190	1102	-88	-7	3.9E-04

Data source: USBR 2010, 2019c.

Table 3.1-6. Average Monthly Flow at Keno Dam From 1980 to 2011 for 2019 Biological Opinion and KBRA Operations Criteria.

Month	Average Monthly Flow Downstream of Keno Dam		Differences (2019 BiOp vs. KBRA Flows)		p-value
	KBRA Operations Criteria	2019 BiOp Operations Criteria			
	(cfs)	(cfs)	(cfs)	(percent)	--
Oct	684	828	144	21	4.8E-05
Nov	743	960	217	29	8.2E-07
Dec	1040	1133	93	9	0.200
Jan	1437	1573	136	9	0.083
Feb	1843	2011	168	9	0.015
Mar	2601	2847	246	9	0.0044
Apr	2607	2386	-221	-8	0.067
May	1835	1779	-55	-3	0.380
Jun	1456	1139	-317	-22	0.0013
Jul	886	716	-169	-19	0.017
Aug	745	733	-12	-2	0.700
Sep	814	776	-38	-5	0.120

Data source: USBR 2010, 2019c.

Figures 3.1-4 and 3.1-5 present monthly flow exceedances for modeled 2019 BiOp and KBRA Flows downstream of Iron Gate Dam and Keno Dam, respectively, for the 31-year period from 1980 to 2011, where this period encompasses water year types ranging from very dry to very wet. Flows with a 1 to 99 percent probability of occurring at Iron Gate or Keno dam are shown in the monthly flow exceedance curves, but they do not display the upper maximum flows (i.e., exceedance probability less than 1 percent) or lower minimum flows (i.e., exceedance probability greater than 99 percent) that may occur under 2019 BiOp and KBRA operations criteria. Figure and Figure also present the results of the paired heteroscedastic t-tests of the average monthly 2019 BiOp and KBRA Flows for the period 1980 to 2011, with highly significant differences between the average monthly 2019 BiOp and KBRA Flows shown in bright yellow and significant differences between the average monthly 2013 BiOp and KBRA Flows shown in light yellow. Monthly flow exceedance plots are particularly useful for comparing differences between modeled 2019 BiOp and KBRA Flows for different water year types (i.e., wet, median, and dry year types) since exceedance curves present the probability a flow would occur. Here, a wet year type is defined as the highest 10 percent of flows, such that wet year flows are characterized by those at the 10 percent exceedance point in Figures 3.1-4 and 3.1-5 (i.e., typical wet year flows would be exceeded 10 percent of the time). Similarly, a median year is characterized by flows at the 50 percent exceedance

point, while a dry year is characterized by flows at the 90 percent exceedance point. While Tables 3.1-5 and 3.1-6 summarize modeled *average* monthly flows and the significance of the differences between these flows under the 2019 BiOp and KBRA operations criteria, the monthly flow exceedance plots in Figures 3.1-4 and 3.1-5 present a more in-depth comparison of the range of possible flows by month and their probability of occurring under the two operations scenarios.

The overall range of 2019 BiOp and KBRA Flows is generally similar between the two curves such that modeling using KBRA Flows would typically simulate a similar range of flows, but there frequently is a shift in the water year type distribution between 2019 BiOp and KBRA Flows (Figures 3.1-4 and 3.1-5). The shift in the distribution of flows by water year type is characterized by whether the flow within individual months is higher during some water year types and lower during other water year types when comparing between 2019 BiOp and KBRA Flows. Variations between the modeled 2019 BiOp and KBRA Flows during different water year types primarily is evaluated by comparing the exceedance curve flows at the 10 percent exceedance for wet years, 50 percent exceedance for median years, and 90 percent exceedance for dry years. At both Iron Gate and Keno dams from December through May, the modeled 2019 BiOp Flows are generally similarly distributed throughout the various water year types with only small changes to the flow during some water year types. As an example, modeled 2019 BiOp Flows at Iron Gate Dam in January (upper right corner of Figure 3.1-4) tend to be lower than KBRA Flows during very wet water years (i.e., less than 5 percent exceedance), higher than KBRA Flows during wetter water years (i.e., 5 to 30 percent exceedance), and similar to KBRA Flows during median through dry water years (i.e., 30 to 90 percent exceedance). Higher Klamath River flows under the 2019 BiOp Flows than under the KBRA Flows at Iron Gate Dam in March during wet to median water years (i.e., 10 to 50 percent exceedance) is largely due to the 2019 BiOp requirement to release 6,030 cfs for a 72-hour period during the spring period (March 1 to April 15) when hydrologic conditions allow in wet to median water years.

While 2019 BiOp Flows from December through May are generally similar to KBRA Flows with shifts in the flow during only select water year types, 2019 BiOp Flows during June through November exhibit shifts from KBRA Flows during most water year types. However, the type of shifts from KBRA to 2019 BiOp Flows between water year types is different between June through September and October through November. During June through September, 2019 BiOp Flows tend to be lower than KBRA Flows during wetter through median years and higher than or similar to KBRA Flows during drier years. During October through November, 2019 BiOp Flows are consistently greater than KBRA Flows, but the magnitude is often relatively small (i.e., less than 100 cfs or less than 10 percent of the KBRA Flow). As an example of the June through September shift, modeled 2019 BiOp Flows at Iron Gate in July (lower mid-left of Figure 3.1-4) are less than modeled KBRA Flows during wetter and median water years (i.e., less than 70 percent exceedance), similar to modeled

KBRA Flows during median to drier water years (i.e., 70 to 80 percent exceedance), and greater than modeled KBRA Flows during drier water years (i.e., greater than 80 percent exceedance). As an example of the October through November shift, modeled 2019 BiOp Flows at Iron Gate in October (upper left of Figure 3.1-4) are consistently greater than modeled KBRA Flows for all water year types, but modeled 2019 BiOp Flows for wet (i.e., 10 percent exceedance), median (i.e., 50 percent exceedance), and dry (i.e., 90 percent exceedance) water years are only greater than modeled KBRA Flows by approximately 40 cfs, 60 cfs, and 120 cfs, respectively.

Despite the aforementioned differences between the modeled 2019 BiOp and KBRA Flows, the range of possible 2019 BiOp Flows in the Klamath River at Iron Gate and Keno dams typically would be represented by KBRA Flows since the range of 2019 BiOp Flows is within the range of modeled KBRA Flows approximately 99.0 percent of the time at Keno Dam and approximately 99.9 percent of the time at Iron Gate Dam. Modeled 2019 BiOp Flows outside the range of modeled KBRA Flows at Keno Dam are exclusively due to 0.1 percent of 2019 BiOp Flows being less than minimum KBRA Flows, while modeled 2019 BiOp Flows outside the range of modeled KBRA Flows at Iron Gate Dam are exclusively due to 0.01 percent of 2019 BiOp Flows being greater than maximum KBRA Flows. These modeled 2019 BiOp Flows outside the range of modeled KBRA Flows occur too infrequently (i.e., 0.1 percent of the time or less at Keno Dam and 0.01 percent of the time or less at Iron Gate Dam) to substantially alter the range of flow conditions in the Klamath River. While flow exceedance curves representing typical flow conditions (i.e., 1 to 99 percent exceedance) would not capture the extremely infrequent modeled 2019 BiOp Flows outside the range modeled KBRA Flows, a comparison of the 2019 BiOp and KBRA maximum and minimum monthly flow exceedance further highlights that typical 2019 BiOp Flows are sufficiently represented by KBRA Flows. Modeled 2019 BiOp Flows at Keno Dam are generally within the range of KBRA Flows since the maximum monthly KBRA Flows at Keno Dam during extremely wet years (i.e., 1 percent exceedance) are greater than the corresponding maximum monthly 2019 BiOp Flows, and the minimum monthly KBRA Flows at Keno Dam during drier years (i.e., 90 to 95 percent exceedance) are less than the corresponding minimum monthly 2019 BiOp Flows (Figure 3.1-6(a)). Minimum monthly 2019 BiOp Flows during extremely dry years (i.e., 1 percent exceedance) would not be represented by KBRA Flows, but these low flows would infrequently occur. Modeled 2019 BiOp Flows at Iron Gate Dam are generally within the range of KBRA Flows since the maximum monthly KBRA Flows at Iron Gate Dam during extremely wet years (i.e., 1 percent exceedance) are greater than the corresponding maximum monthly 2019 BiOp Flows and the minimum monthly KBRA Flows at Iron Gate Dam during dry years (i.e., greater than 90 percent exceedance) are less than the corresponding minimum monthly 2019 BiOp Flows (Figure 3.1-6(b)). At both Keno and Iron Gate dams, the higher maximum monthly 2019 BiOp Flows compared to the maximum monthly KBRA Flows (e.g., maximum flow exceedances from 10 to 45 percent) are largely due to the 2019

BiOp requirement at Iron Gate Dam to release 6,030 cfs for a 72-hour period during March 1 to April 15 in wet to median years (i.e., 10 to 50 percent exceedance) when hydrologic conditions allow. Flow exceedances where the minimum monthly 2019 BiOp Flows at Iron Gate Dam are less than minimum monthly KBRA Flows at Iron Gate Dam (e.g., minimum flow exceedances from 50 to 70 percent) are due to shifts in the distribution of flows by water year type as previously discussed. Differences between the minimum or maximum monthly 2019 BiOp and KBRA Flows would be contained within the overall range of KBRA Flows from 1 to 95 percent at Keno Dan and 1 to 99 percent at Iron Gate Dam, thus the range of 2019 BiOp Flows is still typically bracketed by the range of KBRA Flows.

It is reasonable to assume the outputs of hydrologic models using the KBRA Flows represent the typical range of results of hydrologic models using the 2019 BiOp Flows since the typical range of 2019 BiOp Flows is within the range of KBRA Flows, with modeled 2019 BiOp Flows within the range of modeled KBRA Flows 99.0 percent of the time at Keno Dam and 99.9 percent of the time at Iron Gate Dam. Peak 2019 BiOp Flows with a 1 percent exceedance probability during December through April would be captured by modeled KBRA Flows since peak 2019 BiOp Flows with a 1 percent exceedance probability are less than modeled KBRA Flows during this time. Extremely infrequent peak 2019 BiOp Flows (i.e., less than 1 percent exceedance probability) would not be captured by modeled KBRA Flows due to these extremely infrequent peak 2019 BiOp Flows being greater than modeled KBRA Flows, but the probability of these flows occurring is extremely low (i.e., less than 1 percent). Farther downstream of Iron Gate Dam, Klamath River flow estimates are only affected by assumptions regarding tributary inflows (accretions) that are not affected by operations of the Klamath Irrigation Project[2]. While variations may exist between the frequency of certain flows occurring under 2019 BiOp and KBRA Flows, the range of model results would be similar if 2019 BiOp Flows were used in the hydrologic model rather than KBRA Flows, since KBRA Flows typically bracket 2019 BiOp Flows.

In summary, the hydrologic model outputs previously developed using the KBRA Flows for the 2012 KHSA EIS/EIR are sufficient to estimate conditions under 2019 BiOp Flows. As explained above, the primary difference between 2019 BiOp and KBRA Flows is a shift in the expected flows during different water year types such that late fall months generally have higher Klamath River flows and summer/early fall months generally have lower flows during wet or median years and higher flows during drier years. The previous KBRA Flows typically bracket the range of 2019 BiOp Flows, supporting the conclusion that the prior modeling using the KBRA Flows sufficiently represents the range of potential effects of Klamath River flows under the 2019 BiOp Flows.

Consequently, this EIR considers the potential effects of dam removal under the Proposed Project by applying existing hydrology information presented in the

2012 KHSA EIS/EIR, as well as in the numerous technical studies that were foundational to that effort. However, potential changes in the previous analysis and technical studies resulting from the differences between 2019 BiOp and KBRA Flows are evaluated and discussed, as necessary.

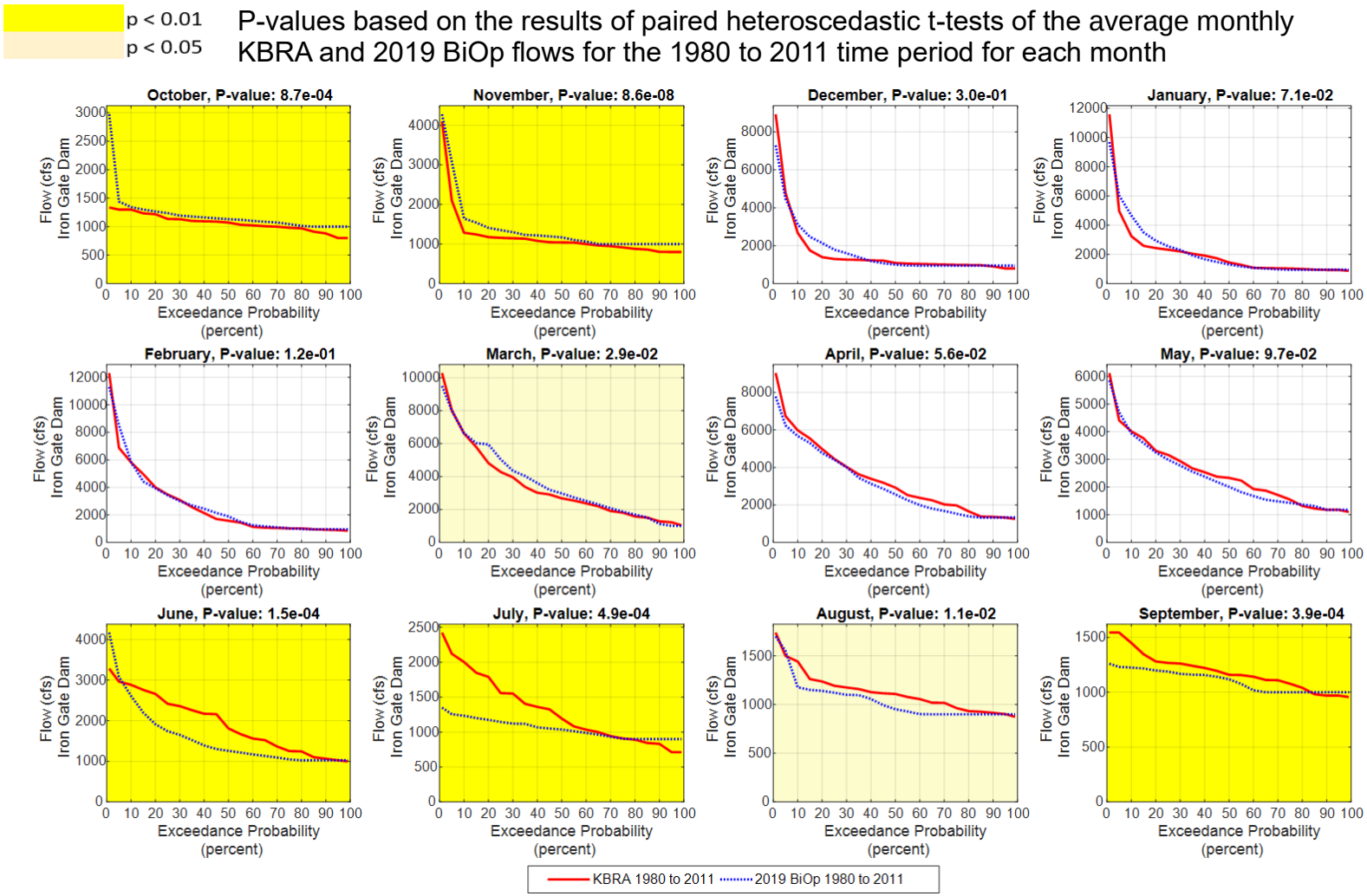

Figure 3.1-4. Monthly Flow Exceedance Curves at Iron Gate Dam for the KBRA Flows (KBRA) and 2019 Biological Opinion Flows (2019 BiOp) Based on the Modeled Flows from 1980 to 2011. Data Source: USBR 2010, 2019c. Note: The Scale of the Y-Axis (Flow in cfs) Varies Significantly Between Months. Wet, Median, and Dry Water Year Types Are Characterized by Flows at the 10, 50, 90 Percent Exceedance, Respectively.

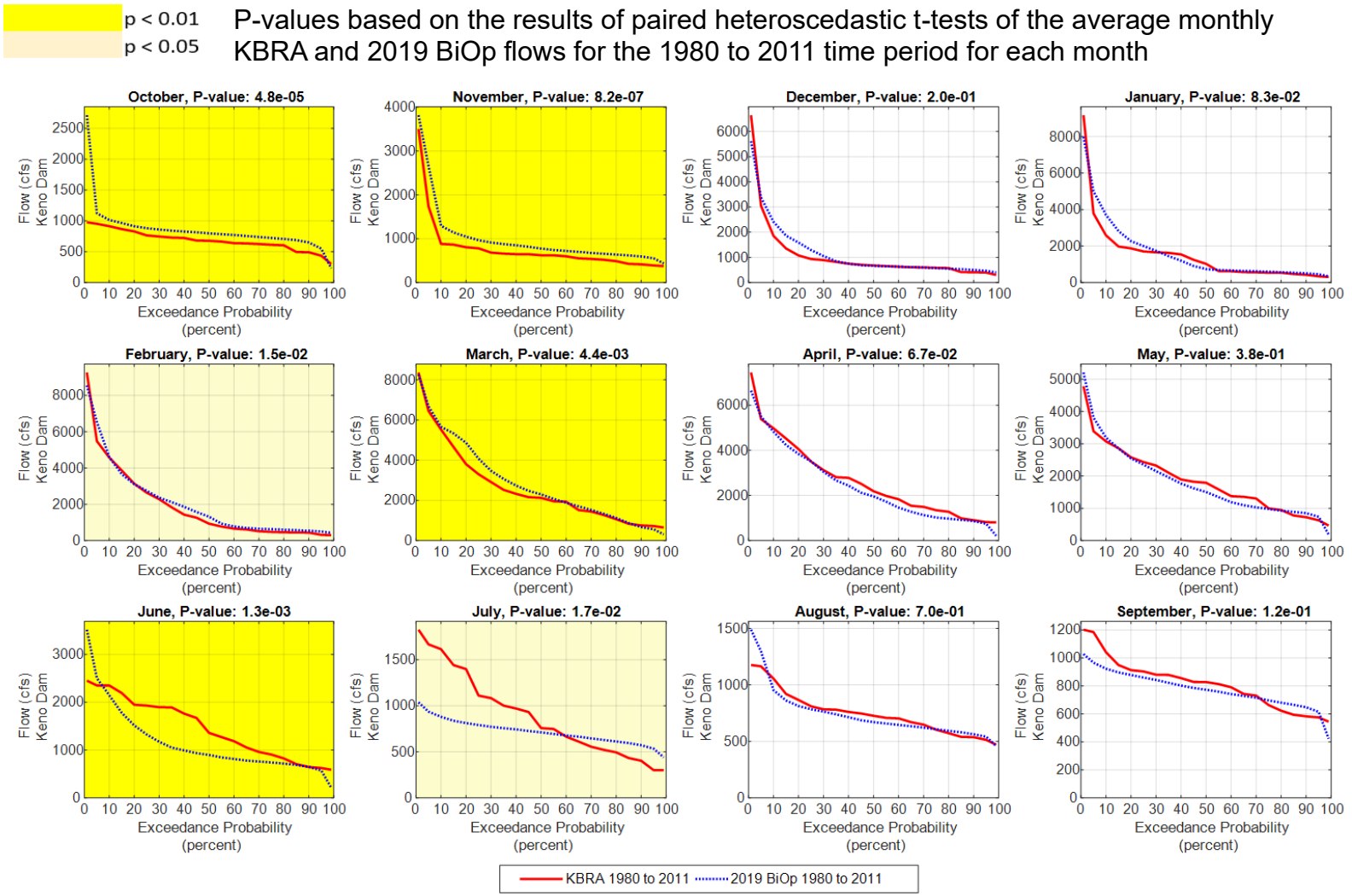

Figure 3.1-5. Monthly Flow Exceedance Curves at Keno Dam for the KBRA Flows (KBRA) and 2019 Biological Opinion Flows (2019 BiOp) Based on Modeled Flows from 1980 to 2011. Data Source: USBR 2010, 2019c. Note: The Scale of the Y-Axis (Flow in cfs) Varies Significantly Between Months. Wet, Median, and Dry Water Year Types Are Characterized by Flows at the 10, 50, 90 Percent Exceedance, Respectively.

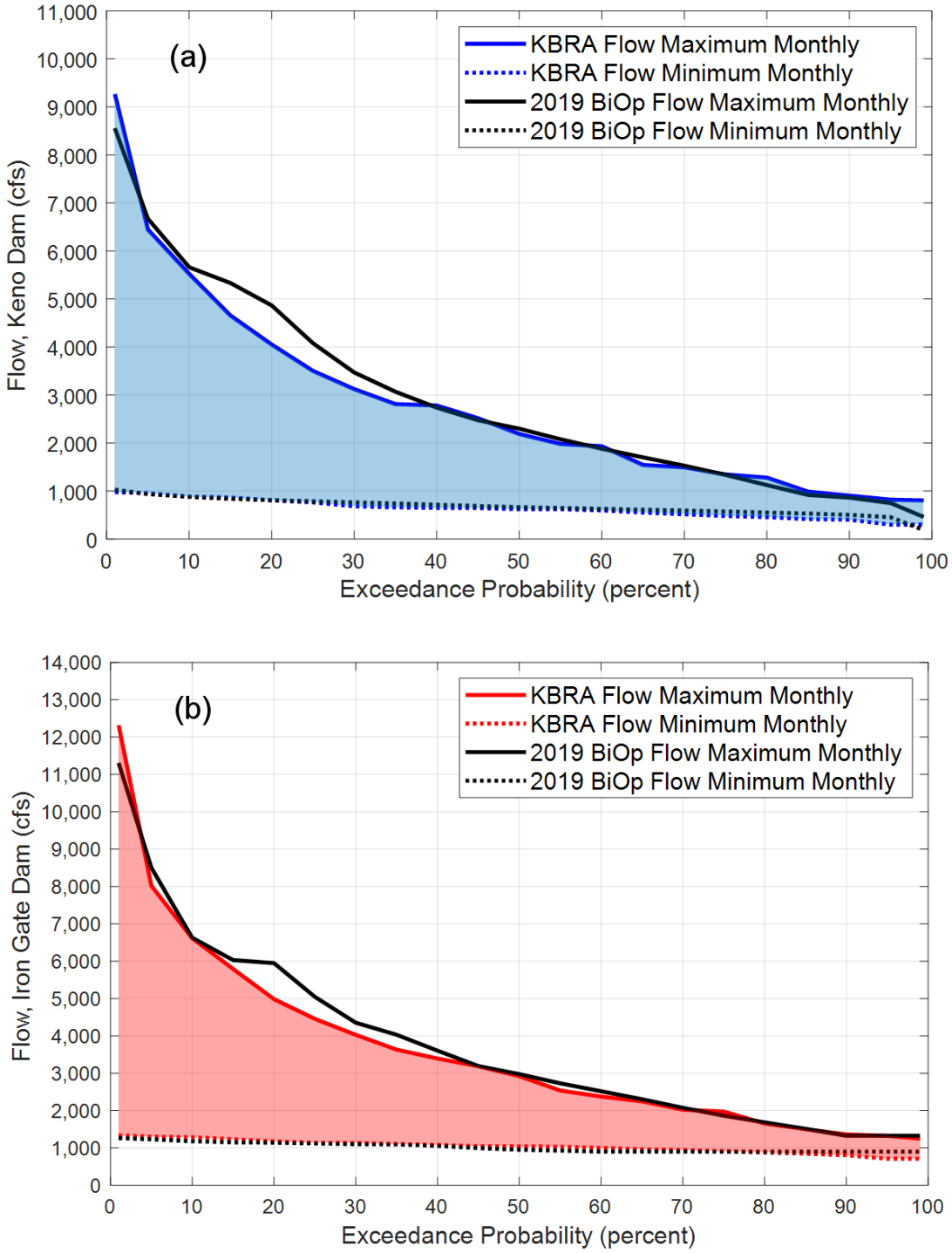

Figure 3.1-6. Comparison of the Maximum and Minimum Monthly Exceedance Curves for the 2019 Biological Opinion (2019 BiOp) and KBRA Flows From 1 to 99 Percent Exceedance Flows at (a) Keno Dam (b) Iron Gate Dam. Data Source: USBR 2010, 2019c.

3.1.7 References

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3.2 Water Quality

This section focuses on potential water quality effects due to the Proposed Project. Other sections of this EIR discuss *Flood Hydrology* (Section 3.6*)*, *Groundwater* (Section 3.7*)*, and *Water Supply/Water Rights* (Section 3.8*)*.

Many comments were received during the NOP public scoping process relating to water quality (see Appendix A). A number of comments focused on the potential effects of dam removal on Klamath River water quality, including short-term exceedances of federal, state, and/or tribal water quality objectives and the potential for release of contaminants contained within reservoir sediments. With respect to long-term impacts on water quality, several comments noted that analyses in the EIR need to consider dam removal, as well as alternatives where dams remain in place, within the context of the existing Klamath River total maximum daily loads (TMDLs). There were numerous comments regarding the potential for dam removal to alleviate existing impaired conditions for water

temperature, dissolved oxygen, and blue-green algae[3] and associated algal toxins. Conversely, some commenters indicated their belief that the Lower Klamath Project reservoirs improve water quality by serving as a sink for phosphorus and reducing downstream summertime water temperatures, or otherwise improving water quality in an unspecified manner. Additional summary of the water quality comments received during the NOP public scoping process, as well as the individual comments, are presented in Volume II Appendix A.

After circulation of the Draft EIR, numerous additional comments were received regarding water quality (see Volume III), and changes to the section in response to those comments are flagged in the comment responses and then printed in this Final EIR section. None of the changes result in significant new information in the EIR under the meaning of CEQA Guidelines, section 15088.5, subdivision (a):

> New information added to an EIR is not 'significant' unless the EIR is changed in a way that deprives the public of a meaningful opportunity to comment upon a substantial adverse environmental effect of the project or a feasible way to mitigate or avoid such an effect (including a feasible project alternative) that the project's proponents have declined to implement.

However, the changes were numerous enough that reprinting the section rather than simply including a list of revisions was warranted to improve clarity and readability of the document.

3.2.1 Area of Analysis

The Area of Analysis for water quality includes multiple reaches of the Klamath River, as listed below and shown in Figure 3.2-1.

[3] Blue-green algae are a type of phytoplankton that are naturally found in lakes, streams, ponds, and other surface waters which can produce toxic compounds (e.g., microcystin) that have harmful effects on fish, shellfish, mammals, bird, and people (USEPA 2014). Though blue-green algae are technically cyanobacteria, they are commonly referred to as algae. For readability, and to reduce confusion, this EIR refers to cyanobacteria as blue-green algae except when a cited reference specifically uses the term cyanobacteria.

Upper Klamath Basin

- Hydroelectric Reach[4] (upstream end of J.C. Boyle Reservoir to Iron Gate Dam)

Mid-Klamath Basin

- Klamath River from Iron Gate Dam downstream to the confluence with the Salmon River
- Klamath River from the confluence with the Salmon River to the confluence with the Trinity River

Lower Klamath Basin

- Lower Klamath River from the confluence with the Trinity River to the estuary
- Klamath River Estuary
- Pacific Ocean nearshore environment

Table 3.2-1 lists the river mile locations of the above reaches and of features relevant to the water quality Area of Analysis.

[4] Note that the portion of the Hydroelectric Reach that extends into Oregon (i.e., from the Oregon-California state line [RM 214.1] to the upstream end of J.C. Boyle Reservoir) is only being considered to the extent that conditions in this reach influence water quality downstream in California.

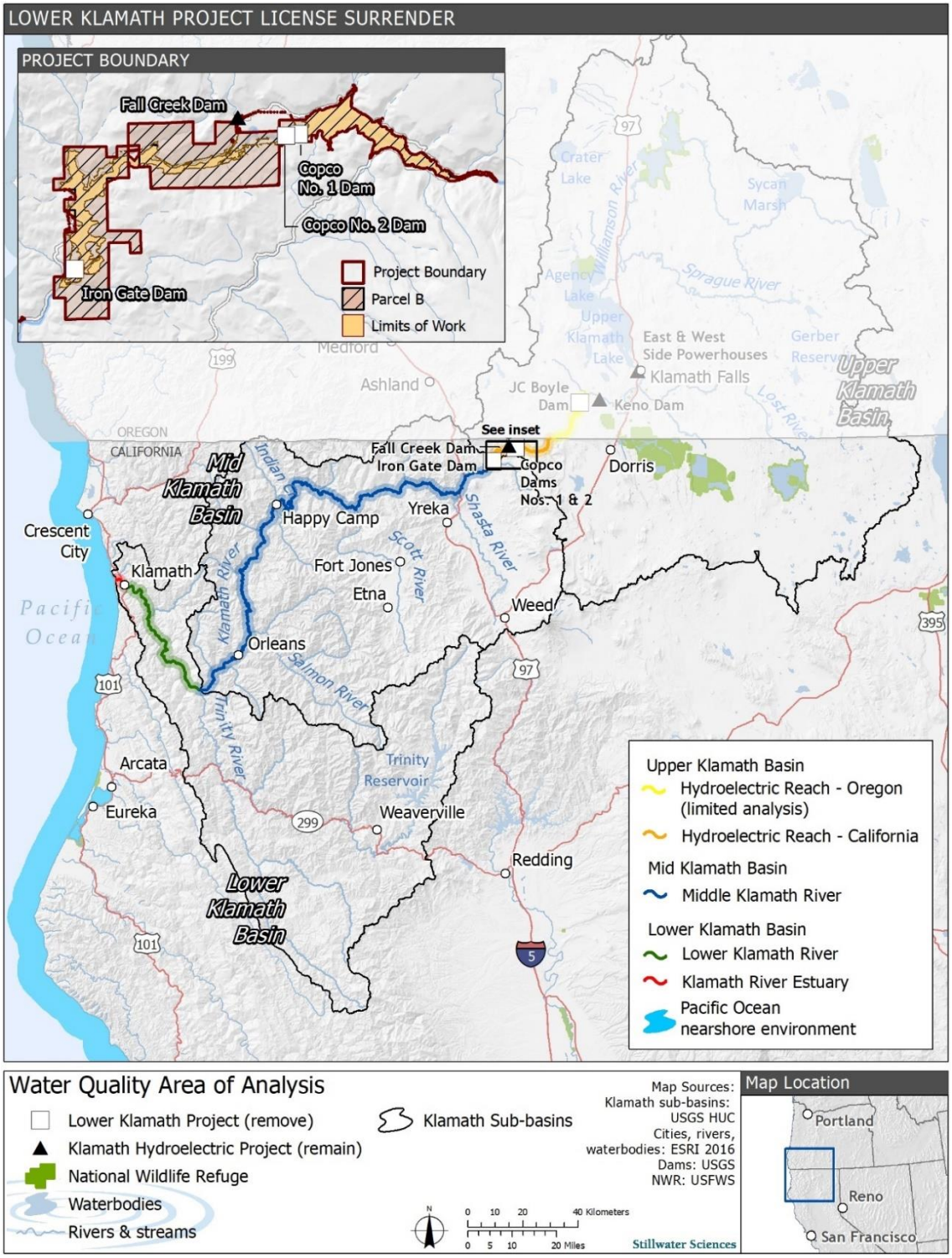

Figure 3.2-1. Klamath River Reaches Included in the Area of Analysis for Water Quality.

Table 3.2-1. River Mile Locations of Klamath River Features Relevant to the Water Quality Analysis.

Feature	River Mile[1]
Upper Klamath Basin	
J.C. Boyle Reservoir	229.8 to 233.3
Oregon-California state line	214.1
Copco No. 1 Reservoir	201.8 to 208.3
Copco No. 2 Reservoir	201.5 to 201.8
Iron Gate Reservoir	193.1 to 200.0
Mid-Klamath Basin	
Klamath River confluence with Shasta River	179.5
Klamath River confluence with Scott River	145.1
Seiad Valley	132.7
Klamath River confluence with Salmon River	66.3
Orleans	58.9
Hoopa Valley Tribe Reservation lands	44.8 to 45.8
Weitchpec	43.6
Lower Klamath Basin	
Yurok Reservation Lands	0 to 45
Klamath River confluence with Trinity River	43.3
Klamath River confluence with Turwar Creek	5.6
Klamath River Estuary	0 to 3.9

Notes:

[1] River Mile (RM) refers to distance upstream of the mouth of the Klamath River. RM's have been updated from the Detailed Plan (see Appendix B: *Detailed Plan*) to those of the Definite Plan (see Appendix B: *Definite Plan – Section 1.4*).

3.2.2 Environmental Setting

This section provides a description of the environmental setting for water quality resources in the Area of Analysis, including a brief overview of water quality processes in the Klamath Basin to inform subsequent impact analyses.

3.2.2.1 Overview of Water Quality Processes in the Klamath Basin

Water quality in the Klamath River is affected by the geology and meteorology of the Klamath Basin, as well as current and historical land- and water-use practices. Cold air temperatures and precipitation generally occur from November to March, corresponding to periods of higher flows and colder water temperatures. Warmer air temperatures and drier conditions occur from April to October, corresponding to periods of lower flows and warmer water temperatures. The Upper Klamath Basin has naturally elevated levels of phosphorus that combine with human activities (e.g., wetland draining, agriculture, ranching, logging, water diversions), to increase concentrations of

nutrients (nitrogen and phosphorus) and suspended sediment, to degrade water quality parameters (e.g., water temperature, pH, dissolved oxygen). This, in turn, affects the water quality entering California. Within California, the Middle and Lower Klamath River is composed of generally steep, mountainous terrain (see Section 3.11 *Geology, Soils, and Mineral Resources*). Historically, hillslope and in-channel gold mining and extensive logging have occurred, along with agricultural and ranching activities that divert water in many of the lower tributary basins. These activities have altered stream flows, increased concentrations of suspended sediment and nutrients in watercourses, and increased summer water temperatures.

The presence and operations of the Lower Klamath Project facilities in the Klamath Hydroelectric Reach affect many aspects of water quality in the Klamath River. In general, the most common effects of hydroelectric project operations on water quality result from changes in the physical structure of the aquatic ecosystem. The dams alter the flow patterns in a river by slowing the transport of water downstream and modifying the timing and magnitude of flows on a short-term basis. Dams intercept and retain sediment, organic matter, nutrients, and other constituents that would otherwise be transported downstream. Dams additionally alter seasonal water temperatures when compared to free-flowing stream reaches.

In general, effects on water quality from hydroelectric project operations include:

River and reservoir water temperatures. The primary effects of hydroelectric project operations on the natural temperature regime of streams and rivers are related to alterations in water surface area, depth, and velocity due to water diversions into or out of the stream corridor, including reservoir impoundments and conveyance through canals, pipelines, or penstocks. These changes influence the amount of heat entering and leaving waterbodies (such as from solar radiation and nighttime cooling), which influences the water temperature. As large reservoirs are often deep, they can retain their water temperature for weeks or months, thereby shifting the natural water temperature patterns in river reaches downstream of the reservoirs. For example, water released from reservoirs in the late spring is typically cooler than would naturally occur because the reservoir retains some of the cold water it received in the winter. Similarly, water released from reservoirs in the early fall is typically warmer than would naturally occur because the reservoir still contains water that was heated during the summer months. Additionally, due to surface heating of the reservoir in the late spring and summer, a warmer, less dense layer of water forms on the reservoir surface (the epilimnion), which overlies colder, denser water (the hypolimnion) (Figure 3.2-2). This process, called thermal stratification, often persists for months. In late fall, thermal stratification typically breaks down as the surface water layer cools and wind mixing of the water column occurs. This process is called reservoir turnover (Figure 3.2-2).

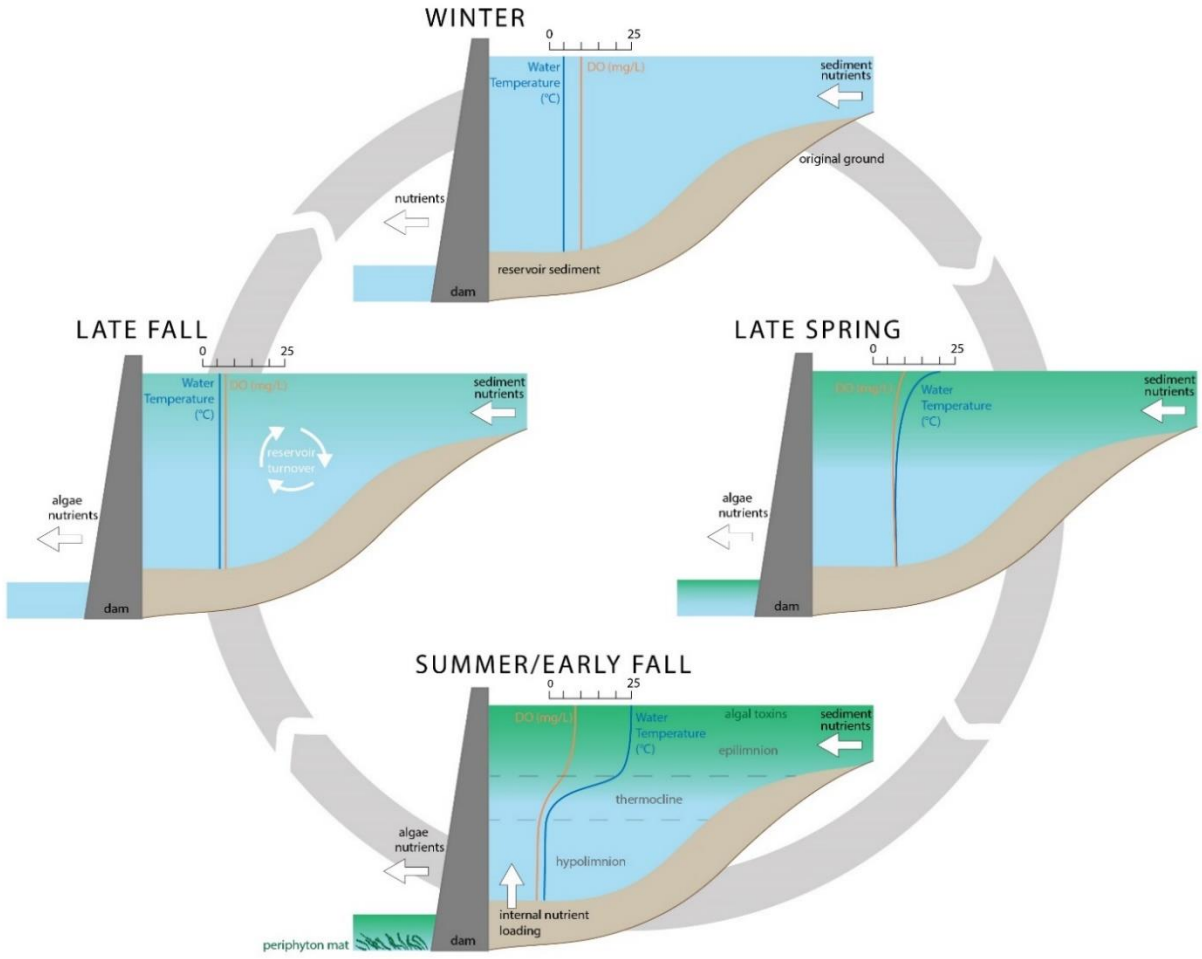

Figure 3.2-2. General Seasonal Pattern of Thermal Stratification, Dissolved Oxygen Concentrations, and Algae Blooms in Relatively Deep, Productive Reservoirs in Temperate Climates, With Darker Green Shading In Surface Waters Representing a Higher Intensity of Algae Growth.

- **Reservoir mixing and dissolved oxygen.** The water column in the deepest portions of most large reservoirs has a characteristic thermal and chemical structure. With thermal stratification (in summer and early fall), the isolated deeper water is not exposed to the atmosphere and often completely loses its supply of dissolved oxygen over a period of weeks or months as organic matter in bottom sediments decays (anoxic) (Figure 3.2-2). Releases of this deeper, oxygen-depleted water from the bottom of the reservoir can cause serious problems for downstream fish and other aquatic biota if released waters are not re-oxygenated through the outlet facilities and/or powerhouse or other means.
- **Phytoplankton in reservoirs.** As large reservoirs have long retention times for water and thermally stratify in the summer months, they often provide ideal conditions for the growth of phytoplankton in the epilimnion. Phytoplankton are microscopic organisms, including algae, bacteria, protists, and other single-celled plants, that float in the water column of fresh and salt waters and obtain energy via photosynthesis. Depending upon available nutrients, extensive seasonal phytoplankton blooms can develop in these reservoirs (Figure 3.2-2). Phytoplankton photosynthesis during the day releases dissolved oxygen and consumes carbon dioxide. At night, phytoplankton respiration consumes dissolved oxygen and releases carbon dioxide. This can result in wide daily swings in dissolved oxygen and pH, which is stressful to aquatic biota. A naturally weakly buffered system like the Klamath River (i.e., alkalinity typically less than 100 mg/L as calcium carbonate [$CaCO_3$]; PacifiCorp [2004a], Karuk Tribe of California [2010a]) is especially prone to wide daily pH swings due to phytoplankton photosynthesis and respiration. Under nutrient-rich conditions, harmful blooms of phytoplankton composed of blue-green algae (also referred as cyanobacteria) can occur. Blue-green algae can produce algal toxins, which are also referred to as cyanotoxins (e.g., cyclic peptide toxins such as microcystin that adversely affects liver function and alkaloid toxins such as anatoxin-a and saxitoxin that adversely affect the nervous system). Algal toxins can be harmful to a wide range of organisms including exposed fish, shellfish, livestock, and humans. If not removed from the reservoir water column (e.g., by a mechanical/physical barrier like an intake barrier/ thermal curtain), releases of reservoir impounded waters can transport phytoplankton and/or toxins to downstream waters (Figure 3.2-2) and phytoplankton blooms can die abruptly (“crash”), releasing algal toxins into the water column. The subsequent decomposition of organic matter associated with dead phytoplankton can create periods of low dissolved oxygen in reservoir bottom waters, along with peaks of algal toxins, which adversely impact environmental and human health conditions (Figure 3.2-2). Additional information on phytoplankton and its impacts on water quality (including nitrogen fixation) can be found in *Section 3.4 Phytoplankton and Periphyton*.
- **Nutrient cycling in reservoirs and internal loading.** Nutrients entering reservoirs can undergo many changes and be involved in many

biochemical processes. On an annual basis, the majority of nutrients entering a reservoir from a watershed are eventually discharged downstream, with the combined total phosphorus retention in Iron Gate and Copco No. 1 reservoir sediments equal to approximately 11 percent of the total phosphorus inflow and the combined total nitrogen retention in Iron Gate and Copco No. 1 reservoir sediments equal to approximately 12 percent of the total nitrogen inflow. Dissolved nutrients (e.g., ortho-phosphorus, nitrate, and ammonium) entering a reservoir can be used directly by phytoplankton (which includes blue-green algae) when growing conditions are conducive. When phytoplankton die, they settle to the bottom of reservoirs and contribute nutrients and organic matter to the sediments. Under low dissolved oxygen (i.e., anoxic) conditions, nutrients contained within bottom sediments can be released back into the water column, creating a source of nutrients internal to the reservoir itself, in addition to the nutrients entering the reservoir from upstream sources. This is particularly important for phosphorus and results in highly enriched reservoir bottom waters during periods of stratification. Dissolved nutrients in the reservoir water column can be released downstream during late summer and fall before reservoir turnover occurs, potentially resulting in a secondary (fall) phytoplankton bloom (which includes blue-green algae). During reservoir turnover in fall when stratification breaks down, nutrient rich waters are mixed throughout the reservoir water column, further releasing dissolved nutrients downstream of the dam (Figure 3.2-2).

- **Sediment deposition in reservoirs**. The characteristically slow-moving waters within large reservoirs result in the deposition of sediments that enter the reservoir from the surrounding watershed (Figure 3.2-2). While large reservoirs interrupt the natural transport of both coarse sediments (e.g., sand, gravel, cobble, boulders) and fine sediments (e.g., clay, silt), contaminants found in the bottom sediments of reservoirs are typically transported from the watershed with fine sediments, which include both inorganic material and organic particulate matter. Trace metals are mostly attached to inorganic material (e.g., clays and silts). Organic contaminants, such as pesticides and dioxin, are adsorbed to (i.e., attached to the surface of) organic particulate matter, such as dead vegetation and phytoplankton.
- **Periphyton growth downstream of reservoirs.** Slow transport of water downstream and modified timing and magnitude of river flows can affect the growth of periphyton downstream of hydroelectric dams. Periphyton are aquatic freshwater organisms, including algae and bacteria that live attached to underwater surfaces such as rocks on a riverbed. Periphyton are important base components of the food web in riverine systems. Periphyton can influence riverine water quality by affecting nutrient cycling and diel (i.e., 24-hour cycle) fluctuations in dissolved oxygen and pH. Natural scouring of periphyton populations can be diminished downstream of large dams due to altered flows and interception of coarse sediment movement by the dam, leading to seasonal occurrence of large periphyton mats that can cause water quality problems and provide abundant habitat

for fish parasites (see also Section 3.3.4.5 *Fish Disease and Parasites* and Section 3.4.2.2 *Periphyton*).

The following sections summarize general existing water quality conditions in the water quality Area of Analysis. Existing conditions are generally defined as physical, chemical, and biological characteristics of water in the Area of Analysis at the time of the NOP (i.e., 2016). Water quality parameters analyzed in this EIR are represented by data collected within the past 10 to 17 years (i.e., 2000 to 2017). Additional detail, including data from multiple agency and tribal monitoring programs throughout the Klamath Basin, is presented in Appendix C.

3.2.2.2 Water Temperature

Water temperatures in the Klamath Basin vary seasonally and by location. The North Coast Regional Water Quality Control Board (North Coast Regional Board) has determined that existing receiving water temperatures in the Klamath River are already too warm to support several designated beneficial uses, including cold freshwater habitat (COLD), rare, threatened, or endangered species (RARE), and migration of aquatic organisms (MIGR) annually during late summer/early fall (North Coast Regional Board 2010). All reaches of the Klamath River from the Oregon-California state line to the mouth of the Klamath River are listed as impaired for elevated water temperature on the Clean Water Act (CWA) Section 303(d) list. As a result, the North Coast Regional Board has developed TMDLs for water temperature in the Klamath River. A quantitative Klamath River TMDL model was created to determine what natural water temperature conditions would be in the Klamath River, and then the model was used to determine how flow modifications, water withdrawals, and other human activities alter water temperatures, forming the basis of the TMDLs (see Appendix D). The Klamath River TMDL allocates specific water temperature loads for Copco No. 1 and Iron Gate reservoirs, as discussed below. Properly functioning thermal refugia[5] are necessary to meet the Basin Plan water temperature objectives, as these areas of colder water in the mainstem Klamath River moderate naturally high summer water temperature conditions by providing places where fish can escape warmer temperatures. These thermal refugia support beneficial uses such as migration of salmonids (North Coast Regional Board 2011).

In the Hydroelectric Reach, water temperatures are influenced by the presence of the Lower Klamath Project facilities. The relatively shallow depth and short hydraulic residence times do not support thermal stratification in J.C. Boyle

[5] Thermal refugia are typically identified as areas of cool water created by inflowing tributaries, springs, seeps, upwelling hyporheic flow, and/or groundwater in an otherwise warm stream channel offering refuge habitat to cold-water fish and other cold-water aquatic species (North Coast Regional Board 2011). Cold-water fish utilize thermal refugia for cold water habitat when ambient river temperatures exceed their preferred temperature range.

Reservoir (FERC 2007; Raymond 2008a, 2009a, 2010a) and thus this reservoir does not directly alter summertime water temperatures in further downstream reaches (NRC 2004). However, current bypass operations at the J.C. Boyle Dam affect water temperatures in the river immediately downstream from the dam. While natural diel (24-hour) water temperature variations occur in the river, bypass operations between J.C. Boyle Dam (river mile [RM] 229.8) and the J.C. Boyle Powerhouse (RM 225.2) result in water temperatures that are typically cooler from May to September and warmer from November to March than ambient river temperatures upstream or downstream (PacifiCorp 2004a). Decreases in the daily water temperature (i.e., cooler water temperature than upstream of J.C. Boyle Reservoir) and the range of daily water temperature variations occur in the J.C. Boyle Bypass Reach during the summer/fall because warmer reservoir discharges are diverted around this reach (see also Section 2.3.1 *J.C. Boyle Dam Development*) and cold groundwater springs enter the river and dominate remaining flows (PacifiCorp 2004a; Kirk et al. 2010). Water temperatures in the J.C. Boyle Bypass Reach can decrease by 9 to 27°F when bypass operations are underway due to the influence of the springs (Kirk et al. 2010). In the J.C. Boyle Peaking Reach, which is downstream of the J.C. Boyle Bypass Reach, the flow diverted around the J.C. Boyle Bypass Reach rejoins the Klamath River (see Figure 2.3-1). At the upstream end of the J.C. Boyle Peaking Reach, the natural, cold groundwater input into the J.C. Boyle Bypass Reach, combined with fluctuations in river flow due to hydroelectric power operations in the J.C. Boyle Peaking Reach also produces an observed increase in daily water temperature range above the natural diel water temperature fluctuations (Kirk et al. 2010). For example, daily water temperature in the J.C. Boyle Peaking Reach in 2002 varied by approximately 3 to 13˚F during hydroelectric power operations, while daily water temperature varied by approximately 1 to 2˚F during non-peaking flows. Based on available data, the influence of the springs dominates water temperature in this reach; for example, while daily variations in water temperature increased during peaking operations, water temperatures in the J.C. Boyle Peaking Reach still decreased by 9 to 16˚F compared to upstream of J.C. Boyle Reservoir (PacifiCorp 2004a; FERC 2007).

Further downstream in the J.C. Boyle Peaking Reach, near the confluence of the Klamath River and Shovel Creek (Figure 2.2-3), there are natural hot springs that contribute flows to the mainstem river. The natural hot springs were not found to result in consistent substantial warming of the Klamath River based on two sets of measurements made in November and December 2017 (KRRC 2018). Water temperature data collected upstream and downstream of the confluence of the Klamath River and Shovel Creek showed a 1.4˚F increase in the downstream direction during the November 2017 measurement, but a 0.2˚F decrease during the December 2017 measurement (KRRC 2018).

Iron Gate and Copco No. 1 reservoirs are the two deepest reservoirs in the Hydroelectric Reach. These reservoirs thermally stratify each year beginning in April/May and the warmer surface and cooler bottom waters do not mix again

until October/November (FERC 2007; Raymond 2008a, 2009a, 2010a; Asarian and Kann 2011). The large thermal mass of the stored water in the reservoirs delays the natural warming and cooling of riverine water temperatures on a seasonal basis such that spring water temperatures in the Hydroelectric Reach are generally cooler than would be expected under natural conditions, and summer and fall water temperatures are generally warmer (Figure 3.2-3; North Coast Regional Board 2010; Asarian and Kann 2013). In the Hydroelectric Reach, maximum temperatures, generally occur in late July and regularly exceed the range of chronic effects temperature thresholds (approximately 55 to 68°F) for full salmonid support in California (North Coast Regional Board 2010).

To alleviate the late summer/fall warming caused by Lower Klamath Project reservoirs under existing conditions, the Klamath River TMDL specifies a zero water temperature increase above natural water temperatures in the Hydroelectric Reach. However, to account for the anthropogenic heat load entering the Hydroelectric Reach from upstream sources and to acknowledge that even without the presence of the reservoirs, the Klamath River would be expected to naturally change temperature through the reaches currently occupied by the reservoirs, the TMDL sets the allowable increase in daily average (and daily maximum) water temperatures at 0.9°F (0.5°C) for Copco No. 1 and Copco No. 2 reservoir tailraces and 0.18ºF (0.1ºC) for the Iron Gate Reservoir tailrace (North Coast Regional Board 2010). Additionally, the Klamath River TMDL specifies a portion of Copco No. 1 and Iron Gate reservoirs must provide suitable water temperature and dissolved oxygen conditions for cold-water fish during the critical summer period—thus maintaining a “compliance lens” within the reservoirs that can support cold-water fish. In 2015, PacifiCorp installed a powerhouse intake barrier/thermal curtain in Iron Gate Reservoir under IM 11. While the primary purpose of the curtain is to isolate surface waters that have high concentrations of blue-green algae (cyanobacteria) such that extensive summer and fall blooms are not readily released downstream to the Middle and Lower Klamath River (see further discussion in Potential Impact 4.2.2-2), PacifiCorp reports that the curtain also provides a secondary benefit of isolating warmer surface waters and draws deeper cooler water for release to the Klamath River downstream of Iron Gate Dam (PacifiCorp 2016a, 2017a, 2018a). Results from the intake barrier/thermal curtain studies indicate that modest 1 to 2°C (1.8 to 3.6°F) water temperature improvement is possible (PacifiCorp 2016a, 2017a), although data do not indicate that this measure could achieve compliance with the Thermal Plan or to meet the Klamath River TMDLs temperature requirement in the Middle Klamath River (North Coast Regional Board (2010). Additionally, water temperature improvements from operation of the intake barrier/thermal curtain would be potentially limited by the need to access water with higher dissolved oxygen concentrations to comply with dissolved oxygen standards, with the curtain completely rolled up during portions of 2017 to maximize dissolved oxygen concentrations for aquatic life (PacifiCorp 2018a).

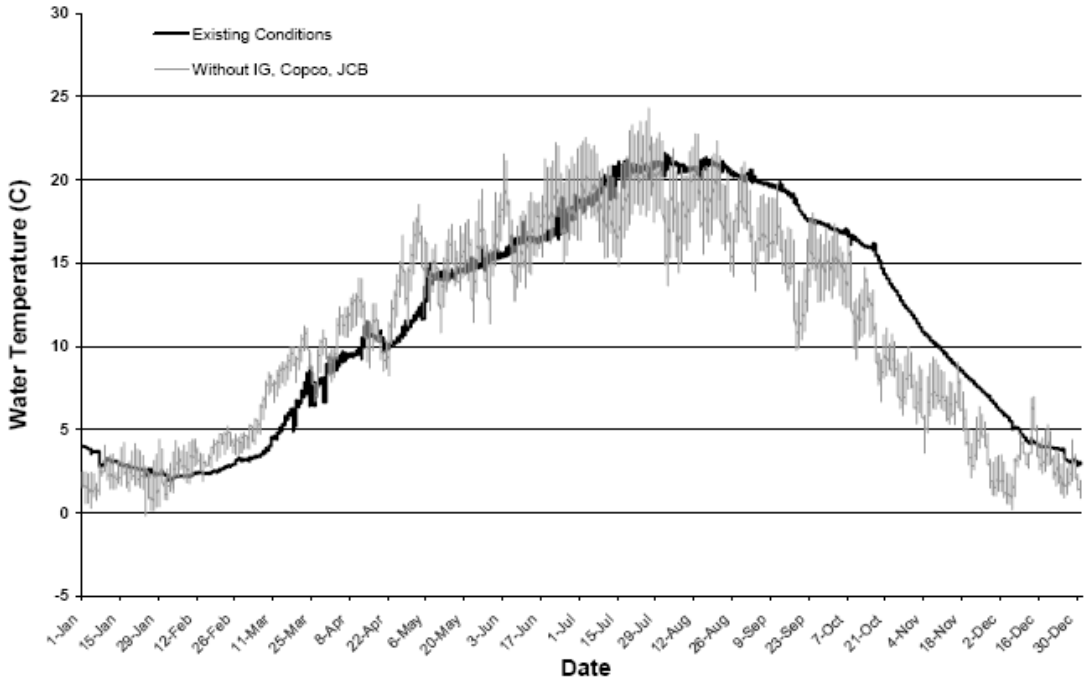

Figure 3.2-3. Simulated Hourly Water Temperature Downstream from Iron Gate Dam Based on Year 2004 for Existing Conditions Compared to Hypothetical Conditions without J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate Dams. Source: PacifiCorp 2005a.

The seasonal water temperature pattern of the Hydroelectric Reach is similar in the Klamath River immediately downstream from Iron Gate Dam, where water released from Iron Gate Dam is 1.8 to 4.5°F (approximately 1 to 2.5°C) cooler in the spring and approximately 4 to 18°F (approximately 2 to 10°C) warmer in the summer and fall as compared to modeled conditions without the Lower Klamath Project dams (PacifiCorp 2004a; Dunsmoor and Huntington 2006; North Coast Regional Board 2010). In addition to this "thermal lag", immediately downstream from Iron Gate Dam water temperatures tend to exhibit relatively low variability due to the influence of the reservoir's water releases (Karuk Tribe of California 2009, 2010a, 2010b, 2011, 2012, 2013; Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019; Asarian and Kann 2013). The Iron Gate Dam intake structure is designed to withdraw water from the surface to approximately 35 feet (10 meters) below the Iron Gate Reservoir full pool elevation, so the dam typically is releasing water from the epilimnion during periods when the reservoir is stratified. The design and operation of the Iron Gate Dam intake structure results in the water temperature in the Klamath River immediately downstream of Iron Gate Dam being similar (i.e., within a few degrees or less) to the water temperature measured approximately 10 to 30 feet below the surface of Iron Gate Reservoir near the dam (PacifiCorp 2004a; FERC 2007). After deployment of PacifiCorp's intake barrier/thermal curtain, the water temperature in the Klamath River immediately downstream of Iron Gate Dam

was most similar to the water temperature measured approximately 16 feet below the surface of Iron Gate Reservoir (PacifiCorp 2017a). Water temperature data collected since 2009 as part of KHSA Interim Measure 15 (see also Table 2.7-12) indicate that water temperature trends under the 2013 BiOp Flows are consistent with those under the pre-2013 BiOp Flows. For example, Asarian and Kann (2013) found that mean and maximum water temperature between 2001 and 2011 peaked each year between July and August with a maximum temperature of approximately 75°F. Although the 2013 BiOp increased minimum flows during July compared to pre-2013 BiOp Flows, water temperature downstream of Iron Gate Dam peaked in July/August during 2013 to 2018 under 2013 BiOp Flows, with a maximum temperature of approximately 75°F in mid/late July to early/mid-August in all six years (Watercourse Engineering, Inc. 2014, 2015, 2016, 2017, 2018, 2019). Water temperature trends under the 2019 BiOp Flows cannot be compared with those under the pre-2013 BiOp Flows and the 2013 BiOp Flows since water temperature data from the Klamath River, including KHSA IM 15 data, after the 2019 BiOp Flows became the applicable flow criteria (i.e., April 1, 2019) has not been reviewed and approved for distribution. Water temperature trends under the 2019 BiOp Flows are expected to be similar to those under 2013 BiOp Flows due to the similarities in 2019 BiOp Flows and 2013 BiOp Flows (see Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project* and Section 4.2.1.1 *[No Project Alternative] Alternative Description – Summary of Available Hydrology Information for the No Project Alternative*).

Farther downstream, the presence of the Lower Klamath Project exerts less influence on water temperatures, and the Klamath River is more influenced by solar energy, the natural heating and cooling regime of ambient air temperatures, and tributary inputs of surface water. Meteorological influences on water temperature result in increasing temperature with distance downstream from Iron Gate Dam in the summer and fall months (Basdekas and Deas 2007; Asarian and Kann 2013). For example, daily average temperatures between June and September are approximately 1.8 to 7.2°F higher near Seiad Valley (RM 132.7) than those just downstream from Iron Gate Dam (Karuk Tribe of California 2009, 2010a, 2010b, 2011, 2012, 2013) (see Appendix C for more detail). At the Salmon River confluence with the Klamath River (RM 66.3), the effects of the Lower Klamath Project on water temperature are significantly diminished. Downstream from the Salmon River, the influence of the Lower Klamath Project dams on water temperature in the Klamath River is not discernable from the modeled data (PacifiCorp 2005a; Dunsmoor and Huntington 2006; North Coast Regional Board 2010; Perry et al. 2011; Risley et al. 2012).

Downstream from the Salmon River (RM 66), summer water temperatures begin to decrease slightly with distance as coastal weather influences (i.e., fog and lower air temperatures) decrease longitudinal warming (Scheiff and Zedonis 2011) and cool water tributary inputs increase the overall flow volume in the Klamath River (Asarian and Kann 2013). In general, however, water

temperatures in this reach still regularly exceed salmonid thermal preferences (less than 68ºF) during summer months. Asarian and Kann (2013) reported that the average daily maximum water temperature[6] between 2001 and 2011 was 73.4ºF or higher between July through August from the Salmon River (RM 66) to Turwar Creek (RM 5.6). Daily maximum summer water temperatures have been measured at values greater than 78.8°F just upstream of the confluence with the Trinity River (Weitchpec [RM 43.6]), decreasing to 76.1°F near Turwar Creek (RM 5.6) (YTEP 2005; Sinnott 2010a). Maximum temperatures in the Klamath River downstream from Iron Gate Dam to the Klamath River Estuary regularly exceed the range of chronic (sublethal) effects temperature thresholds[7] (55.4 to 68°F) for full salmonid support in California (North Coast Regional Board 2010; Sinnott 2010a, 2011a, 2012a; Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019; Hanington 2013; Hanington and Ellien 2013) (see Appendix C for more detail).

Water temperatures in the Klamath River Estuary are linked to meteorological conditions (e.g., solar radiation, coastal fog), temperatures and flows entering the estuary, salinity of the estuary and resulting density stratification, and the timing and duration of sand berm formation across the estuary mouth. When the estuary mouth is open, denser salt water from the ocean sinks below the lighter fresh river water, resulting in a salt wedge that moves up and down the estuary with the daily tides (Horne and Goldman 1994; Wallace 1998; Hiner 2006). The saltwater wedge results in thermal stratification of the estuary with cooler, high salinity ocean waters remaining near the estuary bottom, and warmer, low salinity river water near the surface. Under low-flow summertime conditions, when the mouth can close, surface water temperatures in the estuary have been observed at 64.4 to 76.5°F (Wallace 1998; Hiner 2006; Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019). Input of cool ocean water and fog along the coast minimizes extreme water temperatures much of the time (Scheiff and Zedonis 2011).

3.2.2.3 Suspended Sediments

For the purposes of the Lower Klamath Project EIR, “suspended sediment” refers to settleable suspended material in the water column. Bed materials, such as gravels and larger substrates, are discussed in Section 3.11.2.4 *Sediment Load*. Two types of suspended material are important to water quality in the Klamath River: algal-derived (organic) suspended material and mineral (inorganic) suspended material. Sources of each type of suspended material differ, as do

[6] The average daily maximum water temperature is calculated by determining the daily maximum water temperature for each day with at least 80 percent complete data (38 out of 48 individual 30-minute measurements present), then averaging the daily maximum water temperature for each day from 2001 to 2011.
[7] Chronic (sub-lethal) effects temperature thresholds are detailed in Appendix 4 of North Coast Regional Board (2010).

spatial and temporal trends for each, within the Upper, Middle, and Lower Klamath river reaches.

Suspended material concentrations tend to decrease through the Hydroelectric Reach (PacifiCorp 2004b), where interception, decomposition, and retention of organic suspended materials occur in the Lower Klamath Project reservoirs. Additionally, dilution from coldwater springs below J.C. Boyle assists in decreasing organic suspended material concentrations. However, seasonal increases in organic suspended material can occur in Copco No. 1 and Iron Gate reservoirs due to large summertime phytoplankton blooms, which can adversely affect water quality beneficial uses (PacifiCorp 2004b; Raymond 2008a, 2009a, 2010a; Watercourse Engineering, Inc. 2011b, 2012, 2013, 2014, 2015, 2016) (see Appendix C, Section C.2.1 for more detail).

In the winter months, suspended material in the Hydroelectric Reach is dominated by mineral sediment loads from several tributaries that join the river in this reach (primarily Shovel Creek, Spencer Creek, Jenny Creek, Fall Creek). Inorganic suspended materials (i.e., silts, clays with diameters less than 0.063 mm) are primarily transported during high flow events and generally settle out in the Lower Klamath Project reservoirs such that water column concentrations decrease with distance downstream in this reach (see also Appendix C, Section C.2.1). Likewise, the reservoirs trap bedload or fluvial sediment (coarse sand, gravels, and larger materials with diameters greater than 0.063 mm) from the tributaries. In the Hydroelectric Reach, J.C. Boyle, Copco No.1, and Iron Gate reservoirs trap sediment and suspended material, reducing suspended sediment concentrations immediately downstream of their respective dams. Copco No. 2 Reservoir does not trap appreciable amounts of sediment or suspended material (USBR 2011) or reduce suspended sediment concentrations downstream of its dam, since the immediately upstream Copco No. 1 Dam traps upstream sediment and the relatively small volume of Copco No. 2 Reservoir (i.e., 70 acre-feet) prevents suspended material from settling out inside the reservoir. On the scale of the entire Klamath Basin, the trapping of fine sediments and suspended materials does not appear to be a critical function of the Lower Klamath Project reservoirs with respect to the overall cumulative sediment delivery including downstream tributaries (see also Section 3.11.2.4 *Sediment Load*), since a relatively small percentage (3.4 percent) of total sediment supplied to the Klamath River on an annual basis originates from the Upper and Middle Klamath River (i.e., from J.C. Boyle Dam to the confluence with the Shasta River). Beneficial uses in the Hydroelectric Reach are currently not impaired due to inorganic suspended material (North Coast Regional Board 2011).

Trapping of fine sediments and suspended materials by the Lower Klamath Project reservoirs reduces suspended sediment concentrations immediately downstream of Iron Gate Dam (RM 193.1), thus inorganic suspended material concentrations are generally low in this reach. However, in the summer months, organic suspended materials can increase in the Klamath River between Iron

Gate Dam and Seiad Valley (RM 132.7) due to the transport of in-reservoir algal blooms to downstream reaches of Klamath River, resuspension of previously settled organic materials, and degradation (i.e., senescence) of periphyton communities along the stream (YTEP 2005; Sinnott 2008; Armstrong and Ward 2008; Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016, 2017). The relative magnitude of the contribution from the different sources of organic (algal-derived) suspended material in the Klamath River has not been and cannot be quantified from the available data since the measurements did not attempt to distinguish between the potential sources. Near the confluence with the Scott River (RM 145.1) concentrations of organic suspended materials tend to decrease with distance as phytoplankton gradually settle out of the water column farther downstream or are diluted by tributary inputs (see Appendix C for more detail).

Inorganic suspended sediments downstream of Iron Gate are mainly contributed by major tributaries to the mainstem during winter and spring (Armstrong and Ward 2008). The three tributaries that contribute the largest amount of suspended sediment to the Klamath River are located below Iron Gate Dam and include: the Scott River (RM 145.1) (607,300 tons per year or 10 percent of the cumulative average annual delivery from the basin); Salmon River (RM 66) (320,600 tons per year or 5.5 percent of the cumulative average annual delivery from the basin) (Stillwater Sciences 2010); and, the Trinity River (3,317,300 tons per year or 57 percent of the cumulative average annual delivery from the basin) (Stillwater Sciences 2010) (see Appendix C for more detail). Additionally, steep terrain and land use activities such as timber harvest and road construction near the Klamath River and its tributaries result in high sediment loads during high-flow periods.

3.2.2.4 Nutrients

Levels of nutrients, including nitrogen and phosphorus, are affected by the geology of the Klamath Basin, upland productivity and land uses, and a number of physical processes affecting aquatic productivity within reservoir and riverine reaches. The two major upstream sources of nutrients to the water quality Area of Analysis are Upper Klamath Lake, which inputs nitrogen and phosphorus (Kann and Walker 1999; ODEQ 2002; PacifiCorp 2004b; Deas and Vaughn 2006; FERC 2007; Sullivan et al. 2008; Asarian et al. 2010) and the Lost River Basin (via the Klamath Straits Drain and the Lost River Diversion Channel), which inputs nutrients and organic matter (Lytle 2000; Mayer 2005; Sullivan et al. 2009; Sullivan et al. 2011; Kirk et al. 2010).

On an *annual* basis, nutrients typically decrease slightly through the Hydroelectric Reach due to settling of particulate matter and associated nutrients in Copco No. 1 and Iron Gate reservoirs, and dilution by the coldwater springs located downstream of J.C. Boyle Reservoir (Asarian et al. 2010; North Coast

Regional Board 2010; Oliver et al. 2014)[8]. Annual total nitrogen (TN) inputs to Copco No. 1 and Iron Gate reservoirs range from approximately 2,026 to 3,443 metric tons TN between May 2005 and May 2007, with an annual TN retention of approximately 259 to 419 total metric tons TN. Thus, the annual TN retention in Copco No. 1 and Iron Gate reservoirs is approximately 12 percent (419 of 3,443 metric tons TN) from May 2005 to May 2006 and 13 percent (259 of 2,026 metric tons TN) from May 2006 to May 2007 (Asarian et al. 2009). The annual total phosphorus (TP) inputs to Copco No. 1 and Iron Gate range from approximately 210 to 335 metric tons TP between May 2005 and May 2007, with an annual TP retention of approximately 28 to 30 total metric tons TP. Thus, annual TP retention in Copco No. 1 and Iron Gate reservoirs is approximately 9 percent (30 of 335 metric tons TP) from May 2005 to May 2006 and 13 percent (28 of 210 metric tons TP) from May 2006 to May 2007 (Asarian et al. 2009). Overall, on an annual basis, external loading of nutrients from the Upper Klamath River appears to be the dominant source of total nutrients to the Hydroelectric Reach and the Lower Klamath Project reservoirs and is also responsible for the majority of total nutrients being transported downstream of the reservoirs.

However, on a *seasonal* basis, TP, and to a limited degree the ammonia contribution to TN, can increase in the Hydroelectric Reach due to the release (export) of dissolved forms of phosphorus (ortho-phosphorus) and nitrogen (ammonium) from reservoir sediments during summer and fall when reservoir bottom waters are anoxic (Kier Associates 2006; Kann and Asarian 2007; Stillwater Sciences 2009; Asarian et al. 2009, 2010; Oliver et al. 2014). Such internal loading of nutrients on a seasonal basis is common in reservoirs that thermally stratify and become anoxic for several weeks to months during summer and fall. In Copco No. 1 and Iron Gate reservoirs, total combined TP retention is approximately negative 8 percent during the main reservoir phytoplankton growing season (i.e., approximately May to September), with the negative combined TP retention during this period indicating a net export of TP. The total combined TN retention in Copco No. 1 and Iron Gate reservoirs is approximately 23 percent during the main reservoir phytoplankton growing season (i.e., approximately May to September). The higher TN retention during summer months is attributed to settling of organic matter and algal material, denitrification, and/or ammonia volatilization (Asarian et al. 2009, 2010). While TN retention is seasonally higher in Copco No. 1 and Iron Gate during the main reservoir phytoplankton growing season, the ammonia concentration downstream of Iron Gate increases during this period from approximately 0.01 to 0.05 mg/L until peaking in October and November at approximately 0.1 to 0.2 mg/L due to the anoxic conditions in the lower section Iron Gate Reservoir (Asarian et al. 2010) (see Appendix C for additional details). Seasonal nutrient releases occur during

[8] The total nitrogen (TN) and total phosphorus (TP) nutrient concentrations in the natural coldwater springs are low, at approximately 0.22 mg/L TN (almost exclusively dissolved) and 0.06 to 0.08 mg/L TP (mostly dissolved) (Asarian et al. 2010).

periods of in-reservoir phytoplankton growth, and, in the case of TP, can result in downstream transport of bioavailable nutrients to the Lower Klamath River where they can stimulate growth of periphyton (aquatic freshwater organisms attached to river bottom surfaces). Additional information on effects of the Lower Klamath Project to phytoplankton and periphyton can be found in Section 3.4 *Phytoplankton and Periphyton*.

Seasonal variations in concentrations of TN and TP occur in the Klamath River downstream of Iron Gate Dam due to a combination of nutrient storage and release from the water column and reservoir sediments, varying water concentrations at the elevation of the penstock intakes, residence times, and possible atmospheric losses through denitrification (for TN only) (Asarian and Kann 2011). In the summer and fall, TN and TP loads from Iron Gate Reservoir dominate nutrient loading to the Lower Klamath River compared to inputs from downstream tributaries, because tributary flows are relatively low during these seasons (Armstrong and Ward 2008). Downstream from the Lower Klamath Project, TP values typically range 0.1 to 0.25 milligrams per liter (mg/L) in the Klamath River between Iron Gate Dam and Seiad Valley, with the highest values occurring just downstream from the dam. TN concentrations in the river downstream from Iron Gate Dam generally range from less than 0.1 to over 2.0 mg/L and are generally lower than those in upstream reaches due to reservoir retention and dilution by springs in the Hydroelectric Reach (Asarian et al. 2009) (see Appendix C for additional details). TP and TN concentrations in the Klamath River during summer through early fall vary with flow, with the highest concentrations tending to occur during low flow years (e.g., 2001 to 2004) and the lowest concentrations tending to occur during high flow years (e.g., 2006, 2010, 2011) (Asarian and Kann 2013). Dissolved nitrogen (nitrate) shows substantial variability among years (Asarian and Kann 2013).

Further variations in TN occur in the Middle and Lower Klamath river reaches due to a combination of tributary dilution and in-river nutrient spiraling processes by phytoplankton and periphyton. Nutrient concentrations are generally much lower in tributaries, with the exception of TP, TN, and soluble reactive phosphorus in the Shasta River and TN and nitrate in the Scott River at the outlet of Scott Valley (Asarian and Kann 2013). In-river nutrient spiraling processes by phytoplankton and periphyton involve cycling of nutrients by uptake during growth, storage in biomass, and release during biomass decay. These nutrient spiraling processes strongly affect nitrogen concentrations in flowing rivers. Removal processes such as denitrification and/or assimilation and storage related to biomass uptake decrease dissolved nitrogen concentrations in the river (Mulholland 1996; Butcher 2008; Asarian et al. 2010; Asarian and Kann 2013). Late-seasonal recycling of nutrients downstream occurs as active phytoplankton and periphyton growth wanes and may result in more bioavailable nutrients in the river. Ratios of nitrogen to phosphorus (TN:TP) measured in the Klamath River downstream from Iron Gate Dam suggest the potential for nitrogen-limitation of

primary productivity[9] (i.e., phytoplankton and/or periphyton growth) with some periods of co-limitation by both nitrogen and phosphorus. However, concentrations of both nutrients are high enough that other factors (i.e., light, water velocity, or available substrate) may be more limiting to phytoplankton and periphyton growth than nutrients are, particularly in the vicinity of Iron Gate Dam (FERC 2007; HVTEPA 2008; Asarian et al. 2010) (see Appendix C and Section 3.4 *Phytoplankton and Periphyton* for additional details).

Downstream from the confluence with the Salmon River, nutrient concentrations continue to decrease in the Klamath River due to tributary dilution and nutrient retention. Contemporary data (2001 to 2015) indicate that TP concentrations in this portion of the river are generally 0.05 to 0.1 mg/L with peak values occurring in September and October. Contemporary data indicate that, on a seasonal basis, TN increases from May through November with peak concentrations (greater than 0.5 mg/L) typically observed between August and October (YTEP 2004a, 2005; Sinnott 2008, 2009a, 2009b, 2010b, 2011b, 2012b; Asarian et al. 2010; Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016; Asarian and Kann 2013; HVTEPA 2013; Hanington and Torso 2013; Hanington and Stawasz 2014; Hanington and Cooper-Carouseli 2014; Oliver et al. 2014). Under these existing conditions, both TP and TN are at or above the Hoopa Valley Tribe numeric criterion of 0.2 mg/L TN and 0.035 mg/L TP (HVTEPA 2008).

Nutrient levels in the Klamath River Estuary experience inter-annual and seasonal variability. Measured levels of TP in the estuary are typically below 0.1 mg/L during summer and fall (June to October) and TN levels are consistently below 0.7 mg/L (June to October) (Sinnott 2008, 2009a, 2009b, 2010b, 2011b, 2012b; Hanington and Torso 2013; Hanington and Stawasz 2014; Hanington and Cooper-Carouseli 2014). While the Basin Plan water quality objective for biostimulatory substances is narrative rather than numeric (North Coast Regional Board 2011), as with upstream reaches, measured nutrient levels in the Klamath River Estuary typically exceed the half-saturation constant (0.003 mg/L for phosphorus [Tetra Tech 2009] and 0.014 mg/L for nitrogen [Tetra Tech 2009]) but may, at times, promote algal growth at levels that cause nuisance effects or adversely affect beneficial uses.

3.2.2.5 Dissolved Oxygen

Dissolved oxygen is the amount of oxygen gas dissolved in water. Oxygen enters water by direct incorporation from the atmosphere, through rapid mixing of water with air (e.g., turbulent mixing in fast flowing stream reaches), or as a waste product of photosynthesis by aquatic organisms. Water temperature and the volume of moving water can influence dissolved oxygen concentrations in water. Dissolved oxygen concentrations in the Klamath River depend on several

[9] Primary productivity is the synthesis of organic compounds by organisms through either photosynthesis or chemosynthesis.

factors, including water temperature (colder water absorbs more oxygen), water depth and volume, stream velocity (as related to mixing and re-aeration), atmospheric pressure, salinity, and the activity of organisms that depend upon dissolved oxygen for respiration. This last factor (respiratory consumption) is strongly influenced by the availability of nitrogen and phosphorus for supporting algal and aquatic plant growth.

During summer, the Lower Klamath Project reservoirs' surface waters exhibit varying levels of dissolved oxygen mainly driven by phytoplankton, especially large blue-green algae blooms, in the reservoirs. During daylight hours, phytoplankton produce dissolved oxygen (through photosynthesis), resulting in super-saturation of dissolved oxygen. During nighttime hours, phytoplankton consume dissolved oxygen (through respiration) contributing to dissolved oxygen levels that can be below Basin Plan objectives.

The relatively long and shallow J.C. Boyle Reservoir (in Oregon) does not thermally stratify (see also Section 3.2.2.2 *Water Temperature*). While reaeration in the steep gradient of the Upper Klamath River between Keno Dam and J.C. Boyle Reservoir can increase dissolved oxygen in the Klamath River to near saturation levels, high biological oxygen demand in water entering J.C. Boyle Reservoir during summer months can still reduce dissolved oxygen levels as the water slows in the relatively low gradient of the reservoir (Raymond 2008a, 2009a, 2010a). While J.C. Boyle Reservoir does not thermally stratify, there are still large summertime variations in dissolved oxygen with depth observed in J.C. Boyle Reservoir that result in bottom waters in the reservoir having lower dissolved oxygen concentrations than surface waters (Raymond 2009a, 2010a; see Appendix C, Figure C-29 for more detail). This variation can affect dissolved oxygen concentrations further downstream in the California portion of the Hydroelectric Reach.

Copco No. 1 and Iron Gate reservoirs thermally stratify beginning in April/May and do not mix again until October/November (FERC 2007). During summer months, dissolved oxygen in Copco No. 1 and Iron Gate in the layer of water at the surface (epilimnion) is generally at, or in some cases above, saturation, while levels in hypolimnetic waters (the layer at the bottom) reach minimum values near 0 mg/L by July (see Appendix C for more detail). While the lowest surface dissolved oxygen concentrations in Copco No. 1 Reservoir generally co-occur with maximum water temperatures in July and August, the lowest surface dissolved oxygen concentrations in Iron Gate Reservoir tend to occur in October (see Appendix C, Figure C-32). The low surface dissolved oxygen levels and their occurrence later in the season at Iron Gate Reservoir may be associated with respiration of ongoing seasonal algal blooms in surface waters in this reservoir, as well as decomposition of organic matter derived from upstream sources. Very low dissolved oxygen levels in hypolimnetic (i.e., bottom) waters and sediments in mid-summer through fall in both reservoirs are due to the decomposition of dead algae cells from seasonal in-reservoir algal blooms as

well as the decomposition of organic matter from upstream sources (Raymond 2009a, 2010a; Asarian and Kann 2013). Low dissolved oxygen concentrations in bottom waters generally persist longer in Iron Gate Reservoir than Copco No. 1 Reservoir since Copco No. 1 Reservoir experiences complete water-column mixing during approximately mid-October to early November, but Iron Gate Reservoir tends to mix approximately a month later, in late November to early December (see Appendix C, Figure C-32) (Raymond 2009a, 2010a; Asarian and Kann 2011).

In addition to the biological oxygen demand of the water column, there is also a sediment oxygen demand that influences dissolved oxygen levels in the water column of lakes, reservoirs, and rivers (Doyle and Lynch 2005). Sediment oxygen demand is the rate at which dissolved oxygen is removed from the water column by the decomposition of organic matter in streambed or lake/reservoir sediments. An analysis of oxygen demand in sediment cores sampled in 2002 from Copco No. 1 and Iron Gate reservoirs indicates that sediment oxygen demand in these waterbodies ranges from 1.0 to 2.0 grams of oxygen per square meter per day (g O_2/m^2/day) (FERC 2007), which is on the high end of values measured in other California reservoirs that typically range from approximately 0.1 g O_2/m^2/day to 1.4 g O_2/m^2/day (Beutel 2003).

Based upon measurements collected in the Middle Klamath River approximately 1,000 feet downstream from Iron Gate Dam, dissolved oxygen concentrations in this location regularly fall below 8.0 mg/L[10] and the Basin Plan minimum dissolved oxygen criteria of 85 to 90 percent saturation (depending on season and location) (Karuk Tribe of California 2001, 2002, 2003, 2007, 2009, 2010a, 2010b, 2011, 2012, 2013; Asarian and Kann 2011, 2013; Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016, 2017). Daily fluctuations in dissolved oxygen (ranging from 1 to 3 mg/L per day) measured in the Klamath River approximately 1,000 feet downstream from Iron Gate Dam have been attributed to daytime algal photosynthesis and nighttime bacterial respiration in the upstream reservoirs (Karuk Tribe of California 2002, 2003; YTEP 2005; North Coast Regional Board 2010; Asarian and Kann 2011, 2013). Measured dissolved oxygen concentrations at this monitoring site are the net result of daily dissolved oxygen variations in the water being discharged from Iron Gate Dam along with mechanical aeration in the Klamath River and photosynthesis and respiration by organisms between the location where water is discharged from Iron Gate Dam and the monitoring site, but the magnitude of dissolved oxygen contributions from processes in the Klamath River between the reservoir discharge location and the monitoring site compared to the magnitude

[10] The Hoopa Valley Tribe surface-water quality objective for dissolved oxygen for COLD beneficial use is 8.0 mg/L (see

Table 3.2-).

of contributions from the upstream reservoirs have not been quantified. Although PacifiCorp has operated a turbine venting system since 2010 that mechanically adds oxygen to water as it is passed through the powerhouse turbines and before it is discharged to the Middle Klamath River, low dissolved oxygen saturation values continue to occur immediately downstream of the dam during late summer through fall (August through November) every year (PacifiCorp 2013a, 2014b, 2015a, 2016b, 2017b; Karuk Tribe of California 2012, 2013). Data from 2017 indicate that when dissolved oxygen decreased to 70 percent saturation in September at the monitoring site approximately 1,000 feet downstream of Iron Gate Dam, reaeration to greater than the applicable Basin Plan minimum dissolved oxygen saturation criterion (i.e., 85 percent saturation) occurred within approximately 2 to 3 miles downstream of Iron Gate Dam (PacifiCorp 2018b).

Farther downstream in the mainstem Klamath River, near Seiad Valley, dissolved oxygen concentrations tend to be higher but variable, with mean daily values ranging from approximately 6.5 mg/L to supersaturated concentrations of approximately 11.5 mg/L from June through November (Karuk Tribe of California 2001, 2002, 2003, 2007, 2009, 2010a, 2010b, 2011, 2012, 2013; Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016). At Seiad Valley, 31 percent of dissolved oxygen continuous data showed less than 8.0 mg/L between June and October during 2001 to 2011. During this period, the dissolved oxygen concentrations were less than 90 percent saturation in 25 percent of the continuous data and less than 85 percent saturation in 9 percent of measurements (Asarian and Kann 2013). Longitudinal variations in dissolved oxygen from Iron Gate Dam to Seiad Valley are most pronounced in the fall when dissolved oxygen concentrations are low immediately downstream of Iron Gate Dam and increase to saturation (or supersaturation) by Seiad Valley (Karuk Tribe of California 2013).

Dissolved oxygen concentrations from Orleans to Turwar in the Klamath River are also variable, with typical daily values ranging from approximately 6.5 mg/L to supersaturated concentrations of 11.5 mg/L during summer through fall (Karuk Tribe of California 2001, 2002, 2003, 2007, 2009, 2010a, 2010b, 2011, 2012, 2013; Ward and Armstrong 2010; North Coast Regional Board 2010; Asarian and Kann 2011, 2013; Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016). Near the confluence with the Trinity River and at Turwar, diel fluctuations in dissolved oxygen concentrations were observed resulting in dissolved oxygen greater than 8.0 mg/L during part of the day, but dissolved oxygen below 8.0 mg/L for several hours on multiple consecutive days to weeks during late summer/early fall (YTEP 2005; Sinnott 2010a, 2011a, 2012a; Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015; Asarian and Kann 2013; Hanington 2013; Hanington and Ellien 2013) (see Appendix C for additional details).

Dissolved oxygen concentrations in the Klamath River Estuary vary both temporally and spatially; concentrations in the deeper main channel of the estuary are generally greater than 6 to 7 mg/L throughout the year (Hiner 2006, YTEP 2005). Low dissolved oxygen concentrations (less than 1 to 5 mg/L) have been observed during summer months in the relatively shallow, heavily vegetated south slough (Hiner 2006; Wallace 1998). The low levels of dissolved oxygen observed in the slough are likely due to high rates of growth and subsequent decomposition of algae and macrophytes, which are not abundant elsewhere in the estuary. Data during the period of 2009 to 2015 in the lower Klamath River Estuary (approximately RM 0.5) indicate that dissolved oxygen usually ranges from 7 mg/L to supersaturated concentrations of approximately 11 mg/L during summer and fall, with minimum levels near 5 mg/L (Sinnott 2010a, 2011a, 2012a; Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015; Hanington 2013; Hanington and Ellien 2013; Hanington and Cooper-Carouseli 2014) (see Appendix C for additional details).

3.2.2.6 pH

The pH of surface water is controlled by atmospheric carbon dioxide as well as the photosynthetic and respiratory processes of organisms in the water. pH controls the form that some chemical compounds take and mediates the chemical speciation of other compounds in the water (e.g., ammonia/ammonium, minerals, metals). In addition, pH influences the concentration of un-ionized ammonia and the ammonium ion in the water column (North Coast Regional Board 2010). The ability of a system to buffer changes in pH from natural and anthropogenic sources is measured by the total alkalinity of the water. Typical alkalinity of freshwater ranges from 20 to 200 mg/L, with levels below 100 mg/L indicating limited buffering capacity and an increased susceptibility to changes in pH. Levels below 10 mg/L indicate that the system is poorly buffered and very susceptible to changes in pH (Stillwater Sciences 2009).

The Klamath River is a weakly buffered system (i.e., has typically low alkalinity less than 100 mg/L as calcium carbonate [$CaCO_3$]; PacifiCorp [2004a], Karuk Tribe of California [2010a]), so it is susceptible to photosynthesis-driven daily and seasonal swings in pH. In the Hydroelectric Reach, pH varies with both depth in the reservoirs and season, as changes in rates of photosynthesis and respiration alter pH of the water. Vertical profile measurements of pH in Iron Gate and Copco No. 1 reservoirs between March and November 2000 to 2005 and June through November 2007 indicate that pH decreases with depth in both reservoirs (Figure 3.2-4; see Appendix C for additional details). The vertical distribution of pH values in both Lower Klamath Project reservoirs is attributed to photosynthesis of floating phytoplankton in surface waters (which increases pH) and respiration in bottom waters (which decreases pH) (Raymond 2008a; Asarian and Kann 2011). The dissolved oxygen vertical profiles in the Lower Klamath Project reservoirs further supports the role of phytoplankton in influencing pH with supersaturated dissolved oxygen concentrations in surface

waters from photosynthesis and low dissolved oxygen in bottom waters from respiration (Figure 3.2-4).

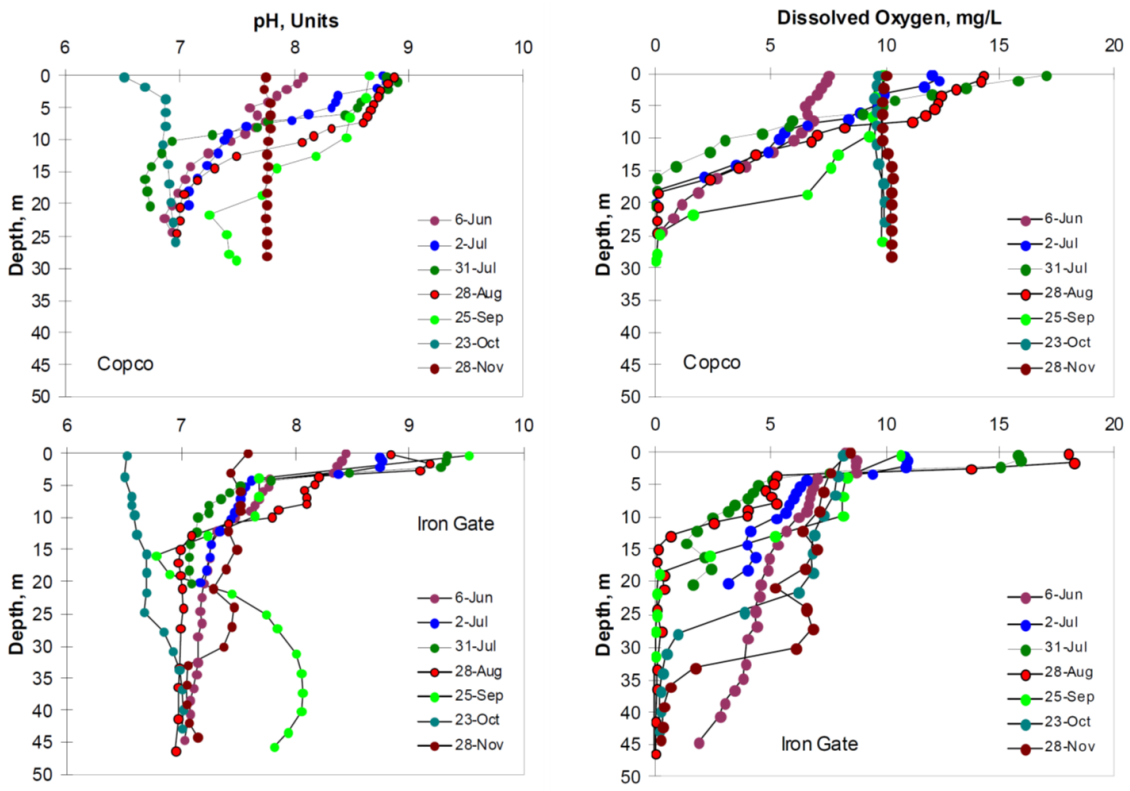

Figure 3.2-4. Vertical Profiles of pH and Dissolved Oxygen Measured During 2007 in Copco No 1. Reservoir at the Log Boom (top plot) and Iron Gate Reservoir at the Log Boom (bottom plot). Source: Adapted from Raymond 2008a.

Approximately 30 percent of samples collected in Copco No. 1 Reservoir and 5 to 20 percent of samples[11] collected in Iron Gate Reservoir surface waters (here, less than eight meters deep) exhibited pH values greater than 8.5 standard units (s.u.) (PacifiCorp 2008a), which is the Basin Plan instantaneous maximum pH objective (North Coast Regional Board 2011). In contrast, pH samples collected in bottom waters (here, greater than 20 meters) of both reservoirs tend to be lower, with approximately 17 percent of samples (68 of 391) collected in Copco No. 1 Reservoir and 22 percent of samples (135 of 613) collected in Iron Gate Reservoir exhibiting pH values less than 7.0 s.u. Other studies document peak

[11] PacifiCorp (2008a) Table 5.2-11 specifies the number of samples with pH greater than 8.5 as 25 of 485 total samples, equating to approximately 5 percent of samples. However, the table lists the percent of samples with pH greater than 8.5 as 19.6 percent. This appears to be a typographical error that cannot be resolved with the available information in PacifiCorp (2008a).

pH values (8.5 to 9.2 s.u.) near the reservoir surfaces during summer months (Raymond 2010a; Watercourse Engineering, Inc. 2012, 2013, 2014, 2015, 2016), while lower values (5.4 to 8.0 s.u.) have been documented near reservoir bottoms, without a consistent temporal trend amongst the reservoirs. Longitudinally within the Hydroelectric Reach, the lowest pH values have been recorded downstream from J.C. Boyle Reservoir (in Oregon) and the highest values in Copco No. 1 and Iron Gate reservoirs (Raymond 2008a, 2009a, 2010a).

In the Middle Klamath River, there are seasonally high pH values, with the highest pH values generally occurring during late-summer and early-fall months. Daily cycles in pH also occur in these reaches, with pH usually peaking during later afternoon or early evening following the period of maximum photosynthesis (North Coast Regional Board 2010; Asarian and Kann 2013). Hourly pH variations measured in the Klamath River downstream of Shasta River during a 48-hour period between July 28 to July 30, 1997 show the daily change in pH ranging from approximately 0.8 to 1.5 s.u. (Deas and Orlob 1999). The daily range of pH (i.e., daily maximum pH minus daily minimum pH) generally peaks between late July and early September, corresponding to daily cycles of photosynthesis and respiration, which also peak between late July and early September (Asarian and Kann 2013). The Basin Plan instantaneous maximum pH objective of 8.5 s.u. is regularly exceeded in the Middle and Lower Klamath River (FISHPRO 2000; Karuk Tribe of California 2002, 2003; YTEP 2005; FERC 2007; USFWS 2008; North Coast Regional Board 2010, 2011; Asarian and Kann 2013; Watercourse Engineering, Inc. 2012, 2013, 2014, 2015, 2016, 2017) (see Appendix C for more detail). The most extreme pH exceedances typically occur from Iron Gate Dam to approximately Seiad Valley, with pH values generally decreasing with distance downstream (FERC 2007; Karuk Tribe of California 2007, 2009, 2010a, 2010b, 2011, 2012, 2013; Asarian and Kann 2013) (see Appendix C for more detail). Analysis of data from 2001 to 2011 indicates that for June through October, 35 percent of pH measurements exceeded 8.5 s.u. between Iron Gate Dam and the confluence with the Shasta River, and 11 percent of pH measurements exceeded 8.5. s.u. at Orleans. pH greater than 9.0 s.u. was most frequently recorded at Iron Gate Dam (nine percent for September) and was rare (less than 0.1 percent) at mainstem locations below Seiad Valley (Asarian and Kann 2013).

During the summer months, pH values also are elevated in the Lower Klamath River from the confluence with the Trinity River downstream to approximately Turwar Creek (FISHPRO 2000; Karuk Tribe of California 2002, 2003, 2007, 2009, 2010a, 2010b, 2011, 2012, 2013; YTEP 2005; USFWS 2008; North Coast Regional Board 2010, 2011; Sinnott 2010a, 2011a, 2012a; Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016, 2017; Asarian and Kann 2013) (see Appendix C for more detail). In the Klamath River Estuary, pH typically ranges from approximately 6.9 and 9.0 s.u. with peak values also occurring during the summer months, though values below 6.9 s.u. have

occasionally been measured (YTEP 2005; Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016, 2017). Daily variations in pH are typically on the order of 0.5 s.u., and fluctuations tend to be somewhat larger in the late summer and early fall. When large daily fluctuations are observed, they are likely caused by algal blooms that are transported into the estuary (YTEP 2005).

3.2.2.7 Chlorophyll-*a* and Algal Toxins

As primary producers, phytoplankton and periphyton are critical components of river and lake ecosystems (see also Section 3.4 *Phytoplankton and Periphyton*). Their presence and abundance affect food web dynamics as well as physical water quality parameters (e.g., dissolved oxygen, pH, turbidity, and nutrients). Physical water quality parameters are affected by phytoplankton and periphyton through rates of photosynthesis, respiration, and decay of dead phytoplankton and periphyton cells (Horne and Goldman 1994). Phytoplankton and periphyton species in the water quality Area of Analysis include a number of different species that may have very different effects on water quality and water chemistry. With respect to phytoplankton, a 2007 field study of river and lake/reservoir sites from Upper Klamath Lake to the Klamath River at Turwar found that the major groups present include diatoms (70 percent of total biovolume), cyanobacteria [blue-green algae] (28 percent of total biovolume), and green algae (1 percent of total biovolume) (Raymond 2008b). In a lake or reservoir environment, diatoms (i.e., unicellular, photosynthetic microalgae) typically dominate in spring then decrease due to zooplankton[12] grazing and the onset of water column stratification, which results in the diatoms settling out of the water column below the lake or reservoir surface layer (epilimnion). Cyanobacteria, also referred to as “blue-green algae,” are photosynthetic bacteria and can often be a nuisance aquatic species, occurring as large seasonal blooms that alter surrounding water quality. In a lake or reservoir environment, blue-green algae dominance increases during late summer and early fall because their ability to control their buoyancy enables blue-green algae to remain near the surface during lake or reservoir stratification, thereby obtaining light for photosynthesis better than diatoms (Raymond 2008b, 2009b, 2010b; Asarian and Kann 2011; McDonald and Lehman 2013; Visser et al. 2016). Dense blooms of blue-green algae that can remain at the water surface also reduce the light available for photosynthesis and growth of other phytoplankton species, like diatoms and green algae, that cannot control their buoyancy (Miller et al. 2010).

Some blue-green algae species produce algal toxins, which are also referred to as cyanotoxins (e.g., cyclic peptide toxins such as microcystin that act on the liver, alkaloid toxins such as anatoxin-a and saxitoxin that act on the nervous system). Cyanotoxins can cause irritation, sickness, or, in extreme cases, death to exposed organisms, including humans (WHO 1999). Incidence of visual disturbance, nausea, vomiting, muscle weakness, and acute liver failure have

[12] Heterotrophic plankton that prey on diatoms.

been reported in humans exposed to algal toxins (Butler et al. 2012). For example, four hours of recreational water exposure to 48.6 micrograms per liter (ug/L) of microcystin (one of the more common algal toxins found in Iron Gate and Copco reservoirs) is documented to cause abdominal pain, headache, sore throat, vomiting, nausea, dry cough, diarrhea, blistering around the mouth, and pneumonia (USEPA 2015). The California Cyanobacteria and Harmful Algal Bloom (CCHAB) Network, a multi-agency workgroup formerly called the Statewide Blue-Green Algae Working Group, has developed guidance for responding to harmful algal blooms (HABs), cyanotoxin (algal toxin) threshold levels for protection of human health, and cyanotoxin posting requirements for recreational waters (State Water Board et al. 2010, updated 2016). Species present in the Klamath River capable of producing microcystin include *Microcystis aeruginosa* and *Anabaena flos-aquae*[13], while species present in the Klamath River in the genus *Anabaena* can produce anatoxin-a and saxitoxin. The potentially microcystin and anatoxin-*a* producing *Oscillatoria sp.* was identified in the October 1975 survey of an algal bloom in Iron Gate Reservoir (USEPA 1978), but based on more recent data this algal species exhibits generally low abundance in the reservoirs and the Klamath River (Raymond 2008b, 2009b, 2010b; Asarian et al. 2014, 2015; Genzoli and Kann 2017). Microcystin-producing species in the genera *Gloeotrichia* and *Planktothrix* along with other algal toxin-producing species in the genera *Limnothrix* and *Pseudanabaena* also have been detected in the Klamath River, but these species have never been found to dominate the algal community (Kann and Asarian 2006; Genzoli and Kann 2017; E&S Environmental Chemistry, Inc. 2018a, 2018b). More complete listings of specific toxins produced by genera of blue-green algae worldwide are provided in Lopez et al. (2008) and ODEQ (2011).

For microcystin specifically, thresholds in drinking water or recreational waters for the protection of human health have been developed primarily using the results of animal studies (USEPA 2015). The State Water Board, California Department of Public Health (CDPH), and California Environmental Protection Agency's (CalEPA) Office of Environmental Health and Hazard Assessment (OEHHA) "Caution Action" posting threshold for the protection of human health in recreational waters is 0.8 micrograms per liter (ug/L) of microcystin (State Water Board et al. 2010, updated 2016).

[13] While *Anabaena flos-aquae* are capable of producing microcystin (Lopez et al. 2008), it is widely assumed that detected concentrations of microcystin are due to *Microcystis aeruginosa* rather than *Anabaena flos-aquae* due to the lower abundance of *Anabaena flos-aquae* compared to *Microcystis aeruginosa*. The relative proportion of microcystin contributions from *Anabaena flos-aquae* versus *Microcystis aeruginosa* has not been documented for the Klamath Basin.

Additional discussion of algal species, including algae suspended in the water column (phytoplankton) and algae attached to bottom sediments or channel substrate (periphyton), is provided in Section 3.4 *Phytoplankton and Periphyton*.

Chlorophyll-*a*, a pigment produced by photosynthetic organisms, is often used as a surrogate measure of algal biomass. Historically, seasonal algal blooms and elevated chlorophyll-*a* concentrations have been observed in the Hydroelectric Reach, including a 1975 survey in Iron Gate Reservoir documenting algal blooms in March, July, and October, including diatoms and blue green algae. The blue-green algae species *Aphanizomenon sp.* and *Oscillatoria sp.* were identified in the July and/or October 1975 Iron Gate Reservoir surveys, with the potentially microcystin and anatoxin-a producing *Oscillatoria sp.* as the most abundant of the five phytoplankton species identified in the October 1975 algal bloom. However, no *Microcystis aeruginosa* or *Anabaena flos-aquae* were identified during the three sampling dates in 1975 (USEPA 1978). More contemporary data indicate that chlorophyll-*a* levels in Copco No. 1 and Iron Gate reservoirs can be two to ten times greater than those in the mainstem Klamath River (Flint et al. 2005; Kann and Corum 2009; North Coast Regional Board 2010; Asarian and Kann 2011; Watercourse Engineering, Inc. 2016) (Figure 3.2-5; see Appendix C for more detail).

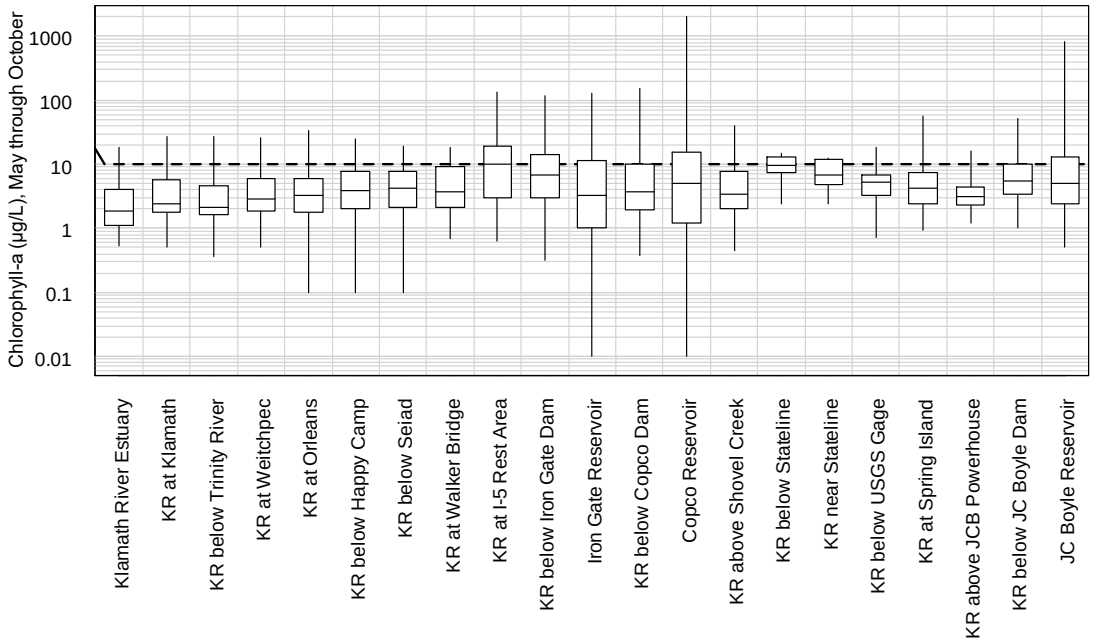

Figure 3.2-5. Longitudinal Analysis of Summer Through Fall (May to October) KHSA Interim Measure 15 (IM15) Chlorophyll-*a* Concentrations from 2000 to 2017 Along the Klamath River and in the Upper 10 Meters of the Lower Klamath Project Reservoirs. Whiskers Extend from Minimum to Maximum Value, Boxes Extend From the First to the Third Quartile, and the Horizontal Line Indicates the Median of the Dataset at Each Site. Note the Logarithmic Scale. The Dashed Horizontal Line is the Chlorophyll-*a* Klamath River TMDL Target (i.e., 10 ug/L). Chlorophyll-*a* Data from Stations That Shifted Locations Between Years Are Plotted Together (e.g., KR at Walker Bridge). Source: PacifiCorp 2003, 2004d, 2005b, 2007, 2008b, 2009b, 2010b, 2011, 2012, 2013b, 2014c, 2015b, 2016c, 2017c.

Summer and early fall chlorophyll-*a* measurements for the period 2000 to 2017 show a higher range of concentrations in J.C. Boyle, Copco No. 1, and Iron Gate reservoirs compared to the Hydroelectric Reach upstream of Copco No. 1 Reservoir or downstream of the Klamath River Walker Bridge station. Chlorophyll-*a* concentrations are generally higher at the reservoir surface and decrease with depth in the reservoir. Peak chlorophyll-*a* concentrations during algal blooms are generally higher in Copco No. 1 Reservoir than in Iron Gate Reservoir, with some exceptions (Asarian and Kann 2011). Overall, chlorophyll-*a* in the Klamath River tends to decrease downstream of Iron Gate Dam, but concentrations can occasionally remain approximately the same or increase during intense algal blooms in Iron Gate and Copco No. 1 reservoirs (Ward and Armstrong 2010; Asarian and Kann 2013; Watercourse Engineering, Inc. 2013,

2014, 2015, 2016, 2017). Chlorophyll-*a* concentrations downstream of Iron Gate Dam also exhibit seasonal variation, with concentrations increasing in summer months and decreasing in fall and winter (Asarian and Kann 2013) (see Appendix C for additional details). Chlorophyll-*a* concentrations downstream of Iron Gate Dam tend to be low during winter months (Asarian and Kann 2011).

In 2015, PacifiCorp installed a powerhouse intake barrier/thermal curtain in Iron Gate Reservoir under IM 11 with the primary purpose of isolating surface waters that have high concentrations of blue-green algae (cyanobacteria) and potentially limiting the release of Iron Gate Reservoir water containing extensive summer and fall blue-green algae blooms downstream to the Middle and Lower Klamath River. The curtain also provides a potential secondary benefit of isolating warmer, less dense near-surface waters while withdrawing cooler, denser, and deeper waters from the reservoir for release to the Klamath River downstream (see Section 3.2.2.2 *Water Temperature)* (PacifiCorp 2018a). Water quality measurements during 2015 and 2016 when the intake barrier/thermal curtain was in use indicate that the curtain reduces entrainment of blue-green algae into the Iron Gate Powerhouse intake and subsequent release downstream into the Klamath River (PacifiCorp 2016a, 2017a). However, water quality monitoring data from 2017 and 2018 downstream of Iron Gate Dam show multiple exceedances of the Klamath TMDLs phytoplankton chlorophyll-a target (i.e., 10 ug/L) and multiple microcystin posting limits (e.g., 6 ug/L for CCHAB Warning TEIR I; Table 3.2-10) (Watercourse Engineering, Inc. 2018, 2019). An analysis of the intake barrier/thermal curtain performance during 2017 or 2018 has not been published and PacifiCorp continues to test and refine the intake barrier/thermal curtain design and operations, but available data do not indicate that this measure would prevent releases from Iron Gate Dam that exceed water quality standards (Table 3.2-4) or would consistently achieve the Klamath TMDLs phytoplankton chlorophyll-*a* target of 10 ug/L for Copco No. 1 and Iron Gate reservoirs during the May to October growth season (North Coast Regional Board 2010). Additionally, potential reductions in the entrainment of blue-green algae, chlorophyll-*a* concentrations, and microcystin concentrations downstream of Iron Gate Dam from operation of the intake barrier/thermal curtain would be potentially limited by the need to access water with higher dissolved oxygen concentrations to comply with dissolved oxygen standards, with the curtain completely rolled up during portions of 2017 to maximize dissolved oxygen concentrations for aquatic life (PacifiCorp 2018a).

Phycocyanin, a pigment produced by blue-green algae, has been measured between May and November at some monitoring sites in the Klamath River downstream of Iron Gate Dam since 2007. At the Klamath River monitoring sites Iron Gate (RM 193.1) and Seiad Valley (RM 132.7), phycocyanin data from 2007 to 2014 is typically low from May through early July, increases to a peak in early to mid-September, and decreases until reaching low levels again by the end of October to early November (Asarian and Kann 2013). Phycocyanin concentrations generally coincide with chlorophyll-*a* concentrations for the

portion of the Klamath River at Seiad Valley. Farther downstream in the Klamath River upstream of Tully Creek (RM 38.8) and at Turwar (RM 5.8), phycocyanin also is typically low from May through early July, but it increases more gradually and peaks in late-September before decreasing to low levels again at the end of October. Phycocyanin generally decreases in the downstream direction from Iron Gate Dam to Orleans, but there is an increase in phycocyanin at Weitchpec before again decreasing in the downstream direction to Turwar. The longitudinal decrease in phycocyanin was most pronounced between Iron Gate and Seiad Valley and Seiad Valley and Orleans (Genzoli and Kann 2016).

High levels of the cyanotoxin microcystin occur during summer months in Copco No. 1 and Iron Gate reservoirs (Kann and Corum 2009; Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016, 2017; Otten et al. 2015; Otten 2017). In Copco No. 1 Reservoir, peak microcystin concentrations between 2006 and 2015 exceeded the CCHAB (2010, updated 2016) 0.8 ug/L threshold for the protection of human health in recreational waters by over 10,000 times. Watercourse Engineering (2011a) found extremely high concentrations (1,000 to 73,000 ug/L) during summer algal blooms in both Copco No. 1 and Iron Gate reservoirs during 2009 (see Appendix C for more detail). Consistent with previous findings, public health sampling data from 2015 show microcystin peaking between 12,000 and 16,000 ug/L in Copco No. 1 Reservoir during algal blooms in the summer and microcystin peaking from 64 to 770 ug/L in Iron Gate Reservoir (Watercourse Engineering, Inc. 2016). Microcystin concentrations are generally low from J.C. Boyle Reservoir to Copco No. 1 Reservoir, higher between Copco No. 1 Reservoir and Iron Gate Reservoir, and then generally decrease with distance downstream from Iron Gate Reservoir (Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016, 2017; Genzoli and Kann 2017; Otten 2017).

Microcystin concentrations downstream of Iron Gate Dam to the Klamath River Estuary are spatially and temporally variable (see Appendix C for more detail). The longitudinal and temporal variations in microcystin concentrations from upstream of Copco No. 1 Reservoir to Turwar along with genetic analysis of *Microcystis aeruginosa* in Copco No. 1 Reservoir, Iron Gate Reservoir, and multiple Klamath River sites downstream of Iron Gate Dam indicate that Iron Gate Reservoir is the principal source of *Microcystis aeruginosa* cells to the Middle and Lower Klamath River (Otten et al. 2015). The timing of peak microcystin concentrations in Iron Gate Reservoir corresponds to peak concentrations in the Klamath River downstream of Iron Gate Dam, consistent with the reservoir as the source (Otten et al. 2015). This evidence indicates that *Microcystis aeruginosa* populations from Iron Gate Reservoir contribute to *Microcystis aeruginosa* public health exceedances in the Klamath River downstream of Iron Gate Reservoir (see Section 3.4.2.3 *[Phytoplankton and Periphyton] Hydroelectric Reach*). While cyanobacteria [blue-green algae] that potentially produce algal toxins have been observed in calm, slow-moving habitats along shorelines and protected coves and backwaters during low-flow

periods in the Middle and Lower Klamath River under existing conditions (Fetcho 2008; Raymond 2008b; Kann and Corum 2009; Kann et al. 2010a; Genzoli and Kann 2016, 2017), Otten et al. (2015) found no evidence of endemic *Microcystis aeruginosa* populations that would produce algal toxins (i.e., microcystin) in the flowing regions of the Klamath River upstream or downstream of Copco No. 1 and Iron Gate reservoirs. Longitudinal decreases in *Microcystis aeruginosa* cell density and microcystin concentrations in open-channel and shoreline samples from the Klamath River downstream of Iron Gate Dam (RM 193.1) to upstream of the Klamath River Estuary suggest that water velocity and constant mixing in the river are not supportive of blue-green algae reproduction and algal toxin production, although microcystin concentrations between downstream of Iron Gate Dam and Orleans (RM 58.9) in July through October can exceed established public health thresholds (e.g., 0.8 ug/L) (Otten et al. 2015; Genzoli and Kann 2017). For example, microcystin concentrations in the Klamath River during the period 2010 to 2015 from Orleans (RM 58.9) to Klamath (RM 5.9) range from less than 1.0 ug/L to approximately 12.0 ug/L, with the highest concentrations usually occurring at Weitchpec (RM 43.6) and decreasing with distance downstream (Gibson 2016), although microcystin is occasionally higher at Orleans (RM 58.9) than Weitchpec (RM 43.6) (see Appendix C for additional detail).

Baseline monitoring for potential risk to public health from microcystin toxins was established in 2008. Public health monitoring within the Copco No. 1 and Iron Gate reservoirs and along the mainstem of the Klamath River is conducted collaboratively by PacifiCorp, Karuk Tribe, and Yurok Tribe. Monitoring occurs at various intervals from May through November. If river conditions exceed public health standards for toxic algae the area is posted with a health advisory sign.

Guidelines for posting health advisories have varied since 2008 and currently are provided by the State Water Board et al. (2010, updated 2016) for water in California. SWRCB posting levels are listed as Caution, Warning, and Danger at microcystin concentrations of 0.8, 6, and 20 ug/L, respectively, with toxin producing cells densities greater than 4,000 cells/mL or “blooms, scums, or mats” resulting in posting at the Caution level.

The Karuk Tribe (Kann 2014) and Yurok Tribe (YTEP 2016) each adopted public health guidelines for recreational waters at levels equal to or more stringent than those adopted by the State Water Board. Annual results from baseline monitoring programs along used to determine postings of public health advisories are compiled by Klamath Basin Monitoring Program (KBMP) and used to inform the Blue Green Algae Tracker available on the KBMP website (www.kbmp.net).

Microcystin can also bioaccumulate in aquatic biota. During July through September 2007, 85 percent of tissue samples collected from yearling fall-run Chinook salmon in Iron Gate Hatchery, yellow perch in Copco No. 1 and Iron Gate reservoirs, and mussels at Klamath River locations downstream of Iron

Gate Dam exhibited microcystin bioaccumulation, with the total microcystin congeners ranging from less than detection levels to 2,803 ng/g, reported as wet weight (Kann 2008a). Microcystin congeners were detected in yellow perch fillet and liver samples, but microcystin congeners were only detected in Chinook liver samples (Kann 2008a). Microcystin bioaccumulation was not detected in muscle tissue or liver samples collected during October 2007 from eleven adult Chinook salmon and eight adult steelhead captured at eight locations in the Klamath River downstream of Iron Gate Dam (CH2M Hill 2009a). While microcystin bioaccumulation was detected in mussel samples between July and September 2007, microcystin bioaccumulation was not detected in mussel tissue samples collected in November 2007, suggesting that depuration (i.e., biological purging of algal toxins from living tissue) occurred after *Microcystis aeruginosa* cell densities and microcystin concentrations declined in late October (Kann 2008a). In contrast to the 2007 fish data, microcystin bioaccumulation was not detected in any samples collected during 2008 from resident fish or mussels in the vicinity of Copco No. 1 and Iron Gate reservoirs (CH2M Hill 2009b). Microcystin was not detected in any of the 272 muscle tissue samples (i.e., 166 yellow perch samples, 30 crappie samples, and 76 rainbow trout samples) collected during four seasonal sampling events in 2008 (i.e., May to June, July, September, and November) from 257 resident fish (duplicate tissue samples were obtained from 15 fish) captured in Copco No. 1 and Iron Gate reservoirs and in the river upstream of Copco No. 1 Reservoir or downstream of Iron Gate Dam or in any of the 14 mussel tissue samples from upstream of Copco No. 1 Reservoir and downstream of Iron Gate Reservoir (CH2M Hill 2009b). Fish livers were not tested for microcystin during 2008. Microcystin was not detected in muscle tissue or liver samples collected during two sample events in 2009 (i.e., August and September) from 43 yellow perch captured in Copco No. 1 and Iron Gate reservoirs (PacifiCorp 2010a). However, microcystin was detected in tissue samples of freshwater mussels in the Klamath River from monthly sampling events in 2009 from July to October and December (Kann et al. 2010b). Microcystin bioaccumulation also was measured during 2010 in muscle tissue and liver samples from 20 Chinook salmon, 25 steelhead, and 3 coho salmon collected at five locations downstream of Iron Gate Dam from September through November. Microcystin was detected in 3 of 7 Chinook livers collected in September 2010 near Happy Camp, in 1 of 7 Chinook livers collected in October near Happy Camp, and in 1 of 15 steelhead livers collected in October near Weitchpec, with no microcystin was detected in any other fish tissue sample. Other measured algal toxins (i.e., anatoxin-a, domoic acid, or okadaic acid) were not detected in any Klamath River fish samples (Kann et al. 2013). Estuarine and marine nearshore effects (e.g., sea otter deaths) from blue-green algae exposure have been reported in other California waters; however, none have been documented to date for the Klamath River Estuary or marine nearshore (Miller et al. 2010).

The levels of microcystin bioaccumulation measured in fish and mussel tissue samples collected during July through September 2007 (i.e., less than detection

levels to 2,803 ng/g, reported as wet weight) exceeded the public health guidelines defined by Ibelings and Chorus (2007) (i.e., Acute Tolerable Intake: 1,900 ng/g for an adult, 250 ng/g for a child; Seasonal Tolerable Daily Intake: 300 ng/g for an adult, 40 ng/g for a child; Lifetime Tolerable Daily Intake: 30 ng/g for an adult, 4 ng/g for a child, all as wet weight), indicating ingestion of the fish or mussels would potentially pose a health hazard to humans (Kann 2008a). While microcystin levels were less than the method detection limit for all salmonid muscle tissue and liver samples in October 2007, the method detection limit for these microcystin bioaccumulation tests on salmonids (i.e., 100 to 240 ng/g, reported as dry weight) overlapped with or was greater than the Lifetime Tolerable Daily Intake public health guideline (i.e., 120 ng/g dry weight for an adult and 16 ng/g dry weight for a child) defined by Ibelings and Chorus (2007). Thus, there was a potential chronic (i.e., long-term) health hazard to humans for the October 2007 salmonid samples if microcystin concentrations in the salmonid muscle tissue were between the method detection limit and the Tolerable Daily Intake (CH2M Hill 2009a). Public health advisories were issued in 2009 and 2010 in the Klamath River from the Salmon River confluence to the Klamath River Estuary (including locations on the Yurok Reservation) for elevated microcystin levels in ambient and/or freshwater mussel tissue samples (Fetcho 2010; Kann et al. 2010a; Kann et al. 2010b). During 2010, there was no detectable risk to human health from microcystin bioaccumulation in salmonid fillets because the microcystin concentration in salmonid fillets was less than acute, seasonal, and Lifetime Tolerable Daily Intake public health guidelines. During September 2010, microcystin concentrations measured in salmonid livers were less than the public health guideline values. However, during October 2010, microcystin concentrations measured in salmonid livers were greater than multiple public health guideline values (e.g., Klasing and Brodberg 2008 2008; Butler et al. 2012; Mulvenna et al. 2012; Ibelings and Chorus 2007). Although fish livers are not typically consumed, these fish potentially posed a human health hazard due to the high microcystin concentrations (i.e., 121.20 to 152.40 ng/g) measured in the livers (Kann et al. 2013).

Overall, there was no acute or seasonal public health concern identified with eating salmonid fillets based upon the 2007 and 2010 data since microcystin was only detected in salmonid liver samples and salmonid liver is not typically eaten. However, there is potential for a chronic health hazard to humans from microcystin bioaccumulation in salmonids since the method detection limit during 2007 was greater than the Lifetime Tolerable Daily Intake, precluding the assessment of the lifetime public health risk. The method detection limit during 2010 was less than the Lifetime Tolerable Daily Intake and no microcystin was detected in 2010 salmonid fillet samples, so there was not a detectable chronic health hazard to humans in 2010 from microcystin bioaccumulation in salmonid fillets. Section 3.3.2.3 *Habitat Attributes Expected to be Affected by the Proposed Project − Algal Toxins* presents a discussion of algal toxins as related to fish health.

Anatoxin-a has been detected in the Klamath River system, although the timing, distribution, and sources of anatoxin-a production in the Klamath River are not well understood. Anatoxin-a can be produced by number of blue-green algae [cyanobacteria] genera, including *Anabaena*[14], *Aphanizomenon, Cylindrospermopsis, Planktothrix, Oscillatoria*, and *Phormidium* (Chorus and Bartram 1999; Quiblier et al. 2013; USEPA 2014; Bouma-Gregson et al. 2018). In the Klamath River, anatoxin-a production is generally assumed to be due to *Anabaena flos-aquae*, but toxin production by some strains of *Anabaena flos-aquae* appears to be sporadic, and the circumstances which prompt toxin production are unknown. While toxin-producing phytoplankton are more well-studied, periphyton can also produce toxins, including anatoxin-a (Heath et al. 2011; Quiblier et al. 2013). In many California rivers and streams not impounded by dams, periphyton are assumed to be the primary sources of anatoxin-a (Fetscher et al. 2015), including species in the genera *Anabaena* and *Phormidium* in tributaries of the Eel River located south of the Klamath River (Asarian and Higgins 2018; Bouma-Gregson et al. 2018). The relative proportion of anatoxin-a contributions from phytoplankton versus periphyton in the Klamath Basin has not been documented.

In the Klamath River system, anatoxin-a was detected in Iron Gate Reservoir on September 3, 2005, in testing by the California Department of Health Services (Kann 2007a; Kann 2008b). Monitoring conducted for the Karuk Tribe during 2005, 2006, 2007, 2008 in Copco No. 1 or Iron Gate reservoirs did not detect anatoxin-a (Kann and Corum 2006, 2007, 2009; Kann 2007b). At Lower Klamath River monitoring sites, anatoxin-a was not detected above the reporting limit in water samples collected during 2008 and 2009 (Fetcho 2009, 2011). In recent years, anatoxin-a has been measured in the Klamath River downstream of Iron Gate Reservoir on several occasions, typically in the lower reaches including at monitoring sites near Weitchpec and Orleans (Otten 2017). While concentrations of *Anabaena flos-aquae* cells have continued to be monitored, anatoxin-a concentrations are not available for Lower Klamath Project reservoir and Klamath River sites in recent years.

3.2.2.8 Inorganic and Organic Contaminants

Water Column Contaminants

Data collected under the California Surface Water Ambient Monitoring Program (SWAMP) for the period 2001 to 2005 indicate that at eight monitoring sites from the Oregon-California state line to Turwar, the majority of inorganic constituents

[14] Cyanobacteria in the genus *Anabaena* have been recently recategorized, with all planktonic species in the genus *Anabaena* renamed *Dolichospermum* and all benthic species remaining in the genus *Anabaena*. For example, the phytoplankton *Anabaena flos-aquae* was recently renamed *Dolichospermum flos-aquae.* However, this EIR continues to use the *Anabaena* name for both planktonic and benthic species since it was more frequently used in the literature cited and it is still commonly used in descriptions of this species.

(i.e., arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, and zinc) detected in the Hydroelectric Reach, Middle Klamath River, and Lower Klamath River were in compliance with water quality objectives. Aluminum concentrations ranged from 50.7 to 99.2 ug/L, so all samples were less than California primary drinking water standards[15] (1,000 ug/L), but some samples were slightly elevated above USEPA freshwater aquatic life standards (87 ug/L) along with USEPA and California secondary drinking water standards[16] (50 ug/L) (North Coast Regional Board 2008). Grab samples were analyzed for 100 pesticides, pesticide constituents, isomers, or metabolites; 50 polychlorinated biphenyl (PCB) congeners; and six phenolic compounds. Results indicated no PCBs and only occasional detections of pesticides (North Coast Regional Board 2008) (see Appendix C for more detail). The results of water quality studies during 2002 and 2003 at four USGS gage stations downstream of Iron Gate Dam indicate that, with the exception of nickel, magnesium, and calcium, the concentration of trace elements decreased as water flowed downstream, most likely because of binding to other particles and settling out of the water column (Flint et al. 2005) (see Appendix C for more detail).

Sediment Contaminants

To investigate the potential for toxicity of sediments in J.C. Boyle, Copco No. 1, and Iron Gate reservoirs, Shannon & Wilson, Inc. (2006) collected 25 sediment cores in J.C. Boyle, Copco No. 1, and Iron Gate reservoirs and analyzed them for a suite of potential contaminants. The sediment cores were collected as part of a larger study sponsored by the California State Coastal Conservancy (GEC 2006). The locations of the sediment cores were distributed throughout each reservoir, including locations on the historical Klamath River channel (on-thalweg) and surrounding submerged terraces or near tributary mouths (off-thalweg) along the edge of the historical Klamath River. Four locations (4 on-thalweg, 0 off-thalweg) were sampled in J.C. Boyle Reservoir, with maximum core depths ranging from 0.3 feet at the upstream end of the reservoir to 13.2 feet near the dam. Twelve locations (7 on-thalweg, 5 off-thalweg) were sampled in Copco No. 1 Reservoir with maximum core depths ranging from 1.5 feet at the upstream end of the reservoir to 12.1 feet near the middle of the reservoir. Nine locations (5 on-thalweg, 4 off-thalweg) were sampled in Iron Gate Reservoir with maximum core depths ranging from 0.7 feet at the upstream end of the reservoir to 7.8 feet within the Slide Creek/Camp Creek arm of the reservoir. During sediment core drilling, the sediments were evaluated to distinguish recent reservoir-deposited sediment from pre-reservoir sediment, with drilling logs noting the depth of different sediment horizons. Shannon & Wilson, Inc. (2006) used a composite

[15] Primary drinking water standards are limits for inorganic and organic contaminants to protect public health.

[16] Secondary drinking water standards are guidelines to prevent aesthetic effects (e.g., taste, odor, or color) or cosmetic effects (skin or tooth discoloration).

sampling[17] technique to represent field conditions for reservoir sediment deposits. Interval composite/depth interval sediment samples were generated from the sediment cores, including both the reservoir-deposited and pre-reservoir sediments, with the number of interval samples depending on the total depth of the sediment core. The sediment samples were analyzed for contaminants, including acid volatile sulfides, metals, pesticides, chlorinated acid herbicides, PCBs, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), cyanide, and dioxins. No herbicides or PCBs were found above U.S. Army Corps of Engineers (USACE) Puget Sound Dredged Disposal Analysis Program (PSDDA) screening levels and only one sample exceeded applicable PSDDA screening levels for VOCs ethyl benzenes and total xylenes (Shannon & Wilson, Inc. 2006). While cyanide was detected in multiple sediment cores, it was not found in the bioavailable toxic free cyanide form (HCN or CN^-).

Dioxin, a known carcinogen, was also measured in the Shannon & Wilson, Inc. (2006) study. Dioxin is a collective term for a group of seventeen chemically related dioxin and furan compounds (see Appendix C for a list of all seventeen compounds). Long-term exposure to dioxin in humans is linked to impairment of the immune system, the developing nervous system, the endocrine system, and reproductive functions. The various dioxin and furan compounds have different relative toxicities, so a Toxic Equivalent Quotient (TEQ) is calculated by multiplying the measured concentrations of the individual compounds by its toxicity relative to 2,3,7,8- tetrachlorodibenzodioxin (2,3,7,8-TCDD) (i.e., its Toxicity Equivalent Factor) and summing the Toxicity Equivalent Factor weighted concentrations for each compound into one number that can be used to assess overall dioxin toxicity. A Toxic Equivalent Quotient (TEQ) is equal to a Toxic Equivalent Concentration and the two terms are used interchangeably in the literature, so they are both abbreviated as TEQ in this report. In the 2006 J.C. Boyle, Copco No. 1, and Iron Gate reservoir samples, measured levels were 2.48 to 4.83 pg/g TEQ (picograms per gram or parts per trillion [ppt] expressed as Toxic Equivalent Concentrations [TEQ] relative to 2,3,7,8 tetrachlorodibenzodioxin toxicity) and did not exceed USACE (1,000 pg/g TEQ), International Joint Commission for Great Lakes Science Advisory Board (10 pg/g TEQ), PSDDA (15 pg/g TEQ), or Washington State Department of Ecology (8.8 pg/g TEQ) (Shannon & Wilson, Inc. 2006, Dillon 2008, USEPA 2010) and the measured dioxin concentrations were within the estimated background dioxin concentrations (2 to 5 ppt TEQ) for non-source-impacted sediments throughout the U.S. and specifically in the western U.S. (USEPA 2010). However, the range of measured dioxin concentrations was slightly above the minimum for the U.S. Environmental Protection Agency fish and wildlife guidelines (2.5 to 210 pg/g

[17] Composite samples are created by combining and thoroughly mixing individual samples from different locations and treating the combined sample as a single sample for analysis. Composite samples are a standard method for determining average conditions.

TEQ) screening levels for human health and ecological receptors (Shannon & Wilson, Inc. 2006, Dillon 2008, USEPA 2010) (see Appendix C for more detail).

As part of the Klamath Dam Removal Secretarial Determination studies, a sediment evaluation was undertaken during 2009 to 2011 to evaluate potential environmental and human health impacts of the downstream release of sediment deposits currently stored behind the Lower Klamath Project dams[18]. Sediment cores were collected during 2009–2010 at 37[19] sites on the historical Klamath River channel (on-thalweg) and surrounding submerged terraces or near tributary mouths along the edge of the historical Klamath River (off-thalweg), distributed throughout J.C. Boyle Reservoir (Figure 2.6-4), Copco No. 1 Reservoir (Figure 2.6-5), Iron Gate Reservoir (Figure 2.6-6), and the Klamath River Estuary (Figure 3.2-6) (USBR 2010, 2011). Twelve sites (7 on-thalweg, 5 off-thalweg) were sampled in J.C. Boyle Reservoir with maximum core depths ranging from 0.3 feet near the middle of the reservoir to 18.7 feet near the dam. Twelve sites (7 on-thalweg, 5 off-thalweg) were sampled in Copco No. 1 Reservoir with maximum core depths ranging from 1.2 feet on an off-thalweg site downstream of the Beaver Creek arm of the reservoir to 9.7 feet on an off-thalweg location upstream of the Beaver Creek arm of the reservoir. Thirteen sites (8 on-thalweg, 5 off-thalweg) were sampled in Iron Gate Reservoir with maximum core depths ranging from 0.5 feet at the upstream end of the reservoir to 7.7 feet within the Jenny Creek arm of the reservoir. At each site, cores were inspected by on-site geologists to verify that the reservoir-deposited/pre-reservoir sediment contact had been reached for each core. Sediment cores were used to either create whole core composite[17] sediment samples or interval composite/depth interval composite sediment samples for laboratory analysis of potential contaminants with samples representing both the reservoir-deposited and pre-reservoir sediments. Area composite samples were also generated from sediment cores for the Klamath River Estuary. A total of 501 analytes were quantified in the sediment samples, including metals, poly-cyclic aromatic hydrocarbons (PAHs), PCBs, pesticides/herbicides, phthalates, VOCs, SVOCs, dioxins, furans, and polybrominated diphenyl ethers (PBDEs) (i.e., flame retardants). The chemical

[18] There are currently 13.1 million cubic yards of sediment deposits stored within J.C. Boyle, Copco No. 1 and 2, and Iron Gate reservoirs (Table 2.7-7). Prior estimates of the sediment deposits were 14.5 million cubic yards (Eilers and Gubala 2003) and 20.4 million cubic yards (GEC 2006).

[19] Of the 37 sampling sites, two sites in J.C. Boyle, two in Copco No. 1, and three in Iron Gate Reservoir were analyzed for dioxins/furans, PCBs, and PBDEs.

composition of sediment and elutriate[20] sediment samples were analyzed, and bioassays were conducted on the sediment and elutriate sediment samples using fish and invertebrate national benchmark toxicity species (see below for discussion of the bioaccumulation component of this study).

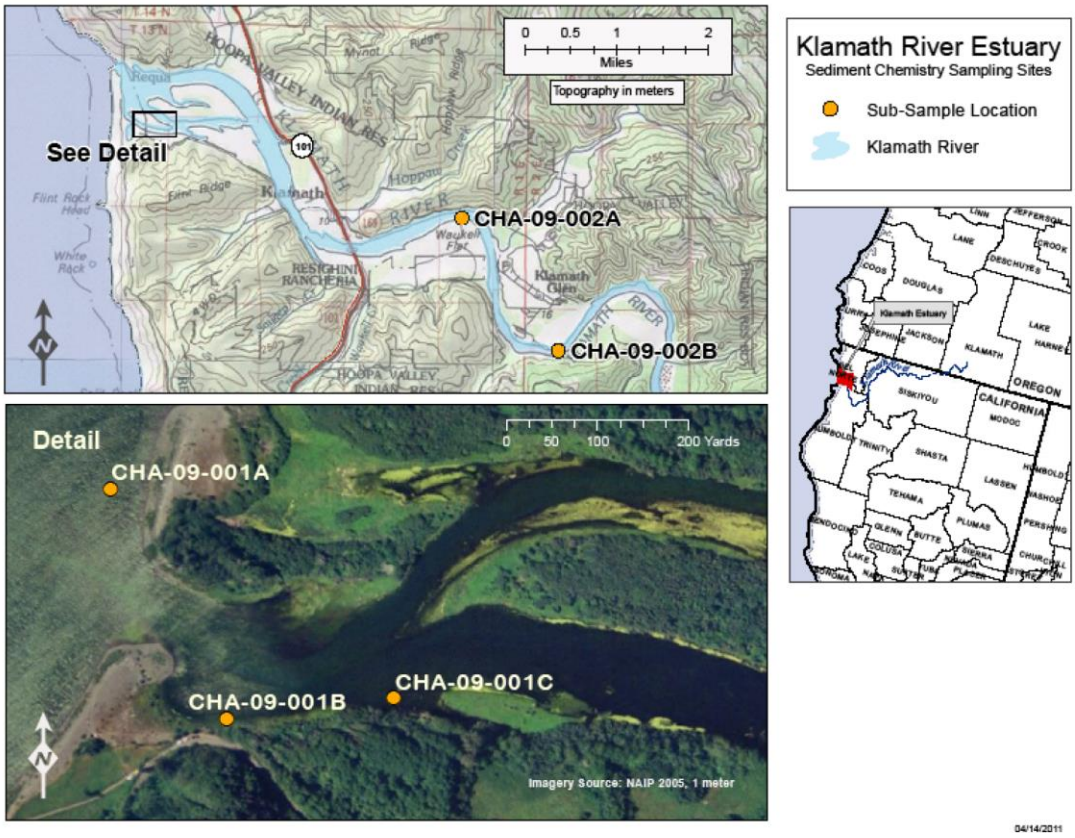

Figure 3.2-6. Klamath River Estuary Sediment Sampling Site Locations. Source: USBR 2011.

A relatively small number of chemicals of potential concern (COPCs) were identified in Lower Klamath Project reservoir sediment samples. Nickel, iron, and 2,3,4,7,8-pentachlordibenzofuran (PECDF) were detected in sediment in all three Lower Klamath Project reservoirs, while 4,4'-dichlorodiphenyltrichloroethane (DDT), 4,4'-dichlorodiphenyldichloroethane (DDD), 4,4'-

[20] Elutriate sediment samples were created from reservoir composite sediment samples mixed with reservoir water (e.g., one part sediment to four parts water). In general, elutriate tests are a standard approach that analyzes the chemical composition of the overlying water of the elutriate sediment sample in order to estimate potential chemical concentrations that may be released into the water from reservoir sediments during suspension. Standard elutriate tests do not reflect the full dilution of re-suspended sediments that would occur during dam removal.

dichlorodiphenyldichloroethylene (DDE), dieldrin, and 2,3,7,8-tetrachlorodibenzodioxin (TCDD) were detected only in J.C. Boyle sediments. No consistent pattern of elevated chemical composition was observed across discrete sampling locations within a reservoir, but sediment in J.C. Boyle Reservoir does have marginally higher iron concentrations and more detected COPCs in sediment when compared to Copco No. 1 and Iron Gate reservoirs and the Klamath River Estuary. Also, J.C. Boyle Reservoir exhibited more COPCs based on comparison to CalEPA, National Oceanic and Atmospheric Administration (NOAA), U.S. Fish and Wildlife Service (USFWS), USEPA, and ODEQ freshwater ecological and human health screening levels (SLs). However, in the case of J.C. Boyle Reservoir, and in other instances where elevated concentrations of chemicals in sediment were found, the degree of exceedance based on comparisons of measured detected chemical concentrations to SLs was small, and in several cases (i.e., arsenic, mercury, 2,3,7, 8-TCDD, total PCBs) may reflect regional background conditions (see Appendix C, Section C.7.1.1 for more detail). Toxicity tests generally indicated low potential for sediment toxicity to benchmark benthic indicator species since the 10-day survival of these species in reservoir sediments was similar compared to laboratory controls, except in a single sample from J.C. Boyle Reservoir where a decrease in survival of the benthic midge *Chironomus dilutus* in the reservoir sediment sample (64 percent) (compared to the laboratory control at 95 percent) indicated a moderate potential for sediment toxicity. Additional bioaccumulation tests of reservoir sediment samples using two benthic organisms (i.e., *Corbicula fluminea* [Asian clams] and *Lumbricula variegates* [blackworms]) showed 100 percent survival with minimal weight changes in J.C. Boyle Reservoir sediments over the 28-day bioaccumulation test period, further supporting the conclusion that there was generally low potential for sediment toxicity to benthic species from reservoir sediments.

Lastly, analysis of the 2009 to 2010 USBR collected sediment core results (USBR 2010, 2011) from J.C. Boyle, Copco No. 1, and Iron Gate reservoirs and the Klamath River Estuary indicate that total chromium and total nickel concentrations are higher in estuary sediments than in Lower Klamath Project reservoir sediments, but total arsenic, total copper, and total lead concentrations are higher in reservoir sediments than estuary sediments (Eagles-Smith and Johnson 2012). Total arsenic concentrations in the reservoir sediments samples range from 4.3 to 15 milligrams per kilogram, dry weight (mg/kg) in J.C. Boyle Reservoir, 6.3 to 13 mg/kg in Copco No. 1 Reservoir, and 7.4 to 10 mg/kg in Iron Gate Reservoir. Peak total copper concentrations in Lower Klamath Project reservoir sediments (9.8 to 38 mg/kg) are greater than total copper concentrations in Klamath River Estuary sediments (19 to 26 mg/kg) (Eagles-Smith and Johnson 2012). Total lead concentrations in reservoir sediments range from 2.8 to 25 mg/kg in J.C. Boyle Reservoir, 6.4 to 10 mg/kg in Copco No. 1 Reservoir, and 5.1 to 11 mg/kg in Iron Gate Reservoir (USBR 2011).

Comparison of the measured total arsenic, total copper, and total lead concentrations with the relevant human-health screening levels show that only total arsenic concentrations exceed USEPA total carcinogenic residential screening levels (0.39 mg/kg), USEPA total non-carcinogenic residential screening levels (22 mg/kg), and CalEPA California Human Health residential (0.07 mg/kg) and commercial (0.24 mg/kg) screening levels. Peak total copper concentrations are approximately two to three orders of magnitude less than USEPA total non-carcinogenic residential screening levels (3,100 mg/kg) and CalEPA California Human Health residential (3,000 mg/kg) and commercial (38,000 mg/kg) screening levels. Total lead concentrations are consistently less than USEPA total non-carcinogen residential screening levels (400 mg/kg) and CalEPA California Human Health residential (80 mg/kg) and commercial (320 mg/kg) screening levels (CDM 2011). There are no USEPA total carcinogenic residential screening levels for copper or lead.

Comparison of the measured total arsenic, total copper, and total lead concentrations with the relevant ecological screening levels shows that total arsenic and total copper concentrations exceeded some ecological screening levels, but total lead concentrations remained below the most stringent freshwater and marine ecological screening level (**freshwater**: Lowest Effect Level [31 mg/kg]; **marine**: T20 [chemical concentration corresponding to 20 percent probability of observing toxicity] [30 mg/kg]). Total arsenic concentrations in Lower Klamath Project reservoir and Klamath River Estuary sediments only exceeded lower NOAA Screen Quick References Table (SQuiRT) freshwater and marine screening levels for arsenic in sediment (**freshwater**: Threshold Effect Concentrations [9.79 mg/kg], Threshold Effects Level [5.9 mg/kg], Lowest Effect Level [6 mg/kg]; **marine**: T20 [chemical concentration corresponding to 20 percent probability of observing toxicity] [7.4 mg/kg], Threshold Effects Level [7.24 mg/kg], Effects Range-Low [8.2 mg/kg]) with no measured total arsenic concentrations in reservoir or estuary sediments above freshwater or marine probable effects concentrations (**freshwater**: Probable Effect Concentrations [33mg/kg], Severe Effect Level [33 mg/kg], Probable Effect Level [17 mg/kg]; **marine**: T50 [chemical concentration corresponding to 50 percent probability of observing toxicity] [20 mg/kg], Probable Effect Level [41.6 mg/kg], Effects Range-Medium [70 mg/kg]). Total copper concentrations in Lower Klamath Project reservoir and Klamath River Estuary sediments also only exceeded lower NOAA Screen Quick References Table (SQuiRT) freshwater and marine screening levels for copper in sediment (**freshwater**: Threshold Effect Concentrations [31.6 mg/kg], Threshold Effects Level [37.3 mg/kg], Lowest Effect Level [16 mg/kg]; **marine**: T20 [chemical concentration corresponding to 20 percent probability of observing toxicity] [32 mg/kg], Threshold Effects Level [18.7 mg/kg], Effects Range-Low [34 mg/kg]) with no measured total copper concentrations in reservoir or estuary sediments above freshwater or marine probable effects concentrations (**freshwater**: Probable Effect Concentrations [149 mg/kg], Probable Effect Level [197 mg/kg];

marine: T50 [chemical concentration corresponding to 50 percent probability of observing toxicity] [94 mg/kg], Probable Effect Level [108 mg/kg]).

Note that while total metal concentrations were measured in the existing sediment cores, metals are typically bound to fine sediments and exhibit limited bioavailability or aquatic toxicity. The amount of bioavailable metals released by sediments may vary significantly depending on the sediment (surface area, availability of sorption sites, organic material, and clay content) and water properties (temperature, dissolved organic compounds, suspended particles, pH, various inorganic cations and anions like those composing hardness and alkalinity) (USEPA 2007).

Contaminants in Aquatic Biota

Section 3.3.2.3 *Habitat Attributes Expected to be Affected by the Proposed Project−Algal Toxins* presents a discussion of algal toxins (i.e., microcystin) in fish tissue. Assessments of other contaminants in fish tissue for the Hydroelectric Reach have been undertaken by SWAMP and PacifiCorp. SWAMP data include sport fish tissue samples collected during 2007 and 2008 to evaluate accumulated contaminants in nearly 300 lakes throughout California. Sport fish were sampled to provide information on potential human exposure to selected contaminants and to represent the higher aquatic trophic levels (i.e., the top of the aquatic food web).

In a screening-level study of potential chemical contaminants in fish tissue in J.C. Boyle, Copco No. 1, and Iron Gate reservoirs, PacifiCorp analyzed metals (i.e., arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, and zinc), organochlorine (pesticide) compounds, and PCBs in largemouth bass (*Micropterus salmoides*) and black bullhead catfish (*Ameiurus melas*) (PacifiCorp 2004c; FERC 2007). PacifiCorp reported that, in general, contaminant levels in fish tissue were below screening level values for protection of human health (USEPA 2000) and recommended guidance values for the protection of wildlife (MacDonald 1994). Exceptions to this include some tissue samples for total mercury, arsenic, total DDTs and total PCBs when compared to screening levels for wildlife and subsistence fishers (individual comparisons are shown in Appendix C for more detail). Dioxins were not tested.

Fish tissue samples also were collected in Copco No. 1 and Iron Gate reservoirs and analyzed for total mercury, selenium, and PCBs (Iron Gate Reservoir only) as part of a larger SWAMP study of contaminants in sport fish in California lakes and reservoirs (Davis et al. 2010). SWAMP data for Iron Gate and Copco No. 1 reservoirs indicate mercury tissue concentrations above the USEPA criterion of 300 nanograms per gram (ng/g) methylmercury (for consumers of noncommercial freshwater fish); and greater than OEHHA public health guideline levels advisory tissue levels (Klasing and Brodberg 2008) for consumption for 3 and 2 servings per week (70 and 150 ng/g wet weight, respectively) and the fish contaminant goal (220 ng/g wet weight). Measured selenium

concentrations were 3 to 4 orders of magnitude lower than OEHHA thresholds of concern (2,500 to 15,000 ng/g wet weight) and PCB concentrations were below the lowest OEHHA threshold (i.e., fish contaminant goal of 3.6 ng/g wet weight) (Davis et al. 2010).

To supplement existing fish tissue data and provide additional lines of evidence in the Klamath Dam Removal Secretarial Determination sediment evaluation (see *Sediment Contaminants* above and Appendix C – *Section C.7.1.1*), two species of field-caught fish (perch and bullhead) were collected during late September 2010 from J.C. Boyle, Copco No. 1, and Iron Gate reservoirs and analyzed for contaminant levels in fish tissue (CDM 2011; see Appendix C – *Section C.7.1.1* for more detail). Results indicate that multiple chemicals were present in fish tissue (e.g., arsenic, DDE/DDT, dieldrin, mercury, mirex, selenium, and total PCBs; see Appendix C for a complete list of chemicals detected) (CDM 2011). Mercury exceeded tissue-based toxicity reference values for perch in Iron Gate Reservoir and bullhead samples in all three reservoirs (CDM 2011). Toxicity reference values are not available for several chemicals detected in invertebrate and fish tissue (CDM 2011, see Appendix C – *Section C.7.1.1* for more detail). TEQs for dioxin, furan, and dioxin-like PCBs in reservoir and estuary sediment samples were within the range of local background values and suggest a potential to cause minor or limited adverse effects for fish exposed to reservoir sediments (CDM 2011).

Lastly, Copco No. 1 and Iron Gate reservoirs are included on the 303(d) list of impaired waterbodies for mercury based on elevated methylmercury concentrations in fish tissue for trophic level 4 fish (USEPA 2001; PacifiCorp 2004b; Davis et al. 2010; CDM 2011; State Water Board 2017). A mercury TMDL for Copco No. 1 and Iron Gate reservoirs has not been completed.

3.2.3 Significance Criteria

Significance criteria used for the evaluation of impacts on water quality are listed below. Designated beneficial uses and associated water quality objectives for the Klamath River in California are defined in the Basin Plan (North Coast Regional Board 2018), the Hoopa Valley Tribe Water Quality Control Plan (HVTEPA 2008), and the Yurok Tribe Water Quality Control Plan for the Yurok Indian Reservation[21] (YTEP 2004) (see Table 3.2-2).

Effects on water quality are considered significant if the Proposed Project would:

- Cause an exceedance of water quality standards as identified in the above documents in the areas addressed by the relevant plans;

[21] USEPA approval for treatment of the Yurok Tribe as a State for purposes of operating a water quality standard program has not yet occurred (CWA §§ 303(c)/401).

- Substantially exacerbate an existing exceedance of water quality standards as identified in the above documents in the areas addressed by the relevant plans;
- Cause water quality changes that would result in a failure to maintain existing beneficial uses at the levels currently supported, or result in a failure to maintain high quality waters at the highest level of water quality consistent with the maximum benefit to the people of the State, meaning:
    - The action degrades high quality waters to an extent inconsistent with recent beneficial uses or in a manner that would result in water quality below that required by an applicable water quality control plan; or
    - The action involves a discharge that either does not comply with best practicable treatment or does not employ controls that avoid nuisance or pollution and are consistent with the maximum benefit to the people of the State.
- Result in substantial adverse impacts on human health or environmental receptors.

Unless otherwise indicated in Section 3.2.3.1 *Thresholds of Significance*, for purposes of determining the significance of any potential water quality impacts, "substantial," as used in the significance criteria, means the effect on water quality and the support of beneficial uses (or human health or environmental receptors, as specified) is of considerable importance.

For the Lower Klamath Project water quality analysis, short-term is defined as the period during pre-dam removal activities, reservoir drawdown, dam removal, and associated sediment flushing events, which corresponds to pre-dam removal activities that would occur in the one to three years before dam removal, dam removal year 1, dam removal year 2, and post-dam removal year 1 (Table 2.7-1). Long-term is defined as occurring after post-dam removal year 1 (i.e., greater than three years after dam removal).

Significance criteria related to groundwater and flood hydrology (i.e., subsurface drainage, flooding, inundation) are addressed in Section 3.6 *Flood Hydrology* and/or Section 3.7 *Groundwater*.

Table 3.2-2. Designated Beneficial Uses of Water in the Water Quality Area of Analysis.

North Coast Regional Board (Basin Plan 2018)[1,2]	Hoopa Valley Tribe (HVTEPA 2008)[3]	Yurok Tribe (YTEP 2004)[3]
Aesthetics, Cultural, and Subsistence		
N/A	Wild and Scenic (W&S)	N/A

North Coast Regional Board (Basin Plan 2018)[1,2]	Hoopa Valley Tribe (HVTEPA 2008)[3]	Yurok Tribe (YTEP 2004)[3]
Native American Culture (CUL)	Ceremonial and Cultural Water Use (CUL)**	Cultural (CUL)
Subsistence Fishing (FISH)	N/A	N/A
Agricultural Water Supply		
Agricultural Supply (AGR)	Agricultural Supply (AGR)*	Agricultural Supply (AGR)
Commercial		
Commercial and Sport Fishing (COMM)	N/A	Commercial and Sport Fishing (COMM)
Shellfish Harvesting (SHELL)	N/A	N/A
Mariculture[4]/Aquaculture (AQUA)	N/A	N/A
Fish and Wildlife		
Warm Freshwater Habitat (WARM)	N/A	Warm Freshwater Habitat (WARM)
Cold Freshwater Habitat (COLD)	Cold Freshwater Habitat (COLD)	Cold Freshwater Habitat (COL)
Migration of Aquatic Organisms (MIGR)	Migration of Aquatic Organisms (MIGR)	Migration of Aquatic Organisms (MGR)
Spawning, Reproduction, and/or Early Development (SPWN)	Spawning, Reproduction, and/or Early Development (SPWN)	Spawning, Reproduction, and/or Early Development (SPN)
Estuarine Habitat (EST)	N/A	Estuarine Habitat (EST)
Marine Habitat (MAR)	N/A	Marine Habitat (MAR)
Wildlife Habitat (WILD)	Wildlife Habitat and Endangered Species (WILD)	Wildlife Habitat (WLD)
Preservation and Enhancement of Designated Areas of Special Biological Significance (ASBS) [4]	N/A	Preservation of Areas of Special Biological Significance (BIO)
Rare, Threatened, or Endangered Species (RARE)	Preservation of Threatened and Endangered Species (T&E)	Rare, Threatened, or Endangered Species (RARE)
Saline Habitat (SAL)	N/A	N/A
Potable Water Supply		
Municipal and Domestic Supply (MUN)	Municipal and Domestic Supply (MUN)*	Municipal and Domestic Supply (MUN)

North Coast Regional Board (Basin Plan 2018)[1,2]	Hoopa Valley Tribe (HVTEPA 2008)[3]	Yurok Tribe (YTEP 2004)[3]
Industrial Water Supply		
Industrial Service Supply (IND)	Industrial Service Supply (IND)	N/A
Industrial Process Supply (PROC)	Industrial Process Supply (PROC)	
Hydropower Generation (POW)	N/A	Hydropower Generation (PWR)
Navigation		
Navigation (NAV)	N/A	Navigation (NAV)
Replacement/Recharge		
Groundwater Recharge (GWR)	Groundwater Recharge (GWR)	Groundwater Recharge (GW)
Freshwater Replenishment (FRSH)	N/A	Freshwater Replenishment (FRSH)
Recreation		
Water Contact Recreation (REC-1), including Aesthetic Enjoyment[4]	Water Contact Recreation (REC-1)	Water Contact Recreation (REC-1)
Non-contact Water Recreation (REC-2), including Aesthetic Enjoyment[4]	Non-contact Water Recreation (REC-2)	Non-contact Water Recreation (REC-2)

Notes:

1 Beneficial Uses listed (existing and potential) apply to one or more Basin Plan specified hydrologic areas, sub-areas, or waterbodies within the Water Quality Area of Analysis, but they do not necessary apply all reaches within the Water Quality Area of Analysis.

2 Basin Plan designated Beneficial Uses apply to the entire Water Quality Area of Analysis, including the territorial marine waters of the State of California.

3 Tribal designated Beneficial Uses apply to the sections of the Water Quality Area of Analysis within the tribal boundaries.

4 These Beneficial Uses come from the Basin Plan's incorporation of the State Water Board's 2015 Ocean Plan, which applies to the territorial marine waters of the State of California.

Key:

N/A: Not applicable

* = Proposed Beneficial Use

** = Historical Beneficial Use

Table 3.2-3. Water Bodies Included on the 303(d) List within the Water Quality Area of Analysis.[1]

Water Body/Reach	Water Temperature	Sediment	Organic Enrichment/Low Dissolved Oxygen	Nutrients	Microcystin	Mercury	Aluminum
Hydroelectric Reach of the Upper Klamath River – Oregon-California state line to the upstream end of Copco No. 1 Reservoir	X		X	X			
Hydroelectric Reach of the Upper Klamath River – upstream end of Copco No. 1 Reservoir to Iron Gate Dam (excluding Copco No.1 and No. 2 and Iron Gate Reservoir)	X		X	X	X		
Copco No. 1 Reservoir	X				X	X	
Copco No. 2 Reservoir	X				X		
Iron Gate Reservoir	X				X	X	
Middle Klamath River – Iron Gate Dam to Scott River	X	X	X	X	X		X
Middle and Lower Klamath River – Scott River to Trinity River	X	X	X	X	X		
Lower Klamath River – Trinity River to Mouth	X	X	X	X			

[1] While there are additional water quality impaired waterbodies in the Klamath Basin, the waterbodies listed in this table are the ones that are directly relevant to the water quality analysis for the Proposed Project.

3.2.3.1 Thresholds of Significance

Thresholds of significance for this EIR are identified for water temperature, suspended sediment, nutrients, dissolved oxygen, pH, chlorophyll-*a* and algal toxins, and inorganic and organic contaminants. All of these are a water quality concern due to their potential to influence multiple designated beneficial uses and because hydroelectric project operations can affect these constituents (see Section 3.2.2.1 *Overview of Water Quality Processes in the Klamath Basin*). Table 3.2-4 through Table 3.2-10 provide the existing water quality objectives for: (1) the Basin Plan (North Coast Regional Board 2018), which incorporates the provisions of the Water Quality Control Plan for Ocean Waters of California (Ocean Plan) and the Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California

(Thermal Plan); (2) the Hoopa Valley Tribe Water Quality Control Plan (HVTEPA 2008); and (3) the Yurok Tribe Water Quality Control Plan for the Yurok Indian Reservation[21] (YTEP 2004). The water quality objectives are interpreted in this water quality analysis to determine the applicable thresholds of significance for this EIR since there are multiple overlapping water quality objectives, quantitative objectives are not available for some water quality parameters when objectives are narrative, and there is a lack of background information available to apply objectives that are relative to background conditions. Applicable numeric values used as thresholds of significance for the Lower Klamath Project analysis include water temperature, dissolved oxygen, and pH. There are multiple numeric standards for algal toxins potentially applicable for the Klamath River, so these various numeric standards are evaluated in the sub-section titled *Chlorophyll-a and Algal Toxins* (after Table 3.2-9) to identify the appropriate threshold of significance for algal toxins in this EIR. Numeric and narrative water quality objectives for various inorganic and organic contaminant were combined into a broad set of thresholds of significance as described below in the sub-section titled *Inorganic and Organic Contaminants* (after Table 3.2-11).

Other numeric values presented in Table 3.2-4 through Table 3.2-11, including California turbidity standards, California nitrate and nitrite standards for the support of municipal beneficial uses, the Hoopa Valley Tribe criterion for chlorophyll-*a* as periphyton, and the Hoopa Valley Tribe and Yurok Tribe ammonia and nitrate standards for the support of cold freshwater habitat and municipal beneficial uses, are not used as thresholds of significance. The California surface water quality objective for turbidity could not be used as a threshold of significance for suspended sediment since it is based on a comparison to naturally occurring background levels, but there is not readily available data on turbidity in the Klamath River. The threshold of significance for suspended sediment in this EIR is discussed below in the sub-section titled *Suspended Sediments* (after Table 3.2-9).

The California surface water quality objectives for nitrate (NO_3) and nitrate and nitrite ($NO_3 + NO_2$), along with the Hoopa Valley Tribe and Yurok Tribe nitrate water quality objective, are not appropriate thresholds of significance for nutrients in this EIR since they are based on supporting municipal beneficial uses (i.e., drinking water). These objectives are much higher than concentrations that have been measured in the Klamath Basin, such that there is no indication that the municipal beneficial use is not being met or would not be met in the future under the Proposed Project. Thus, other water quality objectives are evaluated to determine the threshold of significance for nutrients in this EIR, as discussed below in the sub-section titled *Nutrients* (after Table 3.2-9).

The Hoopa Valley Tribe criterion for chlorophyll-*a* as periphyton is not an appropriate threshold of significance for chlorophyll-*a* since it is based on periphyton growth rather than phytoplankton growth; periphyton growth is assessed in detail in Section 3.4 *Phytoplankton and Periphyton*, and it is only

applicable to a short reach (at approximately RM 45) of the Klamath River upstream of the Trinity River. Thus, criteria are evaluated to determine the threshold of significance for chlorophyll-*a* in this EIR, as discussed below in the sub-section titled *Chlorophyll-a and Algal Toxins* (after Table 3.2-9).

The Hoopa Valley Tribe and Yurok Tribe have an ammonia toxicity objective based on pH and temperature (Table 3.2-7 and Table 3.2-8, respectively), but these objectives are not used as a threshold of significance for toxicity since available data suggests there are no actual ammonia toxicity events associated with the operation of the Lower Klamath Project (North Coast Regional Board 2010). Similarly, the Yurok Tribe has a nitrite water quality objective (Table 3.2-8), but available data does not suggest operation of the Lower Klamath Project influences nitrite concentrations in the Klamath River. Turbulent mixing and dissolved oxygen conditions in the Klamath River under the Proposed Project would promote the conversion of ammonia to nitrate or nitrite to nitrate and minimize the potential for ammonia or nitrite toxicity. The potential for short-term toxicity to aquatic organisms during reservoir drawdown, including consideration of ammonia toxicity, is addressed using bioassay results (see Section 3.2.4.7 *Inorganic and Organic Contaminants*).

Table 3.2-4. California Surface-Water Quality Objectives Relevant to the Proposed Project.

Parameter	Description[1]
Suspended Material	Waters shall not contain suspended material in concentrations that cause nuisance or adversely affect beneficial uses.
Settleable Material	Waters shall not contain substances in concentrations that result in deposition of material that causes nuisance or adversely affect beneficial uses.
Sediment	The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses.
Turbidity	Turbidity shall not be increased more than 20% above naturally occurring background levels. Allowable zones of dilution within which higher percentages can be tolerated may be defined for specific discharges upon the issuance of discharge permits or waiver thereof.

Parameter	Description[1]
Temperature	Intrastate waters (Basin Plan) • No alteration of natural receiving water temperature of intrastate waters that adversely affects beneficial uses. • At no time or place shall the temperature of any **COLD** water be increased by more than 5°F above natural receiving water temperature. • At no time or place shall the temperature of **WARM** intrastate waters be increased more than 5°F above natural receiving water temperature. Interstate waters (Thermal Plan) • Elevated temperature waste discharges into **COLD** interstate waters are prohibited. • Thermal waste discharges having a maximum temperature greater than 2.8ºC (5ºF) above natural receiving water temperature are prohibited for **WARM** interstate waters. • Elevated temperature wastes shall not cause the temperature of **WARM** interstate waters to increase by more than 5°F above natural temperature at any time or place.
Dissolved Oxygen	**WARM, MAR, Inland Saline Water Habitat (SAL), COLD, SPWN** Klamath River Mainstem Specific Water Quality Objectives based on natural receiving water temperatures (see Table 3.1a for minimum dissolved oxygen concentrations in mg/L) • From Oregon-California state line (RM 214.1) to the Scott River (RM 145.1), 90% saturation October 1-March 31 and 85% saturation April 1-September 30. • From Scott River (RM 145.1) to Hoopa Valley Tribe boundary (≈RM 45), 90% saturation year-round. • From Hoopa Valley Tribe boundary to Turwar (RM 5.6), 85% saturation June 1-August 31 and 90% saturation September 1-May 31. • For upper and middle Klamath River Estuary (RM 0-3.9), 80% saturation August 1-August 31, 85% saturation September 1-October 31 and June 1-July 31, and 90% saturation November 1-May 31. • **EST** for Lower Klamath River Estuary (RM 0), dissolved oxygen content shall not be depressed to levels adversely affecting beneficial uses as a result of controllable water quality factors.
Biostimulatory Substances	Waters shall not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths cause nuisance or adversely affect beneficial uses.
Nitrate	**MUN** 45 mg/L as NO_3 (equivalent to 10 mg/L for nitrate as N)[2]
Nitrate + Nitrite	**MUN** 10 mg/L as N [3]

Parameter	Description[1]
pH	The pH shall not be depressed below 6.5 units nor raised above 8.5 units, unless otherwise state below
	COLD, WARM Changes in normal ambient pH levels in fresh waters shall not exceed 0.5 units within the range specified above. **MAR, SAL** Changes in normal ambient pH levels shall not exceed 0.2 units
	The pH shall not be depressed below 7 units nor raised above 8.5 units for the Klamath River upstream of Iron Gate Dam, including Iron Gate and Copco No.1 reservoirs, the Klamath River in the Middle Klamath River Hydrologic Area downstream from Iron Gate Dam, and the Klamath River in the Lower Klamath River Hydrologic Area.
Toxicity	All waters shall be maintained free of toxic substances in concentrations that are toxic to, or that produce detrimental physiological responses in human, plant, animal, or aquatic life.
Pesticides	No individual pesticide or combination of pesticides shall be present in concentrations that adversely affect beneficial uses. There shall be no bioaccumulation of pesticide concentrations found in bottom sediments or aquatic life. Waters designated for use as domestic or municipal supply shall not contain concentrations of pesticides in excess of the limiting concentrations set forth in California Code of Regulations, title 22, section 64444 (Table 64444-A), and listed in Table 3-1 of the Basin Plan.
Chemical Constituents	Waters designated for use as domestic or municipal supply (MUN) shall not contain concentrations of chemical constituents in excess of the limits specified in California Code of Regulations, title 22, section 64431 (Table 64431-A) and section 64444 (Table 64444-A) and listed in Table 3-1 of the Basin Plan. Waters designated for use as agricultural supply (AGR) shall not contain concentrations of chemical constituents in amounts which adversely affect such beneficial use.

Source: North Coast Regional Board (2018) unless otherwise noted.

1 Relevant beneficial uses are shown in bold and all caps. If no beneficial use is specified, the objective or criteria applies to all beneficial uses.

2 Maximum contaminant level for domestic or municipal supply.

3 Maximum contaminant level (shall not be exceeded in water supplied to the public) as specified in Table 64431-A (Inorganic Chemicals) of Section 64431, Title 22 of the California Code of Regulations, as of December 20, 2018.

Table 3.2-5. Minimum Dissolved Oxygen Concentrations in mg/L Based on Percent Saturation Criteria (North Coast Regional Board 2010).

Dissolved Oxygen Concentrations (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Stateline to Scott River – 90% October 1 through March 31 and 85% April 1 through September 30												
Stateline	10.4	9.6	8.5	7.6	7.0	6.3	6.3	6.4	6.9	7.8	9.5	10.6
Downstream Copco Dam	10.4	9.6	8.5	7.6	6.9	6.3	6.3	6.4	6.9	7.8	9.5	10.6
Downstream Iron Gate Dam	10.8	9.9	8.8	7.8	7.1	6.5	6.5	6.5	7.1	8.1	9.7	10.9
Upstream Shasta River	10.8	10.0	8.9	7.9	7.1	6.6	6.4	6.4	7.1	7.9	9.6	10.8
Downstream Shasta River	10.8	10.1	9.0	7.9	7.2	6.7	6.5	6.5	7.2	8.0	9.7	10.9
Upstream Scott River	10.9	10.2	9.1	8.1	7.2	6.7	6.4	6.5	7.1	7.9	9.8	10.9
Scott River to Hoopa – 90% all year												
Downstream Scott River	10.8	10.2	9.3	8.7	7.9	7.3	6.9	6.9	7.6	8.0	9.8	10.9
Seiad Valley	10.9	10.2	9.3	8.8	7.8	7.2	6.9	6.9	7.5	7.9	9.9	10.9
Upstream Indian Creek	11.0	10.3	9.4	8.9	8.0	7.3	7.0	7.0	7.5	7.9	9.9	10.8
Downstream Indian Creek	11.0	10.3	9.5	9.0	8.1	7.4	7.0	7.0	7.6	8.0	9.9	10.8
Upstream Salmon River	11.2	10.6	9.8	9.3	8.4	7.5	7.2	7.2	7.7	8.2	10.0	11.0
Downstream Salmon River	11.1	10.6	9.9	9.4	8.5	7.6	7.2	7.2	7.7	8.2	10.0	10.9

Dissolved Oxygen Concentrations (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Hoopa to Turwar – 90% September 1 through May 31 and 85% June 1 through August 31												
Hoopa	11.0	10.6	10.0	9.5	8.5	7.2	7.0	6.9	7.8	8.3	10.1	11.0
Upstream Trinity River	11.0	10.6	10.0	9.5	8.5	7.2	7.0	6.9	7.8	8.3	10.0	11.0
Downstream Trinity River	10.9	10.6	9.9	9.5	8.6	7.4	7.1	7.0	7.9	8.4	10.0	10.9
Youngsbar	10.9	10.6	9.9	9.5	8.7	7.4	7.1	7.0	7.9	8.4	10.0	10.9
Turwar	10.9	10.5	9.9	9.5	8.6	7.2	6.9	6.8	7.6	8.1	9.8	10.8
Upper and Middle Estuary – 90% November 1 through May 31, 85% September 1 through October 31 and June 1 through July 31, 80% August 1 through August 31												
Upper Estuary	10.9	10.6	10.1	9.5	8.6	7.3	7.1	6.7	7.6	8.0	10.0	10.7
Middle Estuary	10.9	10.6	10.1	9.6	8.6	7.3	7.2	6.8	7.8	8.2	10.1	10.8
Lower Estuary – Narrative Objective												

Table 3.2-6. California Marine Water Quality Objectives Relevant to the Proposed Project.

Water Quality Objective[1]	Description
Physical Characteristics	• Floating particulates and grease and oil shall not be visible. • The discharge of waste shall not cause aesthetically undesirable discoloration of the ocean surface. • Natural light shall not be significantly reduced at any point outside the initial dilution zone as the result of the discharge of waste. • The rate of deposition of inert solids and the characteristics of inert solids in ocean sediments shall not be changed such that benthic communities are degraded.
Chemical Characteristics	• The dissolved oxygen concentration shall not at any time be depressed more than 10% from that which occurs naturally, as the result of the discharge of oxygen demanding waste materials. • The pH shall not be changed at any time more than 0.2 units from that which occurs naturally. • The dissolved sulfide concentration of waters in and near sediments shall not be significantly increased above that present under natural conditions. • The concentration of substances set forth in Chapter II, Table 1 (State Water Board 2015), in marine sediments shall not be increased to levels which would degrade indigenous biota. • The concentration of organic materials in marine sediments shall not be increased to levels that would degrade marine life. • Nutrient materials shall not cause objectionable aquatic growths or degrade indigenous biota. • Numerical Water Quality Objectives for discharges are listed in Chapter II, Table 1 (State Water Board 2015), including objectives for the protection of marine aquatic life (i.e., metals, inorganics, organics, chronic and acute toxicity, pesticides and PCBs, radioactivity) and objectives for the protection of human health (noncarcinogenic and carcinogenic compounds).

Source: State Water Board (2015) unless otherwise noted.

[1] Water quality objectives for bacterial characteristics, radioactivity, and elevated temperature (thermal) wastes are not included, as these water quality parameters are not anticipated to be affected by the Proposed Project.

Table 3.2-7. Hoopa Valley Tribe Surface-Water Quality Objectives.

Parameter	Criteria/Description[1]
Ammonia (NH3, as mg/L N)	**COLD** Because ammonia toxicity to fish is influenced by pH, waters designated for the purpose of protection of threatened and endangered fish species in cold freshwater habitat shall meet conditions for ammonia based on maximum one-hour (acute) and 30-day average (chronic) concentrations linked to pH by the following formulas (HVTEPA 2008): Specific use numerical criteria: The one-hour average concentration of total ammonia nitrogen (in [milligrams nitrogen per liter] mg N/L) shall not exceed, more than once every three years on average, the CMC (acute criterion) calculated using the following equation. Where salmonid fish are present: $$CMC = \frac{0.275}{1 + 10^{7.204-pH}} + \frac{39.0}{1 + 10^{pH-7.204}}$$ The thirty-day average concentration of total ammonia nitrogen (in mg N/L) should not exceed, more than once every three years on average, the CCC (chronic criterion) calculated using the following equation. When fish early life stages are present: $$CCC = \left(\frac{0.0577}{1 + 10^{7.688-pH}} + \frac{2.487}{1 + 10^{pH-7.688}}\right) x\ MIN\left(2.85, 1.45\ x\ 10^{0.028\ x\ (25-T)}\right)$$ where T is the water temperature in Celsius.
Periphyton	150 mg chlorophyll-*a* /m^2
Dissolved oxygen[2]	**COLD** 8.0 mg/L minimum
	SPWN 11.0 mg/L minimum
	SPWN 8.0 mg/L minimum in inter-gravel water
Total Nitrogen (TN)[3,4]	0.2 mg/L
Total Phosphorous (TP)	0.035 mg/L
pH	The pH in the Klamath River shall be between 7.0 and 8.5 at all times

Parameter	Criteria/Description[1]
Microcystis aeruginosa cell density	**MUN, REC-1** Less than 5,000 cells/mL for drinking water Less than 40,000 cells/mL for recreational water
Microcystin toxin Concentration	**MUN, REC-1** Less than 1 ug/L total microcystins[5] for drinking water Less than 8 ug/L total microcystins[5] for recreational water
Total potentially toxigenic cyanobacteria [blue-green algae] species [6]	**MUN, REC-1** Less than 100,000 cells/mL for recreational water
Cyanobacterial [blue-green algae] scums	**MUN, REC-1** There shall be no presence of cyanobacterial [blue-green algae] scums
Nitrate	**MUN** 10 mg/L

Source: HVTEPA (2008)

1 Relevant beneficial uses are shown in bold and all caps. If no beneficial use is specified, the objective or criteria applies to all beneficial uses.

2 HVTEPA (2008) includes a natural conditions clause which states, "If dissolved oxygen standards are not achievable due to natural conditions, then the COLD and SPAWN standard shall instead be dissolved oxygen concentrations equivalent to 90% saturation under natural receiving water temperatures." USEPA has approved the Hoopa Valley Tribe definition of natural conditions, but the stated numerical criteria are the operative criteria unless and until the Hoopa Valley Tribe completes the process of establishing the "natural conditions" reference condition. The procedure for defining natural conditions has not been finalized as of December 2018.

3 HVTEPA (2008) includes a natural conditions clause which states, "If total nitrogen and total phosphorus standards are not achievable due to natural conditions, then the standards shall instead be the natural conditions for total nitrogen and total phosphorus." USEPA has approved the Hoopa Valley Tribe definition of natural conditions, but the stated numerical criteria are the operative criteria unless and until the Hoopa Valley Tribe completes the process of establishing the "natural conditions" reference condition. The procedure for defining natural conditions have not been finalized as of December 2018.

4 30-day mean of at least two sample per 30-day period.

5 Total microcystins, as defined in the Hoopa Valley Tribe Surface-Water Objectives, is assumed to be equivalent to total microcystin for this EIR.

6 Includes: *Anabaena*, *Microcystis*, *Planktothrix*, *Nostoc*, *Coelosphaerium*, *Anabaenopsis*, *Aphanizomenon*, *Gloeotrichia*, and *Oscillatoria*.

Table 3.2-8. Yurok Tribe Surface-Water Quality Objectives Relevant to the Proposed Project.

Parameter[1]	Description
Ammonia	Levels of ammonia shall not be increased, in any body of water, by human related activity that could cause a nuisance or adversely affect the water to support specified beneficial uses. Specific use[2] numerical criteria[3]: The one-hour average concentration of total ammonia nitrogen (in [milligrams nitrogen per liter] mg N/L) shall not exceed, more than once every three years on average, the CMC[4] (acute criterion) calculated using the following equation. Where salmonid fish are present: $$CMC = \frac{0.275}{1 + 10^{7.204-pH}} + \frac{39.0}{1 + 10^{pH-7.204}}$$ The thirty-day average concentration of total ammonia nitrogen (in mg N/L) should not exceed, more than once every three years on average, the CCC[5] (chronic criterion) calculated using the following equation. When fish early life stages are present: $$CCC = \left(\frac{0.0577}{1 + 10^{7.688-pH}} + \frac{2.487}{1 + 10^{pH-7.688}}\right) x\ MIN\left(2.85, 1.45\ x\ 10^{0.028\ x\ (25-T)}\right)$$ where T is the water temperature in Celsius. In addition, the highest four-day average within the 30-day period should not exceed 2.5 times the CCC.
Biostimulatory Substances	Waters shall not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths could cause a nuisance or adversely affect the water to support specified beneficial uses.
Dioxins	No dioxin compounds will be discharged to any water within the YIR[6] boundaries.

Parameter[1]	Description
Dissolved Oxygen	Dissolved oxygen concentrations shall not be altered by human caused activities that could cause a barrier to salmonid fish migration or adversely affect the water to support specified beneficial uses. Specific use[1] numerical criteria[3]: **Year-round objective in the water column** 7-day moving average of the daily minimum concentrations ≥ 8 mg/L **Intergravel objective during the incubation and emergence life stage** 7-day moving average of the daily minimum concentrations ≥ 8 mg/L **Water column objective during the incubation and emergence life stage** 7-day moving average of the daily minimum concentrations ≥ 11 mg/L.
Oil and Grease	Waters shall not contain oils, greases, waxes or other materials in concentrations that result in a visible film or coating on the surface of the water or on objects in the water that could cause a nuisance, or adversely affect the water to support specified beneficial uses.
Nitrate	Levels of nitrates in waters with municipal or domestic supply use shall not exceed 10 mg/L. In other bodies of water, the levels of nitrate shall not be increased by human related activity that could cause a nuisance, or adversely affect the water to support specified beneficial uses.
Nitrite	Levels of nitrites shall not be increased, in any body of water, by human related activity that could cause a nuisance, or adversely affect the water to support specified beneficial uses.
Pentachlorophenol (PCP)	No discharge of Pentachlorophenol will be allowed to any water body within the boundaries of the YIR. Any existing point or non-point source resulting in the presence of PCP shall be addressed as a non–compliance condition under the antidegradation plan.
Petroleum Hydrocarbons	No increase above background levels of petroleum hydrocarbons will be allowed due to human related activity in any water body within the YIR boundaries. Background levels shall be considered to be non-detect if baseline levels have not been established.
Pesticides	Pesticide concentrations, individually or collectively, shall not be detected by using the most recent detection procedures available. There shall be no detectable amount of pesticide concentrations found in bottom sediments. There shall be no detectable increase in bioaccumulation of pesticides in aquatic life.
pH	Changes related to human caused activities in normal pH levels shall not exceed 0.5 pH units [s.u.]. pH levels shall not be below 6.5 [s.u.] and not exceed 8.5 [s.u.] due to human caused activities.[2]

Parameter[1]	Description
Phosphates	Levels of phosphorous in any water body shall not be increased by human related activity above the levels that could cause a nuisance, or adversely affect the water to support specified beneficial uses.
Sediment	The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause a nuisance, or adversely affect the water to support specified beneficial uses. In addition, the placing or disposal of soil and silt from any operation where such material could cause a nuisance or adversely affect the water to support specified beneficial uses is prohibited.
Settleable Materials	Waters shall not contain substances caused by human activities in concentrations that result in deposition of material that could cause a nuisance, or adversely affect the water to support specified beneficial uses.
Suspended Materials	Waters shall not contain suspended materials caused by human activities in concentrations that could cause a nuisance, or adversely affect the water to support specified beneficial uses.
Temperature	The natural receiving water temperature shall not be altered unless it is shown to the YTEP[7], and the YTEP concurs, that it does not affect beneficial uses. See Table 3.2-9 for water temperature specific use[2] numerical criteria[3].
Toxicity	All waters shall be maintained free of toxic substances in concentrations that are toxic to, or that produce detrimental physiological responses in human, plant, animal, or aquatic life. Compliance with this objective will be determined by use of indicator organisms, analysis of species diversity, population density, growth anomalies, bioassays of appropriate duration and/or other appropriate methods as specified by USEPA's toxicity test guidance.
Turbidity	Waters shall be free of human caused changes in turbidity that could cause a nuisance, or adversely affect the water to support specified beneficial uses. Allowable zones of dilution within which higher percentages can be tolerated may be defined for specific discharges upon the issuance of discharge permits or waiver thereof. Turbidity shall not exceed 5 Nephelometric Turbidity Units (NTU) over background turbidity when the background turbidity is 50 NTU or less or have more than a 10 percent increase in turbidity when the background is greater than 50 NTU.[8]

Parameter[1]	Description
Other Chemical Constituents	Waters used for domestic or municipal supply shall not contain concentrations of chemical constituents in amounts which adversely affect such beneficial use.

Source: YTEP (2004) unless otherwise noted.

[1] Water quality objectives for bacteria, boron, floating materials, hardness, radioactivity, and elevated temperature (thermal) wastes are not included, as these water quality parameters are not anticipated to be affected by the Proposed Project. Analysis of potential impacts to riverbed substrate composition is discussed in Section 3.11 *Geology, Soils, and Mineral Resources*. Analysis of potential impacts to the ability of tribes to use water for ceremonial and other purposes is discussed in Section 3.12 *Historical Resources and Tribal Cultural Resources*. Analysis of potential impacts to color is discussed in Section 3.19 *Aesthetics*. Consideration of hydrology under the Proposed Project is discussed in Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*. Specific hydrologic conditions for the alternatives are discussed in Section 4 *Alternatives*.

[2] Waters listed with the designated uses of preservation of biological habitat with special significance (BIO), cold freshwater habitat (COL), commercial and sport fishing (COM), cultural and ceremonial activities (CUL), migration of aquatic organisms (MGR), municipal and domestic supply (MUN), navigation (NAV), contact recreation (REC-1), rare, threatened, or endangered species habitat (RARE), spawning, reproduction, and development habitat (SPN) shall meet the criteria over the entire length of the stream including connecting tributaries and the Pacific Ocean where applicable within Yurok Tribal jurisdiction.

[3] Specific use numerical criteria for ammonia adopted from USEPA's 1999 update of ambient water quality criteria for ammonia (USEPA 1999) and Hoopa Valley Tribe's 2001 WQCP (HVTEPA 2008).

[4] CMC = Criteria Maximum Concentrations

[5] CCC = Criterion Continuous Concentration

[6] YIR = Yurok Indian Reservation.

[7] YTEP = Yurok Tribe Environmental Program

[8] Turbidity levels adopted from the State of Washington as specified in Bash et al. (2001).

Table 3.2-9. Yurok Tribe Water Temperature Numerical Criteria.[1]

Life Stage	Time Period (Estimated)	MWAT[2] (°C/°F)	MWMT[3] (°C/°F)	Inst. Max (°C/°F)
Adult Migration	Year-round	15/59	17/62.6	21/69.8
Adult Holding	May–Dec.	14/57.2	16/60.8	22/71.6
Spawning	Sept.–Apr.	11/51.8	13/55.4	22/71.6
Incubation/Emergence All Salmonids except Coho	Jan.–May	11/51.8	13/55.4	22/71.6
Incubation/Emergence Coho Salmon	Nov.–Jun.	10/50	12/53.6	22/71.6
Juvenile Rearing	Year-round	15/59	17/62.6	22/71.6
Smoltification	Jan.–Jun.	12/53.6	14/57.2	22/71.6

Source: YTEP (2004)

[1] Waters listed with the designated uses of preservation of biological habitat with special significance (BIO), cold freshwater habitat (COL), commercial and sport fishing (COM), cultural and ceremonial activities (CUL), migration of aquatic organisms (MGR), municipal and domestic supply (MUN), navigation (NAV), contact recreation (REC-1), rare, threatened, or endangered species habitat (RARE), spawning, reproduction, and development habitat (SPN) shall meet the criteria over the entire length of the stream including connecting tributaries and the Pacific Ocean where applicable within Yurok Tribal jurisdiction.

[2] Mean Weekly Average Temperature

[3] Mean Weekly Maximum Temperature

Suspended Sediments

California has established separate water quality objectives for the two closely-related water quality parameters: suspended sediment (the amount of silt, clay, and other small particles in the water column) and turbidity (the clarity or murkiness of the water due to small particles). California objectives for turbidity are based on comparing the clarity of the water currently to the clarity of the water under natural conditions (Table 3.2-4), where the Basin Plan defines natural conditions as conditions or circumstances affecting the physical, chemical, or biological integrity of water that are not influenced by past or present anthropogenic activities (North Coast Regional Board 2011). However, there are not readily-available data on what turbidity levels are in the Klamath River under natural conditions, so increases in turbidity above natural conditions cannot be calculated for the Proposed Project in the manner anticipated by the Basin Plan (i.e., relative to natural conditions). While measurements of suspended sediments and turbidity are related such that a relationship can be determined to estimate turbidity from suspended sediments, or vice versa, the relationship

between suspended sediments and turbidity varies between watersheds due to variations in the suspended material properties (e.g., the size, shape, and refractive index of particles having different light scattering properties). Flow variations in a river may result in turbidity naturally fluctuating several orders of magnitude, but turbidity has also been observed to fluctuate by an order of magnitude or more when flows are relatively constant due variations in the suspended material properties being transported during different times (Bash et al. 2001). Both suspended sediment and turbidity data must be collected at one or more locations in a river over a sufficiently long time period to characterize the range of suspended sediment and turbidity conditions and determine the relationship between the two parameters in the river near those locations; there currently is not sufficient data to develop this relationship in the Klamath River, either for natural conditions or for existing background conditions (Stillwater Sciences 2009). Additionally, turbidity is only an indicator of suspended sediment effects on salmonids and other fish rather than a direct measure, so turbidity measurements may not accurately characterize the potential impact on salmonids (Bash et al. 2001) and suspended sediment concentrations would better characterize the potential impact of suspended sediments on salmonids. Thus, it is not possible to use the turbidity water quality objective directly, and accordingly the CEQA water quality impacts analysis uses the narrative sediment water quality objectives that include the evaluation of suspended material (i.e., suspended sediment concentrations), rather than the numeric turbidity standards.

Basin Plan water quality objectives for suspended material, settleable material, and sediment are narrative and require that waters not contain concentrations that cause nuisance or adversely affect beneficial uses (Table 3.2-4). While the Klamath River has multiple designated beneficial uses, the use most sensitive to water quality is the cold freshwater habitat (COLD) associated with salmonids (North Coast Regional Board 2011). In order to adequately analyze short-term and long-term impacts[22] of the Proposed Project on this beneficial use, the water quality impact analysis assesses the narrative suspended material water quality

[22] For the Lower Klamath Project water quality analysis, short term is defined as the period during pre-dam removal activities, reservoir drawdown, dam removal, and associated sediment flushing events, which corresponds to pre-dam removal activities that would occur in the one to three years before dam removal, dam removal year 1, dam removal year 2, and post-dam removal year 1 (Table 2.7-1). Long-term is defined as occurring after post-dam removal year 1 (i.e., greater than three years after dam removal.

objective using the predicted suspended sediment concentrations (SSCs)[23] for two to 50 years beginning with the initiation of drawdown in the Lower Klamath Project reservoirs. Predictions of SSCs during dam removal were determined as part of the extensive sediment transport modeling conducted for the Klamath Dam Removal Secretarial Determination process (USBR 2012). The narrative suspended material water quality objective was interpreted into a numeric SSC value for assessing potential impacts to the most sensitive beneficial use (COLD) by analyzing the magnitude and duration of SSCs that produce negligible, behavioral, sub-lethal, and lethal impacts to salmonids (Newcombe and Jensen 1996). Using a generalized "dose-response"[24] approach, the numeric SSCs threshold of significance for potential short-term impacts is 100 mg/L over a continuous two-week exposure period, as this exposure for the duration of two weeks would be a significant adverse impact to salmonids (see Appendix D, Section D.2 for detail).

A more detailed analysis of suspended sediment effects on key fish species, including consideration of specific life history stages, SSCs, and exposure period, is required for a comprehensive assessment of the impacts of the Proposed Project on fisheries-related beneficial uses. This level of analysis is presented in Section 3.3 *Aquatic Resources* and appendices to the section. Further discussion of the particular impacts of suspended sediment on shellfish and estuarine and marine organisms is also presented in Section 3.3.5.1 *Suspended Sediment*.

In the Pacific Ocean nearshore environment, the narrative California marine water quality objectives (Table 3.2-6) are applied as the threshold of significance rather than the freshwater numeric SSCs threshold of significance of 100 mg/L

[23] For the purposes of this report, SSC is considered equivalent to Total Suspended Solids (TSS). SSC and TSS are generally similar (i.e., follow a 1:1 line of equal value), but TSS measurements tend to underestimate actual suspended material when the suspended material contains larger particles (i.e., sand-sized particles or greater) due to the TSS measurement methodology potentially underestimating larger particles that rapidly settle or clog measurement tools. SSC and TSS are more or less evenly distributed around the 1:1 line of equal value when particle sizes are smaller than 0.062 mm (i.e., silts or clays) and TSS is greater than approximately 5 mg/L (Gray et al. 2000). As needed, data from multiple sources reported as either TSS or SSC are used interchangeably, but TSS measurements may underestimate actual suspended material when sand-sized or larger particles comprise more than 25 percent of a sample mass. SSC is more commonly used in riverine systems while TSS is used for wastewater treatment plants.

[24] A "dose-response" approach analyzes how exposure to different concentrations over a range of time periods (i.e., hours, days, weeks, months) produces various impacts (i.e., negligible, behavioral, sub-lethal, and lethal) on the organism being evaluated.

over a continuous two-week exposure period. The freshwater numeric SSCs threshold of significance is not applied to the Pacific Ocean nearshore environment since mixing conditions would potentially result in rapid variations in SSCs and salmonids within the Pacific Ocean nearshore environment would have more of an opportunity to avoid elevated SSCs conditions compared to opportunities within the Klamath River. Due to the fact that turbulent mixing in the Pacific Ocean nearshore environment could result in rapid variations in physical characteristics, including SSCs, the threshold of significance in the marine environment for this EIR is whether the changes in the physical characteristics of the Pacific Ocean nearshore environment would be greater than occurring under natural (i.e., storm) conditions. Variations in the physical characteristics of the Pacific Ocean nearshore environment within the range occurring under natural (i.e., storm) conditions would be similar to existing conditions, so there would be no significant impact. Variations in the physical characteristics of the Pacific Ocean nearshore environment greater than the range occurring under natural (i.e., storm) conditions would potentially cause water quality changes that would result in a failure to maintain existing beneficial uses at the levels currently supported, resulting in a significant impact.

Nutrients

California has a narrative water quality objective for biostimulatory substances and does not stipulate numeric nutrient water quality standards for the COLD beneficial use (Table 3.2-4). California does have numeric nitrate and nitrite standards for the support of municipal beneficial uses (i.e., drinking water). However, these standards are much higher than concentrations that have been measured in the Klamath Basin, such that there is no indication that the municipal beneficial use is not being met or would not be met in the future under the Proposed Project. The Hoopa Valley Tribe and Yurok Tribe also have nitrate standards for municipal beneficial uses (Table 3.2-7 and Table 3.2-8, respectively) that are similarly higher than nitrate concentrations measured in the Klamath Basin. The Yurok Tribe nitrite water quality objective is discussed under the sub-section *Inorganic and Organic Contaminants* below.

The narrative objective for biostimulatory substances in the Basin Plan applies to all North Coast waters. The California Klamath River TMDLs interpret the narrative biostimulatory substances objective for the Klamath River with numeric targets for nutrients, organic matter, chlorophyll-*a*, *Microcystis aeruginosa*, and microcystin. The numeric TMDL targets for nutrients (TP and TN) and organic matter vary by month and are established for the tailraces of Copco No. 2 and Iron Gate dams. The numeric TP targets range from 0.023 to 0.029 mg/L for May to October and 0.024 to 0.030 mg/L for November to April. The numeric TN targets range from 0.252 to 0.372 mg/L for May to October and 0.304 to 0.395 mg/L for November to April (North Coast Regional Board 2010). These are established as the monthly mean concentrations that allow achievement of in-reservoir water quality targets to attain the chlorophyll-*a* summer mean target of 10 ug/L, the *Microcystis aeruginosa* cell density target of 20,000 cells/mL, and

the microcystin target of 4 ug/L (i.e., avoid nuisance algae blooms in Iron Gate and Copco No. 1 reservoirs) (North Coast Regional Board 2010; see also Appendix D, Section D.1 for a discussion of the "TMDL dams-in" modeling scenario [T4BSRN], which is the basis of these targets). Additionally, numeric TP and TN water quality objectives have been established by the Hoopa Valley Tribe (see Table 3.2-7) for the portions of the Klamath River within the Hoopa Valley Tribe Reservation lands (RM 44.8 to RM 45.8), with the mean TP and TN concentrations in any 30-day period from May to October not to exceed 0.035 mg/L TP and 0.2 mg/L TN (HVTEPA 2008).

At multiple locations in the Klamath River, the Klamath River TMDL model results indicate large daily variability in TP and TN in excess of the small range in the monthly TMDL targets, particularly during summer and early fall (generally June to October) (Tetra Tech 2009). As a result, the nutrient impact analysis for this EIR considers if there is a general downward (or upward) trend in TP and TN toward (or away from) the TMDL and Hoopa Valley Tribe (as applicable) numeric targets would occur and, qualitatively, the impact analysis interprets whether such a trend would support or alleviate the growth of nuisance and/or noxious phytoplankton or nuisance periphyton. In the Pacific Ocean nearshore environment, the applicable narrative water quality objective for nutrients would be from the California Ocean Plan that states that nutrient materials shall not cause objectionable aquatic growths or degrade indigenous biota (see Table 3.2-6). Thus, the threshold of significance for nutrients is the combination of a qualitative evaluation of potential changes in nutrients under the Proposed Project and an evaluation of whether potential responses in nuisance and/or noxious phytoplankton or nuisance periphyton would impact designated beneficial uses.

Chlorophyll-*a* and Algal Toxins

The Klamath River TMDLs establish a Lower Klamath Project phytoplankton chlorophyll-*a* target of 10 ug/L during the May to October growth season (North Coast Regional Board 2010). The Hoopa Valley Tribe chlorophyll-*a* criterion[25] (150 mg/m^2) relates to periphyton growth rather than phytoplankton growth or algae blooms and it is not discussed further in this section since periphyton growth under the Proposed Project is addressed in Section 3.4 *Phytoplankton and Periphyton*.

The California TMDL target (10 ug/L) is used as the chlorophyll-*a* threshold of significance for Copco No. 1 and Iron Gate reservoirs. Anticipated regular exceedances of these thresholds greater than would occur under existing conditions would constitute a significant impact for this analysis.

[25] Applicable to the short reach (approximately RM 45) of the Klamath River upstream of the Trinity River.

For algal toxins, the North Coast Regional Board Basin Plan has narrative water quality objectives for general toxicity that all waters shall be maintained free of toxic substances in concentrations that are toxic to, or that produce detrimental physiological responses in human, plant, animal, or aquatic life (North Coast Regional Board 2018). The World Health Organization (WHO) has set numeric thresholds for recreational exposures of microcystin toxin at 4 ug/L for a low probability of adverse health effects, and 20 ug/L for a moderate probability of adverse health effects (Falconer et al. 1999; Chorus and Cavalieri 2000). The WHO thresholds are general levels representing a variety of toxigenic cyanobacteria [blue-green algae]. To avoid conditions that lead to water quality impairments, the California Klamath River TMDLs use the WHO low probability of adverse health effects thresholds as targets specific to the California reaches of the Lower Klamath Project for *Microcystis aeruginosa* (less than 20,000 cells/mL) and microcystin toxin (less than 4 ug/L). In addition to the WHO and California Klamath River TMDLs numeric objectives for microcystin toxin thresholds, the CCHAB Network, comprised of the State Water Board, CDPH, and CalEPA OEHHA with participation by multiple federal, state, and local stakeholders, details primary and secondary cyanotoxin [algal toxin] trigger threshold levels for protection of human health in recreational waters in the *Draft Voluntary Statewide Guidance for Blue-Green Algae Blooms* (Table 3.2-10; State Water Board et al. 2010, updated 2016). The minimum primary cyanotoxin [algal toxin] trigger thresholds that would result in a waterbody being posted include 0.8 ug/L total microcystin toxins, detection of anatoxin-a (using an analytical method that detects less than or equal to 1 ug/L), or 1 ug/L cylindrospermopsin. The secondary trigger thresholds are 4,000 cells/mL of all toxin producing species- or site-specific indicators of cyanobacteria [blue-green algae] like blooms, scums, or mats (State Water Board et al. 2010, updated 2016). Additionally, the Hoopa Valley Tribe and Yurok Tribe have numeric objectives for algal toxins. The Hoopa Valley Tribe numeric objectives for algal toxins are less than 1 ug/L total microcystins[26] for drinking water and less than 8 ug/L total microcystins[26] for recreational water (see Table 3.2-7; HVTEPA 2008). The Yurok Tribe has multiple numeric objectives for algal toxins (i.e., microcystin) with the lowest threshold for posting being detection of microcystin (see Table 3.2-11; YTEP 2016).

[26] "Total microcystins", as defined in the Hoopa Valley Tribe Surface-Water Objectives, is assumed to be equivalent to "total microcystin" for this EIR.

Table 3.2-10. California Cyanobacteria Harmful Algal Bloom (CCHAB) Trigger Levels for Human Health.

Trigger Level	Primary Triggers[1]			Secondary Triggers	
	Total Microcystins (ug/L)	Anatoxin-a (ug/L)	Cylindrospermopsin (ug/L)	Total Potentially Toxigenic Cyanobacteria [blue-green algae] Species (cells/mL)	Site Specific Indicators of Cyanobacteria [blue-green algae]
Caution Action	0.8	Detection[2]	1	4,000	Blooms, scums, mats, etc.
Warning TIER I	6	20	4	-	-
Danger TIER II	20	90	17	-	-

Source: (State Water Board et al. 2010, updated 2016)

[1] Primary triggers are met when ANY toxin exceeds criteria

[2] Must use an analytical method that detects less than or equal to 1 ug/L Anatoxin-a

Table 3.2-11. Yurok Tribe Posting Guidelines for Blue-Green Algae Public Health Advisories

Public Health Advisory Level	*Microcystis aeruginosa* (cells/mL)	Total potentially toxigenic blue-green algae species (cells/mL)	Microcystin toxin Concentration (ug/L)
Caution	Detection	Detection	Detection
Level I Health Advisory Warning	≥ 1,000	≥ 100,000	≥ 0.8
Level II Health Danger Advisory	≥ 5,000	≥ 500,000	≥ 4.0

Source: YTEP (2016)

Since the less than 4 ug/L criterion for microcystin in recreational waters is common to the California Klamath River TMDL, WHO, and Yurok Tribe criteria, and it is less than the Hoopa Valley Tribe recreational criterion, 4 ug/L microcystin is used as the threshold of significance for the Lower Klamath Project EIR water quality analysis. The current lowest CCHAB and Yurok Tribe posting limit for microcystin (0.8 ug/L) is also considered in the analysis although application of the lower threshold would in no case change the significance determinations in this EIR.

While the threshold of significance for microcystin (i.e., algal toxins) is a numeric value, quantitative predictive tools for algal toxins are not available for assessment of the Proposed Project. Therefore, the algal toxin impact analysis is based on a qualitative assessment of whether the Proposed Project would result in exceedances of the criterion and adversely affect human health and recreational beneficial uses. Growth conditions for toxigenic suspended blue-green algae (e.g., nutrient availability, stable, slow-moving water) are considered as part of the qualitative analysis, where predicted changes in nutrient availability, water temperatures, and the availability of stable, slow-moving water (e.g., reservoir) conditions would correspondingly affect algal toxin concentrations.

Inorganic and Organic Contaminants

California has water quality objectives related to inorganic and organic contaminants, with numeric objectives for California's chemical constituents (listed in the Basin Plan [North Coast Regional Board 2018]), and chemical-specific water-column criteria for freshwater and marine aquatic life and human health, including bioaccumulative chemicals such as PCBs, methylmercury, dioxins, and furans (North Coast Regional Board 2018). The most stringent criteria are applied when more than one would be applicable (e.g., freshwater or marine in estuaries with brackish water). California's toxicity and pesticides objectives are narrative (Table 3.2-4).

Thresholds of significance for the California narrative water quality objectives focus on designated beneficial uses and are applicable for contaminants in either the water column or the sediments. For this EIR analysis, establishment of toxicity and/or bioaccumulation potential for sediment contaminants relies upon thresholds developed through regional and state efforts in the Sediment Evaluation Framework for the Pacific Northwest (SEF) (Appendix D – *Section D.3*). The SEF is a regional guidance document that provides a framework for the assessment and characterization of freshwater and marine sediments in Idaho, Oregon, and Washington (RSET 2018). The SEF includes bulk sediment screening levels for standard chemicals of concern and chemicals of special occurrence in marine and freshwater sediments for Idaho, Oregon, and Washington (RSET 2018). Numeric chemical guidelines for the assessment and characterization of freshwater and marine sediments do not exist for California. Exposures to suspended sediment with elevated concentrations of potentially toxic chemicals are of lower concern for marine receptors than exposures to elevated concentrations of dissolved chemicals since dissolved chemicals are more bioavailable (i.e., able to interact with biological processes) and likely to cause toxicity than chemicals that are bound to sediments and less bioavailable (USEPA 2007). As part of the SEF approach used for the Klamath Dam Removal Secretarial Determination process, bioassays and sediment bioaccumulation tests were conducted to provide additional empirical evidence about the biological effects of inorganic and organic contaminants in reservoir

sediment deposits. Bioassays and sediment bioaccumulation test results represent direct exposure to the undiluted reservoir sediments samples, so those results are interpreted based on the expected dilution of reservoir sediments once they are transported from the reservoir footprints under the Proposed Project and potential toxicity from bioassays and sediment bioaccumulation tests are only applied as thresholds of significance after consideration of dilution. Additional information regarding applicable sediment screening levels used for the Klamath Dam Removal Secretarial Determination sediment evaluation process is presented in CDM (2011).

With respect to inorganic and organic contaminants, impacts on water quality are considered significant if the Proposed Project would result in substantive adverse impacts on human health or environmental receptors (e.g., aquatic organisms) due to dam removal. Substantive adverse impacts on human health or environmental receptors is defined as exceedance of applicable chemical screening levels and/or laboratory toxicity results that indicate one or more chemicals are present at levels with potential to cause toxicity after consideration of dilution that would be representative of conditions in the Klamath River, Klamath River Estuary, and the Pacific Ocean nearshore environment during and following dam removal. The detection of one or more chemicals at concentrations with potential to cause only minor or limited adverse effects based on exceedances of applicable screening levels and/or laboratory toxicity results after consideration of dilution under the Proposed Project would be below the threshold of significance, thus constitute a less than significant impact. This evaluation is not intended to be equivalent to the SEF process.

Lastly, the Hoopa Valley Tribe and the Yurok Tribe have ammonia toxicity objective based on pH and temperature (Table 3.2-7). Available data suggests no actual ammonia toxicity events associated with the operation of the Lower Klamath Project (North Coast Regional Board 2010), and the turbulent mixing, increased river velocity and expected dissolved oxygen conditions in the river under the Proposed Project would promote an increase in nitrification (i.e., biological oxidation of ammonia and ammonium to nitrate) minimizing the potential for ammonia toxicity. Similarly, the Yurok Tribe has a nitrite water quality objective (Table 3.2-8), but available data does not suggest operation of the Lower Klamath Project influences nitrite concentrations in the Klamath River. Additionally, the rapid oxidation of nitrite to nitrate in the environment combined with the dissolved oxygen and turbulent mixing conditions in the Klamath River would result in any potential nitrite becoming nitrate under the Proposed Project. As a result, these specific objectives are not considered further. Potential short-term toxicity to aquatic organisms during reservoir drawdown, including consideration of ammonia and nitrite toxicity, is addressed using bioassay results (see Section 3.2.4.7 *Inorganic and Organic Contaminants*).

3.2.4 Impact Analysis Approach

Water quality impact analysis considers the Proposed Project's anticipated short-term and long-term water quality effects. For the Lower Klamath Project water quality analysis, short-term is defined as the period during pre-dam removal activities, reservoir drawdown, dam removal, and associated sediment flushing events, which corresponds to pre-dam removal activities that would occur in the one to three years before dam removal, dam removal year 1, dam removal year 2, and post-dam removal year 1 (Table 2.7-1). Long-term is defined as occurring after post-dam removal year 1 (i.e., greater than three years after dam removal).

As these are the areas of greatest potential impact and of most heightened public concern, the water quality analysis in this EIR focuses on the potential impacts of the Proposed Project on water temperature, suspended sediments, nutrients (TN, TP, nitrate, ammonium, ortho-phosphorus), dissolved oxygen, pH and alkalinity, chlorophyll-*a* and algal toxins, and inorganic and organic contaminants in water and reservoir sediments.

While the timing of reservoir drawdown under the Proposed Project was selected to minimize environmental effects, significant short-term impacts are anticipated. In the short term, the water quality impacts are expected to be heavily driven by the release of fine sediment deposits currently stored behind the dams to the downstream river reaches, the Klamath River Estuary, and the Pacific Ocean nearshore environment. Mobilization of reservoir sediment deposits would be most intense during reservoir drawdown and the year following dam removal, when the majority of sediments would be eroded and transported by river flows (Stillwater Sciences 2008; USBR 2012, 2016) (see also Section 2.7.3 *Reservoir Sediment Deposits and Erosion During Drawdown*). Additionally, there is the potential for short-term water-quality impacts as a result of construction and restoration activities.

Long-term changes in water quality are primarily characterized by the shift from reservoir to river environments in the Hydroelectric Reach and the associated alterations in physical and chemical processes on water quality in this reach and downstream river reaches. Additionally, potential long-term water quality impacts associated with future land use and the transfer of Parcel B lands under the Proposed Project are considered qualitatively.

Multiple numeric models[27] are used for the water quality impact analyses because no one individual existing numeric model captures all of the water quality conditions anticipated for and encompassed by the Proposed Project (Appendix D, Section D.1). Numeric models include those developed by PacifiCorp for the FERC relicensing process for water temperature and dissolved

[27] Here "numeric models" refers to mathematical models that are developed to represent the physical, chemical, and biological conditions in waterbodies such as rivers, lakes, reservoirs, wetlands, estuaries, and the ocean.

oxygen, North Coast Regional Board models for development of the Klamath River TMDLs, and models used in the course of the Klamath Dam Removal Secretarial Determination studies. While modeling conducted as part of the Klamath Dam Removal Secretarial Determination studies used Water Year (WY) 2012 as the start of the period of analysis for hydrology (i.e., river flows), water temperature, and suspended sediment, the overall range of river flows remains generally consistent between WY 2012 and current conditions (see Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*) and other modeling assumptions for water temperature and suspended sediment have not changed in the interim. The California Klamath River TMDL models stemmed from a significant five-year effort by the North Coast Regional Board in collaboration with PacifiCorp and working jointly with USEPA Regions 9 and 10 and ODEQ. That work was subject to extensive peer review and public comment before adoption by the North Coast Regional Board. It was further reviewed and subject to additional public comment before being approved unanimously by the State Water Board. It was then subsequently reviewed and approved by the USEPA in December 2010.

Key concerns with respect to the California and Oregon TMDL models, which were raised during the respective public comment processes, include concerns regarding how the natural condition was determined, how model uncertainty was considered in the analysis, and need for additional years of data for calibration of the model. As discussed in North Coast Regional Board (2010) Appendix 10 *Public Comments & Responses*, the North Coast Regional Board found the uncertainty associated with the Klamath TMDL models to be minimal relative to the magnitude of the source load reductions needed to meet water quality standards in both Oregon and California and that any additional analysis would bring diminishing returns for determining implementation actions for the basin. The North Coast Regional Board indicated that if updates to the California model demonstrate that TMDL allocations and targets should be adjusted, the Regional Water Board staff would propose changes to the TMDL. To date, no such changes have been proposed. The North Coast Regional Board also provided extensive documentation describing the development of the modeled natural condition and indicated that the year chosen for developing the model and establishing the TMDL was selected because it included periods of critical low flow and poor water quality conditions, consistent with the margin of safety requirement and the goal of developing environmentally conservative allocations. While the Oregon portion of the model was calibrated using two model years, there were not sufficient data to evaluate the California portion of the model for the second year. The North Coast Board indicated that adding more model years to the model development process would not significantly change the model parameters, given the within-year variability in the Klamath River system (North Coast Regional Board 2010).

The following documents were assessed to determine if the Proposed Project has the potential to conflict with any local policies or ordinances protecting water quality or conflict with provisions of any adopted conservation plans:

- Del Norte County General Plan (Mintier & Associates et al. 2003):
  - Section 1 *Natural Resources/Conservation, Water Resources*, including Policies 1.B.1, 1.B.3, 1.B.6, 1.B.7, and 1.B.12.
- Humboldt County General Plan for Areas Outside of the Coastal Zone (Humboldt County 2017):
  - Water Resources Element, including Policies WR-P1, WR-P2, WR-P3, WR-P4, WR-P5, WR-P12, WR-P18, WR-P22, WR-P23, WR-P24, WR-P25, WR-P29, WR-P33, WR-P34, WR-P35, WR-P36, WR-P37, WR-P39, WR-P42, WR-P43, and WR-P45; Standards WR-S2, WR-S6, WR-S7, and WR-S9; and Implementation Measures WR-IM9, WR-IM14, WR-IM17, WR-IM19, WR-IM20, WR-P28 [sic], WR-IM29, WR-IM30, and WR-IM32.
- Siskiyou County General Plan:
  - Conservation Element (Siskiyou County 1973), including Section 4.H *Watershed and Water Recharge Lands*, Objective and Recommendations 2, 3, and 4; Section 4.I *The [Conservation] Plan*, 1, 4, 8, and Objectives 1, 3, and 5; and Section 5.C.3 *Environmental Impacts*, 1, 3, 5, and 7.
  - Land Use and Circulation Element (Siskiyou County 1980) and Land Use Update (Siskiyou County 1997).

The aforementioned policies, standards, implementation measures, and objectives are stated in general terms, consistent with their overall intent to protect water quality, water resources, and general watershed conditions. In evaluating the potential impacts to specific water quality parameters within the water quality Area of Analysis, including water temperature, suspended sediments, nutrients, dissolved oxygen, pH, chlorophyll-a and algal toxins, and inorganic and organic contaminants, the more general local policies listed above are inherently considered and addressed by the water quality parameter specific analyses in Section 3.2.5 *[Water Quality] Potential Impacts and Mitigation*.

Parameter-specific analysis methods are discussed below.

3.2.4.1 Water Temperature

The analysis of the Proposed Project's potential short-term and long-term impacts on water temperatures is informed by three quantitative models: the Klamath River Water Quality Model (KRWQM), the Klamath River TMDL model, and the RBM10 model. Each of these models includes a scenario that is similar to existing conditions (i.e., with the Lower Klamath Project dams in place) and scenarios with one or more dams removed that are similar to the Proposed Project and/or alternatives analyzed in Section 4 *Alternatives*. The KRWQM was

developed for FERC relicensing of the Klamath Hydroelectric Project (PacifiCorp 2004a, 2005a), and the KRWQM version that was used to model water quality conditions in 2004 and 2005 (hereafter referred to as the 2004/2005 KRWQM) was later used to inform development of the Klamath River TMDL model. More recent 2019 KRWQM documentation (PacifiCorp 2019) indicates that PacifiCorp has developed an updated version of the KRWQM model, where the updates were primarily focused on Keno Reservoir. However, PacifiCorp (2019) does not present comparisons of dam removal scenarios, so the previous 2004/2005 KRWQM results cannot be replaced with the newer 2019 KRWQM results in the EIR analyses. The Klamath River TMDL model was developed to inform the Oregon and California TMDLs. The Klamath River TMDL model includes a "TMDL dams-in" scenario (T4BSRN), which approximates the condition where the Lower Klamath Project dams remain in place, as well as the TOD2RN (Oregon reaches) and TCD2RN (California reaches) scenarios (together the "TMDL dams-out" scenario) that assume the removal of the Lower Klamath Project (see Appendix D for more detail). The Klamath River TMDL model assumes full TMDL implementation for both the dams-in and dams-out scenarios (Tetra Tech 2009); however, the mechanisms for implementation and the timing required to achieve future TMDL compliance are currently speculative. Despite this assumption, the Klamath River TMDL model results are still a useful source of information with respect to the analysis of potential water temperature impacts under the Proposed Project, particularly in light of the TMDL model's inclusion of the Klamath "TMDL natural conditions scenario" (T1BSR) that contextualizes water temperature background or natural levels as compared with existing conditions, the Proposed Project, and/or the alternatives. The Klamath River TMDL model assumes that the upstream Keno Dam is replaced by the historical natural Keno Reef in the "TMDL natural conditions" scenario (T1BSR), and the "TMDL dams-out" scenario (TOD2RN and TCD2RN), but not in the "TMDL dams-in" scenario (T4BSRN). Where this assumption applies, the Keno Reach is still partially impounded even though the reef's elevation is two feet lower than the current full pool elevation of Keno Impoundment/Lake Ewauna, which does not materially influence model applicability to inform impact determinations for the Proposed Project and alternatives identified in this EIR.

Since the 2004/2005 KRWQM and the Klamath River TMDL model do not include climate change projections or KBRA hydrology[28], one additional set of water temperature modeling results is used for this EIR. The RBM10 model was developed as part of the Klamath Dam Removal Secretarial Determination

[28] Quantitative comparisons between KBRA and the NMFS and USFWS 2013 Joint Biological Opinion for the Klamath Irrigation Project (2013 BiOp Flows) or KBRA and the NMFS and USFWS individual 2019 Biological Opinions (2019 BiOp Flows) indicate that KBRA Flows sufficiently bracket the range of 2013 BiOp Flows and 2019 BiOp Flows (see also Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*), so RBM10 model results still generally represent the expected trends under the Proposed Project.

studies and includes the effects of climate change and KBRA hydrology on water temperatures (Perry et al. 2011). RBM10 model results use climate change predictions from five Global Circulation Models (GCMs) (see Appendix D for more detail). The climate change predictions are used to give additional context to the temperature discussion, but they are not relied on for significance determinations. Future climate changes are not part of the existing condition against which this EIR compares potential impacts under the Proposed Project.

Additional details regarding available numeric models for analysis of long-term water temperature are presented in Appendix D. Table D-1 shows the reaches where 2004/2005 KRWQM, Klamath River TMDL, and RBM10 model results are used for the water quality analysis under the Proposed Project and each alternative and Table D-2 presents a comparison of assumptions and parameters for the available numeric models, including flow assumptions. Since no single existing model captures all of the elements analyzed for water temperature in this EIR, model outputs are used in combination to assess similar spatial and temporal trends in predicted water temperature where possible.

3.2.4.2 Suspended Sediments

Reservoir drawdown under the Proposed Project is anticipated to mobilize a large amount of sediment in the short term (USBR 2012). In light of this, the Proposed Project schedules reservoir drawdown during winter months when precipitation, river flows, suspended sediments, and turbidity are naturally highest (see Section 2.7 *Proposed Project*). This EIR uses quantitative modeling and analyses of drawdown to inform the analysis of drawdown's suspended sediment effects, as further described in this section. Additionally, this EIR evaluates the potential for the Proposed Project to affect suspended sediment concentrations over the long-term, using existing data sources and analyses.

Results from the sediment mobility analysis conducted by USBR (2012) for the Klamath Dam Removal Secretarial Determination process are used to provide estimates of short-term SSCs downstream of Iron Gate Dam under the Proposed Project. The sediment mobility analysis used existing suspended sediment data collected by the USGS at the Shasta River near the City of Yreka (USGS gage no. 11517500), Klamath River near Orleans (USGS gage no.11523000), and Klamath River near Klamath (USGS gage no. 11530500) gages to estimate daily total SSCs (measured in mg/L) as a function of flow (measured in cfs) using the SRH-1D sediment transport model (Sedimentation and River Hydraulics–One Dimension Version 2.4) (Huang and Greimann 2010) and the SRH-2D sediment transport model (Sedimentation and River Hydraulics–Two Dimension Version 2.4) (USBR 2012, 2016). Daily total SSCs were modeled for existing conditions representing WY 1961–2008 ("background") and for short-term conditions following dam removal (WY 2020–2021). SRH-1D model output representing total settleable suspended material in the water column, including both inorganic (e.g., silt, clay, and sand) and organic (e.g., algae and plant) suspended material, is applied herein to the suspended sediment analysis. "Suspended sediments"

and “suspended material” are used interchangeably to refer to the combined inorganic and organic suspended material. Sources of each type of suspended material differ, as do spatial and temporal trends for each, within the Upper, Middle, and Lower Klamath River reaches (Section 3.2.2.3 *Suspended Sediments*). Bed materials, such as gravels and larger substrates, are discussed in Geology and Soils Section 3.11.5 *Potential Impacts and Mitigation*.

The SRH-1D model assumes drawdown for Copco No. 1 Reservoir begins on November 1 and drawdown for J.C. Boyle, and Iron Gate reservoirs begins on January 1, consistent with the Proposed Project. Copco No. 2 was not explicitly considered in the SRH-1D model, since: 1) construction of Copco No. 2 dam was completed seven years after the substantially larger upstream Copco No. 1 dam was completed, where the larger dam effectively cut off the source of sediments that would have been transported into Copco No. 2 Reservoir and potentially stored over many years, and 2) Copco No. 2 Reservoir storage volume (70 ac-ft) is negligible compared with that of the upstream Copco No.1 (33,724 ac-ft) and J.C. Boyle (2,267 ac-ft) reservoirs, such that even if sediment deposits were to occur in Copco No. 2 Reservoir during drawdown of upstream Copco No. 1 and J.C. Boyle reservoirs, the smaller Copco No. 2 Reservoir would not meaningfully increase downstream SSCs during designated reservoir drawdown periods (see also Section 2.7.3 *Reservoir Sediment Deposits and Erosion During Drawdown*).

The Klamath River hydrology for the SRH-1D model was generated using the Index Sequential method, where historical flow data is used to generate a set of flows under future operational conditions (USBR 2012). Historical flows from 1961 to 2009 (i.e., 49 years of data) were used to estimate potential inflows to the Upper Klamath Lake and Klamath River in the future, then these inflows were routed down the Klamath River based on KBRA flow operations and requirements (i.e., KBRA Flows). As discussed in Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*, 2013 BiOp Flows and 2019 BiOp Flows are typically similar to KBRA Flows for all water year types (generally within a few percentage points) and 2013 BiOp Flows or 2019 BiOp Flows outside the range KBRA Flows occur too infrequently to substantially alter the range of flow conditions in the Klamath River. Thus, SRH-1D model predictions made using KBRA Flows are still appropriate for assessing Proposed Project impacts under 2013 BiOp or 2019 BiOp Flows. In SRH-1D modeling that continued for more than one year (i.e., two years or more), the hydrology in the start year was followed by the hydrology in subsequent years. If there were no subsequent hydrology data (i.e., 2009), the period of record was looped (i.e., 2009 hydrology would be followed by 1961 hydrology) to obtain hydrology for Klamath River inflows for the desired modeling period. For example, if a start year of 2001 was chosen for a two-year modeling period, the hydrology from 2001 and 2002 was used to generate the inflows in the Klamath River that then were routed through the Hydroelectric Reach and further downstream. If a start year of 2001 was chosen for a 51-year modeling period, the hydrology from 2001 to 2009 followed by the hydrology from 1961 to 2002 would be used to generate

the inflows in the Klamath River that then were routed through the Hydroelectric Reach and further downstream (USBR 2012).

In addition to modeling the sediment transport during drawdown of the Lower Klamath Project reservoirs, sediment transport in the Klamath River from Iron Gate Dam to the Pacific Ocean for all years between WY 1961 and 2008 was modeled with SRH-1D to estimate the background SSCs in the Klamath River under existing conditions (USBR 2012). Incoming sediment concentrations supplied by tributaries downstream of Iron Gate Dam in the SRH-1D modeling of background SSCs were estimated from existing data on sediment transport and estimates of the sediment delivery rates from portions of the Klamath Basin were used to (Stillwater Sciences 2010; USBR 2012). Additionally, the SRH-1D modeled SSCs were compared with suspended sediment data collected by the USGS on the Shasta River near Yreka, California (USGS 11517500) from 1957 to 1960, on the Klamath River at Orleans, California (USGS 11523000) from 1957 to 1979 and on the Klamath River at Klamath, California (USGS 11530500) from 1974 to 1995 to verify the SRH-1D modeled SSCs sufficiently characterized the background SSCs in the Klamath River at Orleans and Klamath (USBR 2012).

With respect to the assumed reservoir drawdown rate, the USBR (2012) SSC modeling assumes a maximum drawdown rate of 2.25 to 3 feet per day (USBR 2012b) whereas the Proposed Project uses a maximum drawdown rate of 5 feet per day (Appendix B: *Definite Plan*). Stillwater Sciences (2008) modeled a range of drawdown rates (3, 6, and 9 feet per day) for removal of the Lower Klamath Project dams, which spans the aforementioned USBR (2012) and Proposed Project maximum drawdown rates. In Stillwater Sciences (2008), as the drawdown rate increases from 3 to 6 feet per day, the peak concentration of suspended sediments approximately doubles from 10,000 ppm [mg/L] to 20,000 ppm [mg/L], the concentration of suspended sediments decreases more rapidly over the course of days and weeks, and the duration of elevated concentrations decreases by several weeks. A similar response in estimated SSCs is expected for the USBR (2012) model output when increasing the maximum drawdown rate from 2.25 to 3 feet per day to 5 feet per day and accordingly, this response pattern is applied to the analysis of potential impacts due to SSCs, such that no new SSC modeling is required for the Proposed Project. While peak SSCs under the Proposed Project may be somewhat underestimated by the USBR (2012) modeled SSC results, the SSCs under the Proposed Project would still be within the inherent uncertainty of the USBR (2012) model (i.e., approximately a factor of two). Additionally, a more rapid decrease in suspended sediments and shorter duration of elevated SSCs under the faster drawdown in the Proposed Project would result in the USBR (2012) modeled SSC results underestimating the rate SSCs decrease and overestimate the duration of elevated concentrations in the river, thus the overall UBSR (2012) model results would provide a conservative estimate of the short-term impacts of dam removal on suspended sediments in the Klamath River.

The analysis of short-term suspended sediment-related impacts also considers results from previous studies (e.g., Stillwater Sciences 2010) regarding anticipated sediment release from Klamath River Dam removal within the context of sediment delivery at the broader scale of the Klamath Basin.

The long-term impact analysis of suspended materials uses existing data sources for TSS and turbidity sources to the Hydroelectric Reach and the Middle and Lower Klamath River (e.g., PacifiCorp 2004a, 2004b; YTEP 2005; Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016). Existing analyses of the potential effects of dam removal on long-term sediment supply (Stillwater Sciences 2010) are also considered.

3.2.4.3 Nutrients

Under the Proposed Project, short-term nutrient loads associated with high SSCs are assessed in a qualitative manner, considering the likelihood of sediment deposition in the Lower Klamath River, seasonal rates of primary productivity and microbially mediated nutrient cycling, and potential light limitation of primary producers given the high sediment concentrations in the river.

Additionally, the analysis uses Klamath River TMDL model runs to evaluate the general long-term trends (both spatial and temporal) for nutrients in the Hydroelectric Reach and the Middle and Lower Klamath River. The Klamath River TMDL model includes a "TMDL dams-in" scenario (T4BSRN), which approximates the condition where the Lower Klamath Project dams remain in place, as well as the TOD2RN (Oregon reaches) and TCD2RN (California reaches) scenarios (together the "TMDL dams-out" scenario) that assume the removal of the Lower Klamath Project (see Appendix D for more detail). The Klamath River TMDL model assumes full TMDL implementation for both the dams-in and dams-out scenarios (Tetra Tech 2009); however, the mechanisms for implementation and the timing required to achieve future TMDL compliance are currently speculative. Despite this assumption, the Klamath River TMDL model results are still informative with respect to the analysis of potential nutrient impacts under the Proposed Project, particularly since nutrient models were not developed for the FERC relicensing process. To place the Proposed Project analysis in context, results of the "TMDL dams-out" Oregon scenario (TOD2RN) and "TMDL dams-out" California scenario (TCD2RN) are generally interpreted with respect to starting assumptions (i.e., model boundary conditions) about nutrient concentrations. The Klamath River TMDL provides modeling results for all mainstem Klamath River reaches associated with the water quality nutrient analysis for this EIR (see Appendix D, Table D-1).

Long-term trends for nutrients under the Proposed Project are also assessed in this EIR using a prior study of potential nutrient dynamics under a "dams-out" scenario (Asarian et al. 2010). The prior study used nutrient measurements and hydrologic data for the Klamath River, to develop nutrient budgets for June

through October of 2005 to 2008 for the free-flowing reaches of the Klamath River. The prior study included longitudinal trends in absolute and relative retention of TP and TN, and it also compared nutrient retention rates between free-flowing river reaches and reservoir reaches and developed a range of estimates for the degree to which seasonal TP and TN concentrations downstream from Iron Gate Dam might be altered by dam removal. The 2005 to 2008 study used hydrologic and nutrient data collected by a variety of tribal, federal, and state agencies, and PacifiCorp. The nutrient budget estimates for 2005 to 2008 improve upon estimates made for the earlier period 1998 to 2002 (Asarian and Kann 2006a) by using flow- and season-based multiple regression models for predicting daily nutrient concentrations and loads and quantification of uncertainty, relatively lower laboratory reporting limits, higher sampling frequency, and nutrient speciation (not just TN and TP). As compared to the 1998 to 2002 period, the nutrient budget estimates for 2005 to 2008 also used improved accounting for peaking flows in the J.C. Boyle Bypass Reach. The effects of dam removal were quantified using calculated relative retention rates in river reaches and comparing them to results from a retention study of Copco No. 1 and Iron Gate reservoirs by Asarian et al. (2009).

3.2.4.4 Dissolved Oxygen

Both short-term and long-term effects on dissolved oxygen levels due to the Proposed Project are analyzed in this EIR. For short-term effects, results of numerical modeling conducted as part of the Klamath Dam Removal Secretarial Determination studies are used to describe predicted short-term dissolved oxygen levels in the Hydroelectric Reach and downstream from Iron Gate Dam due to oxygen demand from mobilized reservoir sediments during dam removal. The one-dimensional, steady-state spreadsheet model uses an approach similar in concept to the Streeter and Phelps (1925) dissolved oxygen-sag equation to incorporate the oxygen-demand offsets of tributary dilution and re-aeration in evaluating the different short-term oxygen demand parameters (e.g., BOD, immediate oxygen demand [IOD], and SOD). The BOD/IOD spreadsheet model also includes chemical oxygen demand generated from the conversion of ammonium and other nitrogenous compounds in reservoir sediments to nitrate under oxic conditions (i.e., when dissolved oxygen levels are 0 mg/L or greater). This is termed nitrogenous oxygen demand and is inherently included in the oxygen demand rate constants used in the BOD/IOD spreadsheet model (Stillwater Sciences 2011).

BOD and IOD are predicted in the spreadsheet model using empirically derived oxygen depletion rates for a particular SSC based on laboratory incubations conducted under the Klamath Dam Removal Secretarial Determination oxygen demand study (Stillwater Sciences 2011). Oxygen depletion rates are scaled to the level of suspended sediments expected under each of the three water year types (typical dry, median, and typical wet water years) considered for the USBR hydrology and sediment transport modeling assessment (see Section 3.2.4.2 *Suspended Sediments*).

The BOD/IOD spreadsheet model assumes drawdown for Copco No. 1 Reservoir begins on November 1 and drawdown for J.C. Boyle and Iron Gate reservoirs begins on January 1, consistent with the Proposed Project (USBR 2012). This would allow maximum SSCs to occur during winter months when flows are naturally high in the mainstem river (Stillwater Sciences 2008; USBR 2012). While Copco No. 1 and Iron Gate reservoirs exhibit varying degrees of thermal stratification and hypolimnetic anoxia during summer months (see Section 3.2.2.2 *Water Temperature*), all of the reservoirs tend to experience fully mixed conditions by November/December and remain mixed through April/May. Thus, drawdown beginning in November or January is expected to involve a well-oxygenated water column and inflowing water and, potentially, an oxic sediment top layer. This is important because the spreadsheet model is highly sensitive to background concentrations of dissolved oxygen (Stillwater Sciences 2011), which are generally highest in the Lower Klamath Project reservoirs during winter months (see Section 3.2.2.2 *Water Temperature* and Appendix C). The BOD/IOD spreadsheet model results encompass a six-month period following drawdown in order to estimate potential dissolved oxygen minimum concentrations corresponding to the period of greatest sediment transport in the river under the Proposed Project.

For long-term effects, existing information on water quality dynamics and physical, chemical, and biological drivers for dissolved oxygen concentrations in the Klamath River are used to inform the impacts analysis. Additionally, the analysis of the Proposed Project's potential short-term and long-term impacts on dissolved oxygen is informed by two quantitative models: the Klamath River Water Quality Model (KRWQM) and the Klamath River TMDL model. Both of these models include a scenario that is similar to existing conditions (i.e., with the Lower Klamath Project dams in place) and scenarios with one or more dams removed that are similar to the Proposed Project and/or alternatives analyzed in Section 4 *Alternatives*. The KRWQM was developed for FERC relicensing of the Klamath Hydroelectric Project (PacifiCorp 2004a, 2005a), and the KRWQM version that was used to model water quality conditions in 2004 and 2005 (i.e., 2004/2005 KRWQM) was later used to inform development of the Klamath River TMDL model. More recent 2019 KRWQM documentation (PacifiCorp 2019) indicates that PacifiCorp has developed an updated version of the KRWQM model, where the updates were primarily focused on Keno Reservoir. However, PacifiCorp (2019) does not present comparisons of dam removal scenarios, so the previous 2004/2005 KRWQM results cannot be replaced with the newer 2019 KRWQM results in the EIR analyses. The Klamath River TMDL model was developed to inform the Oregon and California Klamath River TMDLs. The Klamath River TMDL model includes a "TMDL dams-in" scenario (T4BSRN), which approximates the condition where the Lower Klamath Project dams remain in place, as well as the TOD2RN (Oregon reaches) and TCD2RN (California reaches) scenarios (together the "TMDL dams-out" scenario) that assume the removal of the Lower Klamath Project (see Appendix D for more detail). The

Klamath River TMDL model assumes full TMDL implementation for both the dams-in and dams-out scenarios (Tetra Tech 2009); however, the mechanisms for implementation and the timing required to achieve future TMDL compliance are currently speculative. Despite this assumption, the Klamath River TMDL model results are still a useful source of information with respect to the analysis of potential long-term dissolved oxygen impacts under the Proposed Project, particularly in light of the TMDL model's inclusion of a "natural condition".

Additional details regarding available numeric models for analysis of long-term dissolved oxygen are presented in Appendix D. Table D-1 shows the reaches where 2004/2005 KRWQM and Klamath River TMDL model results are used for the water quality analysis under the Proposed Project and each alternative and Table D-2 presents a comparison of assumptions and parameters for the available numeric models, including flow assumptions. Since no single existing model captures all of the elements analyzed for dissolved oxygen in this EIR, model outputs are used in combination to assess similar spatial and temporal trends in predicted dissolved oxygen where possible.

3.2.4.5 pH

Short-term effects of the Proposed Project on pH are assessed based on the current understanding of seasonal effects of the Lower Klamath Project reservoirs on pH within the Hydroelectric Reach and the Middle and Lower Klamath River downstream from Iron Gate Dam.

For long-term effects, existing data characterizing pH in the Hydroelectric Reach and the Middle and Lower Klamath River are used to inform the impacts analysis. Additionally, the analysis uses Klamath River TMDL model runs to evaluate the general long-term trends (both spatial and temporal) for pH in the Hydroelectric Reach and the Middle and Lower Klamath River. The Klamath River TMDL model includes a "TMDL dams-in" scenario (T4BSRN), which approximates the condition where the Lower Klamath Project dams remain in place, as well as the TOD2RN (Oregon reaches) and TCD2RN (California reaches) scenarios (together the "TMDL dams-out" scenario) that assume the removal of the Lower Klamath Project (see Appendix D for more detail). The Klamath River TMDL model assumes full TMDL implementation for both the dams-in and dams-out scenarios (Tetra Tech 2009); however, the mechanisms for implementation and the timing required to achieve future TMDL compliance are currently speculative. Despite this assumption, the Klamath River TMDL model results are still informative with respect to the analysis of potential pH impacts under the Proposed Project, particularly since pH models were not developed for the FERC relicensing process. To place the Proposed Project analysis in context, results of the "TMDL dams-in" Oregon scenario (TOD2RN) and "TMDL dams-in" California scenario (TCD2RN) are generally interpreted with respect to starting assumptions (i.e., model boundary conditions) about pH. The Klamath River TMDL provides modeling results for all mainstem reaches associated with the water quality pH analysis for this EIR (see Appendix D, Table D-1).

3.2.4.6 Chlorophyll-a and Algal Toxins

Potential impacts of the Proposed Project on the algal community (phytoplankton, aquatic macrophytes, and periphyton) in the Klamath River are discussed in Section 3.4 *Phytoplankton and Periphyton*. Chlorophyll-*a* water column concentrations are analyzed as a separate water quality parameter in the Lower Klamath Project EIR because chlorophyll-*a* is a surrogate measure of suspended algal biomass and phytoplankton chlorophyll-*a* is a target specific to the Lower Klamath Project reservoirs in the California Klamath River TMDLs (North Coast Regional Board 2010). The Hoopa Valley Tribe water quality objective for chlorophyll-*a* is a measure of attached (benthic) algal growth rather than phytoplankton (i.e., suspended algae) growth, so it is not discussed further in this EIR.

Sufficiently accurate quantitative predictive tools for chlorophyll-*a* are not available for the Lower Klamath Project EIR impact analysis. While the California Klamath River TMDLs model includes a chlorophyll-*a* component covering both periphyton and phytoplankton, comparison of the modeled and measured chlorophyll-*a* indicates that the model tends to over-predict chlorophyll-*a* under existing conditions, suggesting the model would over-predict chlorophyll-*a* under the “dams-out” scenario (Tetra Tech 2009). Thus, the Klamath River TMDL model is not used for the Lower Klamath Project EIR analysis. The phytoplankton chlorophyll-*a* target (10 ug/L) developed for the Lower Klamath Project reservoirs in the California Klamath River TMDLs is based on a Nutrient Numeric Endpoints (NNE) analysis. The phytoplankton chlorophyll-*a* target of 10 ug/L (i.e., reduction to) is a conservative estimate of mean summer chlorophyll-*a* concentrations due to phytoplankton required to move the system toward support of beneficial uses (Creager et al. 2006; Tetra Tech 2008).

Instead, this EIR’s chlorophyll-*a* impact analysis is based on a qualitative assessment of whether the Proposed Project would result in exceedances of the California 10 ug/L target for the Lower Klamath Project reservoirs and adversely affect beneficial uses with respect to water column concentrations of chlorophyll-*a*. Growth conditions for suspended algae (e.g., nutrient availability, impounded water) are considered as part of the qualitative analysis, where predicted changes in nutrient availability, water temperatures, and the availability of lake or reservoir conditions would correspondingly affect chlorophyll-*a* concentrations.

Since algal toxins are a water quality concern and have the potential to affect designated beneficial uses of water, an analysis of the potential impacts of the Proposed Project on algal toxins as related to water quality standards and beneficial uses is also included in the water quality impacts analysis. There are no quantitative models predicting algal toxin trends under a dam removal scenario, thus the impact analysis is based upon trends in the density of toxin-producing blue-green algae, including *Microcystis aeruginosa,* to algal toxin concentrations (see Section 3.2.2.7 *Chlorophyll-a and Algal Toxins* and Appendix

C) discerned from data collected in the Hydroelectric Reach and the Middle and Lower Klamath River. This information is considered along with the potential for changes in habitat availability for *Microcystis aeruginosa* (or other toxin-producing blue-green algae) under the Proposed Project.

3.2.4.7 Inorganic and Organic Contaminants

The determination of potential toxicity and bioaccumulation with respect to aquatic species and humans under the Proposed Project is based on the evaluation of existing data characterizing inorganic and organic contaminants associated with both reservoir water quality and sediment deposits, with comparison to thresholds for human and aquatic species exposure.

In particular, the Klamath Dam Removal Secretarial Determination sediment evaluation process followed screening protocols of the Sediment Evaluation Framework (SEF), issued by the interagency Regional Sediment Evaluation Team (RSET) in 2009 and updated in 2018 (see Appendix C – *Section C.7*). The RSET is comprised of the USACE (Northwestern Division and Portland, Seattle, and Walla Walla Districts), the USEPA (Region 10), NOAA Fisheries (West Coast Region), USFWS (Pacific Region), ODEQ, Idaho Department of Environmental Quality, Washington Department of Ecology, and Washington Department of Natural Resources. The RSET developed the SEF to provide an approach for evaluating the suitability of sediments for placement in aquatic environments. The SEF involves a data screening assessment to compare reservoir sediment data to available and appropriate sediment maximum levels, screening levels, and bioaccumulation triggers established by the RSET. It also provides guidance for conducting elutriate chemistry (the chemistry of the water when sediments are put into suspension with the water), toxicity bioassays, and bioaccumulation tests, and special evaluations such as tissue analysis and risk assessments (the latter not utilized for this evaluation). The results of the SEF-based evaluation for the 2009 to 2010 Klamath River sediment samples are used to inform the water quality impacts analysis related to inorganic and organic contaminants under the Proposed Project.

In the Klamath Dam Removal Secretarial Determination process, sediment data were compared to established sediment screening values in a step-wise manner to systematically consider potential impact pathways. Elutriate[29] sample data were also evaluated through comparison with a suite of regional, state and

[29] Elutriate sediment samples were created from reservoir composite sediment samples mixed with reservoir water (e.g., one part sediment to four parts water). In general, elutriate tests are a standard approach that analyzes the chemical composition of the overlying water of the elutriate sediment sample in order to estimate potential chemical concentrations that may be released into the water from reservoir sediments during suspension. Standard elutriate tests do not reflect the full dilution of re-suspended sediments that would occur during dam removal.

federal standards for water quality (CDM 2011). In this EIR, elutriate test results are considered in light of the dilution that would occur under actual conditions during reservoir drawdown.

Biological testing was also conducted during the Klamath Dam Removal Secretarial Determination process using the SEF approach, and the testing consisted of sediment and elutriate toxicity testing and tissue analyses, or other evaluations designed to provide more empirical evidence regarding the potential for sediment contaminant loads to have adverse impacts on receptors (RSET 2009, 2018). While whole sediment toxicity tests identify potential contamination that may affect bottom-dwelling (benthic) organisms, toxicity tests using suspension/elutriates of dredged material assess potential water column toxicity. Bioaccumulation evaluation is undertaken when bioaccumulative chemicals of concern exceed or may exceed sediment screening levels, and thus further evaluation is needed to determine whether they pose a potential risk to human health or ecological health in the aquatic environment (RSET 2009, 2018).

Results from sediment and elutriate sample toxicity bioassays and sediment bioaccumulation tests carried out for the Klamath Dam Removal Secretarial Determination studies are used to provide additional information beyond simple comparisons of sediment contaminant levels to individual-contaminant regional or national screening levels. The results of sediment and elutriate sample toxicity bioassays provide a direct assessment of potential toxicity that takes into account possible interactive effects of mixtures of multiple contaminants, and of potential contaminants that may be present but were not individually measured.

3.2.5 Potential Impacts and Mitigation

Unless otherwise noted, the potential impacts for each water quality parameter are presented in terms of the physical or chemical process that would potentially cause a change in the existing condition. This potential change is then described and analyzed against the applicable significance criteria in Section 3.2.3 *Significance Criteria*, including application of applicable thresholds described in Section 3.2.3.1 *Thresholds of Significance*.

3.2.5.1 Water Temperature

Potential Impact 3.2-1 Short-term and long-term alterations in water temperatures due to conversion of the reservoir areas to a free-flowing river.

Reservoirs and free-flowing rivers have different effects on water temperatures, and these can vary on a seasonal and annual basis with the size (surface area, depth) and shape of the waterbody (see discussion of general effects on water quality from hydroelectric project reservoirs in Section 3.2.2.1 *Overview of Water Quality Processes in the Klamath Basin*). This potential impact evaluates the changes in the water temperature regime that are expected under the Proposed Project against the significance criteria for temperature.

Hydroelectric Reach

KRWQM water temperature results within the Hydroelectric Reach from J.C. Boyle Reservoir to the Oregon-California state line are not available to characterize conditions similar to the Proposed Project (i.e., removal of J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate dams). KRWQM results presented in PacifiCorp (2004a) estimate water temperature assuming removal of Keno Dam in addition to removal of J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate dams. KRWQM water temperature results were not available for the Hydroelectric Reach in PacifiCorp (2005a). KRWQM results presented in PacifiCorp (2008a, 2014a) do not compare daily water temperature under existing conditions with daily water temperature with removal of J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate dams (i.e., the Proposed Project). Klamath River TMDL model (see Appendix D) results indicate that if the Lower Klamath Project dams were to be removed ("TMDL dams-out, Oregon" [TOD2RN] scenario), water temperatures in the J.C. Boyle Peaking Reach at the Oregon-California state line (RM 214.1) would exhibit slightly lower daily maximum values (0.0 to 3.6°F) as compared to those predicted under the scenario where the dams remain in place ("TMDL dams-in" [T4BSRN] scenario) (Figure 3.2-7). Temperatures at these locations would also exhibit lower diel (i.e., 24-hour period) water temperature variation during June through September (Figure 3.2-7), and a general trend moving toward a more natural thermal regime (North Coast Regional Board 2010, data from electronic appendices of Asarian and Kann 2006b). The relative difference in diel water temperature variation between these two scenarios would be due to the elimination of peaking operations at J.C. Boyle Powerhouse and the associated large artificial temperature swings that occur in the Klamath River downstream.

Overall, the Klamath River TMDL model results indicate that in the short term and long term, the Proposed Project would decrease maximum summer/fall water temperatures. The Proposed Project would also result in less artificial diel water temperature swings in the J.C. Boyle Peaking Reach from the Oregon-California state line to Copco No. 1 Reservoir, returning the Klamath River to a more natural thermal regime compared with existing conditions. Elimination of both of these artificial temperature increases would better conform with the California Thermal Plan's prohibition on elevated temperature discharges (Table 3.2-4).

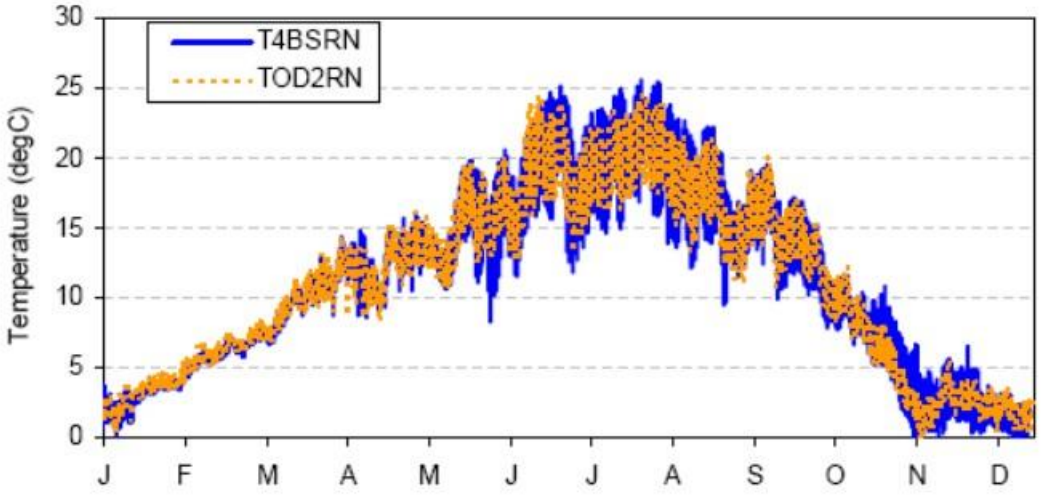

Figure 3.2-7. Predicted Water Temperature at the Oregon-California State Line (RM 214.1) for the Klamath River TMDL Scenarios Similar to the Proposed Project ("TMDL dams-out, Oregon" [TOD2RN] Scenario) and Existing Conditions ("TMDL dams-in" [T4BSRN] Scenario). Source: North Coast Regional Board 2010.

Farther downstream of the J.C. Boyle Peaking Reach (i.e., from Copco No. 1 Reservoir to Iron Gate Dam), the presence of the Lower Klamath Project reservoirs currently decreases spring water temperatures as compared to modeled natural conditions by up to 7°C (13°F) and increases water temperatures as compared to modeled natural conditions by up to roughly 4°C (7°F) (Figure 3.2-3). The Klamath River TMDL model indicates that removal of the Lower Klamath Project under the Proposed Project would eliminate the seasonal temperature shift caused by the Lower Klamath Project reservoirs, returning the Klamath River to a more natural thermal regime. More specifically, the Klamath River TMDL model indicates that just downstream from Copco No. 1 and Copco No. 2 reservoirs (approximately RM 201), removal of the Lower Klamath Project dams would increase daily maximum temperatures to a more natural regime for a period in spring (May and June) and decrease daily maximum temperatures to a more natural regime in late summer/fall (August through October).

Note that the Klamath River TMDL model scenarios are useful for informing impacts associated with the Proposed Project and alternatives identified in Section 4 *Alternatives*, but they include as a starting assumption that there will be full implementation of the TMDLs. For example, the "TMDL dams-in" (T4BSRN) and "TMDL dams-out" (TOD2RN) scenarios for California both assume that water entering into California from Oregon meets California water quality standards for water temperature, organic enrichment/low dissolved oxygen, nutrients, pH, and microcystin. In other words, the starting point for the California models is that all necessary reductions in pollution to address the current

impaired conditions at the Oregon-California state line for these constituents would already have been implemented upstream. The full TMDL compliance modeling assumption does not reflect the existing condition, and it would be speculative at this point to identify either the mechanisms necessary to implement the TMDLs or the timing required to achieve full compliance. However, besides the Lower Klamath Project facilities themselves, the temperature point sources (e.g., industrial discharges, sewage treatment plant discharges) located along the Klamath River between Lake Ewauna (approximately RM 257) to upstream of the Shasta River confluence (RM 179.5) have a negligible impact on water temperatures represented in the TMDL model (North Coast Regional Board 2010). Thus, removal of J.C. Boyle Reservoir and its associated hydropower peaking operations, as well as Copco No. 1, Copco No. 2, and Iron Gate reservoirs, dominates the model response. The Klamath River TMDL model illustrates that dam removal would rapidly and substantially move the Hydroelectric Reach towards achieving California TMDL compliance for water temperature.

Water temperature modeling conducted for the Klamath Dam Removal Secretarial Determination Studies (RBM10) provides generally similar results as the Klamath River TMDL model but includes consideration of future climate change and a KBRA flow regime (see Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project* for an assessment of the KBRA Flows and 2013 BiOp Flows or KBRA Flows and 2019 BiOp Flows). Expected increases in summer and fall water temperatures in the Klamath Basin associated with climate change considerations are on the order of 1.8 to 5.4°F between 2012 and 2061 (Bartholow 2005; Perry et al. 2011). RBM10 model results show a projected shift in the annual temperature cycle that would slightly increase river temperatures in the spring and decrease river temperatures in the late summer/fall in the Hydroelectric Reach under the Proposed Project (Perry et al. 2011; USBR 2016), consistent with the general trend demonstrated by the Klamath River TMDL model results. Further discussion of RBM10 results is presented below for the Middle and Lower Klamath River.

Overall, dam removal under the Proposed Project would cause water temperatures in the Hydroelectric Reach[30] to align with historical anadromous migration and spawning periods for the Klamath River, warming earlier in the spring, and cooling earlier in the fall compared to existing conditions (see also Section 3.3.5.4 *Aquatic Resources – Water Temperature*). The return to a more natural thermal regime compared with existing conditions would align better with the California Thermal Plan's prohibition on increased temperature discharges above natural temperatures and would be beneficial.

[30] Under existing conditions, anadromous fish do not migrate into or spawn in the Hydroelectric Reach due to the fish passage barriers caused by the Lower Klamath Project dams. Under the Proposed Project, these barriers would be removed.

Because drawdown of the reservoirs would begin in winter and would be largely complete by spring prior to thermal stratification in the reservoirs, water temperature alterations caused by the Proposed Project in the Hydroelectric Reach as a whole would be beneficial in the short term. As noted above, dam removal would rapidly and substantially move the Hydroelectric Reach towards achieving California TMDL compliance.

In the long term, the Proposed Project would help to decrease temperatures in the late summer/fall in the Hydroelectric Reach as a whole when climate change is expected to increase summer and fall water temperatures in the Klamath Basin on the order of 1.8 to 5.4°F between 2012 and 2061 (Bartholow 2005; Perry et al. 2011).

In summary, under the Proposed Project, the anticipated increases in springtime water temperatures in the Hydroelectric Reach as a whole and decreases in diel temperature variation in the J.C. Boyle Peaking Reach from the Oregon-California state line to Copco No. 1 Reservoir, would return the Klamath River to a more natural thermal regime compared with existing conditions. The projected decreases in late summer/fall water temperatures in the Hydroelectric Reach as a whole also would return the Hydroelectric Reach to a more natural thermal regime compared with existing conditions and would align better with the California Thermal Plan's prohibition on increased temperature discharges above natural temperatures. These effects would be beneficial in the short term and would rapidly move the Hydroelectric Reach towards achieving California TMDL compliance. In the long term, the beneficial effects would also help to offset the impacts of climate change on late summer/fall water temperatures.

Middle and Lower Klamath River, Klamath River Estuary, and Pacific Ocean Nearshore Environment

Water temperature modeling results are available for the Middle and Lower Klamath River downstream of Iron Gate Dam from three separate modeling efforts: the PacifiCorp relicensing efforts (2004/2005 KRWQM); development of the California Klamath River TMDLs; and water temperature modeling conducted for the Klamath Dam Removal Secretarial Determination studies (RBM10). For more information on these models, please see Section 3.2.4.1 *Water Temperature* (overview) and Appendix D (detailed). The 2004/2005 KRWQM results comparing existing conditions (all Lower Klamath Project dams in place) to four without-project scenarios[31] for 2001 to 2004 indicate that the reservoirs create a temporal shift by releasing generally cooler water from mid-January to April, variably cooler or warmer water from April through early August, and

[31] The four without-project scenarios are: 1) without Lower Klamath Project dams and Keno Dam; 2) without Iron Gate Dam; 3) without Copco No. 1, Copco No. 2, and Iron Gate dams; and 4) without J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate dams (most similar to the Proposed Project).

warmer water from August through November (PacifiCorp 2004a; Dunsmoor and Huntington 2006). Just downstream from Iron Gate Dam, this translates to an approximately 2 to 5°F cooling during spring and an approximately 4 to 18°F warming during summer and fall (Figure 3.2-8). Immediately upstream of the confluence with the Scott River (RM 145.1), the difference between existing conditions and the dam removal scenario modeled using the 2004/2005 KRWQM indicates a lesser, albeit still measurable, warming of approximately 4 to 9°F for most of October and November (Figure). Because patterns in reservoir thermal structure for Iron Gate and Copco No. 1 reservoirs indicate that stratification generally starts in April and ends in November, the effect of reservoir thermal regime on downstream water temperatures appears to be cooling during non-stratified periods and warming during stratified periods.

The 2004/2005 KRWQM results also indicate that reservoir thermal regimes under existing conditions act to reduce the magnitude of diel temperature variation compared with natural conditions in the river reaches immediately downstream from Iron Gate Reservoir (RM 193.1; see Figure) (Deas and Orlob 1999; PacifiCorp 2005a). As with the seasonal temperature effect, the dampening influence on diel temperature variation is considerably diminished farther downstream, at the confluence with the Scott River (RM 145.1; see Figure 3.2-9). The 2004/2005 KRWQM indicates that the overall water temperature influence of the Hydroelectric Reach is mostly attenuated by RM 66.3 at the confluence with the Salmon River (see Figure 3.2-10).

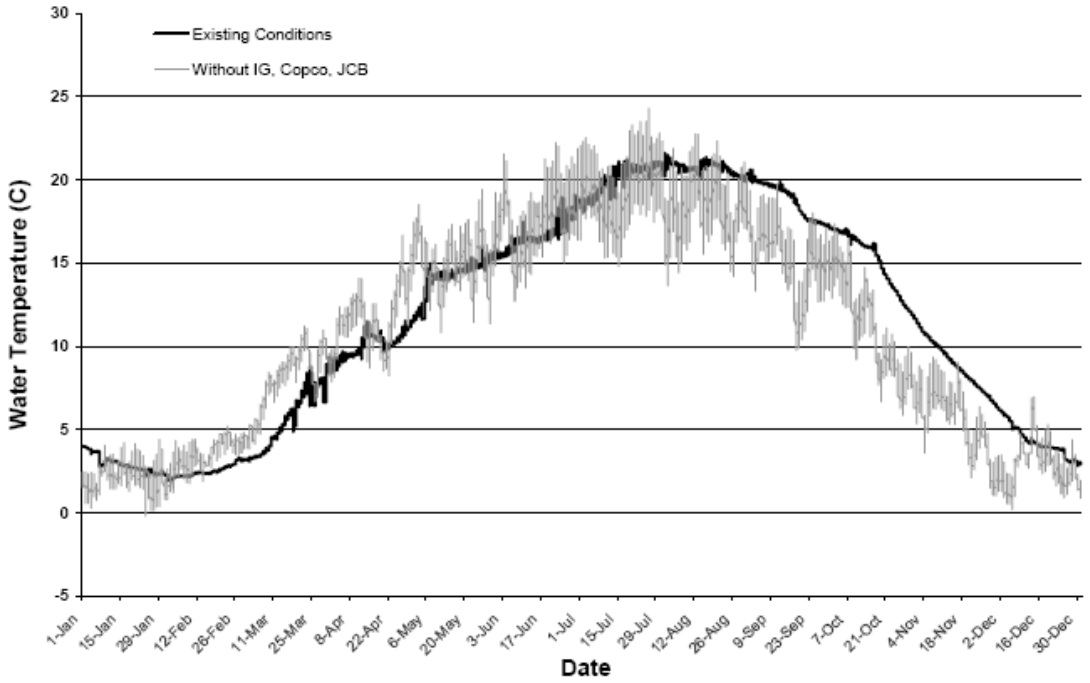

Figure 3.2-8. Simulated Hourly Water Temperature Downstream from Iron Gate Dam Based on Year 2004 for Existing Conditions Compared to Hypothetical Conditions without J.C. Boyle (JCB), Copco No. 1, Copco No. 2, and Iron Gate (IG) Dams. Source: PacifiCorp 2005a.

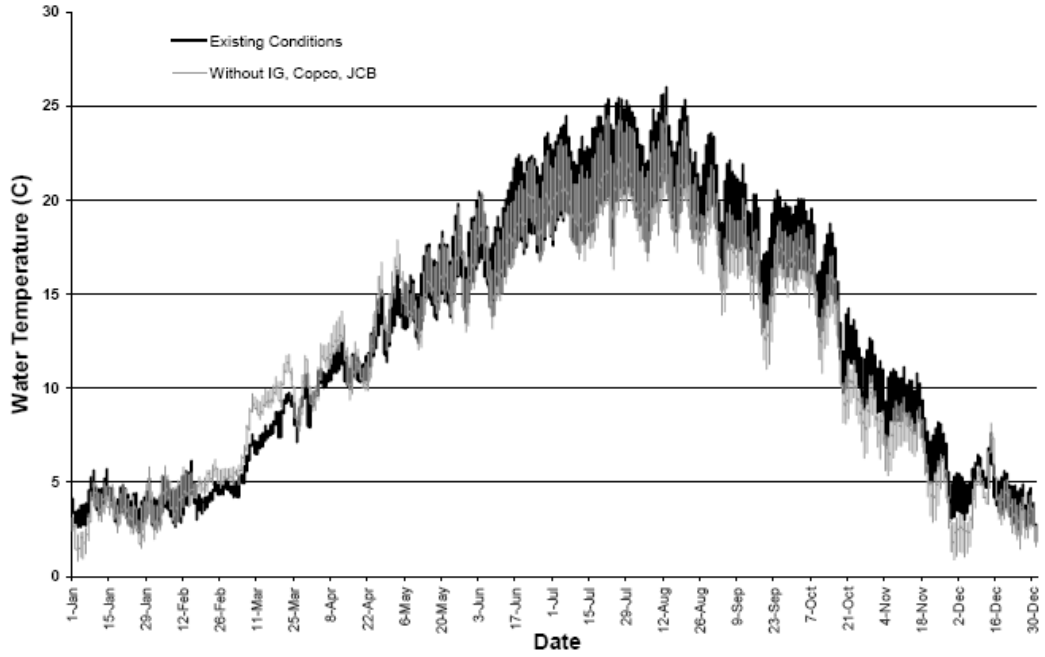

Figure 3.2-9. Simulated Hourly Water Temperature Immediately Upstream of the Scott River Confluence (RM 145.1) Based on Year 2004 for Existing Conditions Compared to Hypothetical Conditions without J.C. Boyle (JCB), Copco No. 1, Copco No. 2, and Iron Gate (IG) Dams. Source: PacifiCorp 2005a.

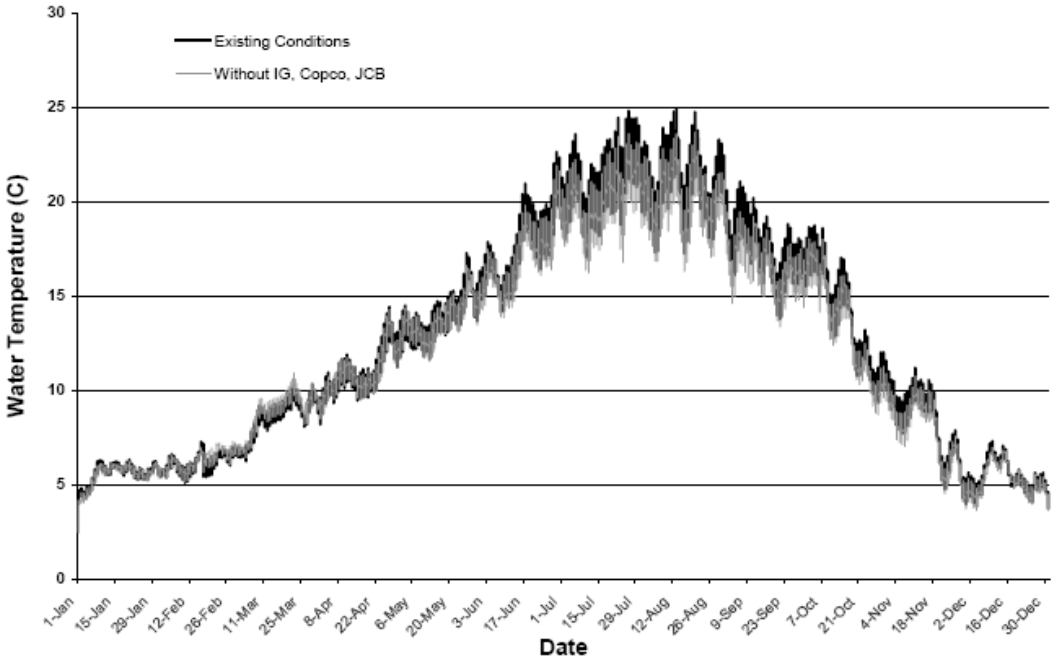

Figure 3.2-10. Simulated Hourly Water Temperature Upstream from the Salmon River Confluence (≈RM 66.3) Based on Year 2004 for Existing Conditions Compared to Hypothetical Conditions without J.C. Boyle (JCB), Copco No. 1, Copco No. 2, and Iron Gate (IG) Dams. Source: PacifiCorp 2005a.

In agreement with 2004/2005 KRWQM results, Klamath River TMDL model results also indicate that if the Lower Klamath Project dams were to be removed ("TMDL dams-out, California" [TCD2RN] scenario), then water temperature in the Klamath River downstream from Iron Gate Dam would be lower (by 4 to 18°F) during August through November and higher (by 4 to 9°F) during January through March (dams remaining in place would be the "TMDL dams-in" [T4BSRN] scenario) (North Coast Regional Board 2010). The Klamath River TMDL model also predicts that diel variation in water temperature downstream from Iron Gate Dam during these same periods would be greater for a dam removal scenario ("TMDL dams-out, California" [TCD2RN]) than a dams in-place scenario ("TMDL dams-in" [T4BSRN]) because river water temperatures would be in equilibrium with, and would reflect, diel variation in ambient air temperatures rather than being dominated by the large thermal mass of, and stratification patterns in, the reservoirs. Note that the Klamath River TMDL model for both "dams-in" and "dams-out" scenarios assumes full implementation of the TMDLs, a condition that is currently highly speculative with respect to the mechanisms and timing required to achieve future compliance. However, besides the Lower Klamath Project facilities themselves, because the temperature point sources (e.g., industrial discharges, sewage treatment plant discharges) located along the Klamath River between Lake Ewauna (approximately RM 257) to upstream of the Shasta River confluence (RM 179.5)

have a negligible impact on water temperatures represented in the Klamath River TMDL model (North Coast Regional Board 2010), removal of the Lower Klamath Project reservoirs dominates model response for the referenced point downstream of Iron Gate Dam. Further, although the Klamath River TMDL model assumes full implementation of the Scott River TMDL (North Coast Regional Board 2005) and the Shasta River TMDL (North Coast Regional Board 2006) for the "dams-out" scenario, it also assumes full implementation of these major tributary TMDLs for the "dams-in" scenario, such that in the reach downstream of Iron Gate Dam, the only difference between the two model scenarios is the removal of the Lower Klamath Project. Thus, even under the assumption of full TMDL compliance, the model illustrates that dam removal would rapidly and substantially move the Klamath River downstream of Iron Gate Dam towards achieving TMDL compliance.

As with 2004/2005 KRWQM, the Klamath River TMDL model indicates that the temperature effects of removing the Lower Klamath Project would decrease in magnitude with distance downstream from Iron Gate Dam, and they would not be evident in the reach downstream from the Salmon River confluence (approximately RM 66.3) (North Coast Regional Board 2010; Dunsmoor and Huntington 2006). Therefore, under a dam removal scenario that also assumes full TMDL implementation ("TMDL dams-out, California" [TCD2RN] scenario), water temperatures would not be directly affected in the Middle Klamath River downstream from the confluence with the Salmon River and would not affect temperatures farther downstream in the Lower Klamath River, the Klamath River Estuary, or the Pacific Ocean nearshore environment.

As part of the Klamath Dam Removal Secretarial Determination studies, the effects of climate change and of KBRA Flows (which, as discussed in Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project* sufficiently bracket the range of flows under the existing condition*)* were included in projections for future water temperatures under the Proposed Project using the RBM10 model. RBM10 model results using climate change predictions from five GCMs indicate that future water temperatures under the Proposed Project and climate change would be 1.8 to 4.1°F warmer than historical temperatures (Perry et al. 2011). This temperature range is slightly lower than that suggested by projecting Bartholow (2005) historical (1962 to 2001) estimates of 0.09°F per year, or approximately 4 to 5°F over 50 years. However, within the general uncertainty of climate change projections, results from the two models correspond reasonably well and indicate that water temperatures in the Upper Klamath Basin are expected to increase on the order of 2 to 5°F between 2012 and 2061.

RBM10 results also indicate that, even with warming of water temperatures under climate change, the primary long-term effect of dam removal downstream of Iron Gate Dam is still anticipated to be the return of approximately 126 miles of the Middle Klamath River, from Iron Gate Dam (RM 193.1) to the Salmon River

(RM 66), to a more natural thermal regime (Perry et al. 2011). Model results indicate that the annual temperature cycle downstream from Iron Gate Dam would shift forward in time by approximately 18 days under the Proposed Project, with warmer temperatures in spring and early summer and cooler temperatures in late summer and fall immediately downstream from the dam. Just downstream from Iron Gate Dam, water temperatures under the Proposed Project, including the anticipated effect of climate change, would average approximately 4°F greater in May, while during October water temperatures would average approximately 7°F cooler. At the confluence with the Scott River, the differences would be diminished, but there would still be a slight warming in the spring (May) with average water temperatures approximately 2°F greater and a slight cooling in the fall (October) with average water temperatures approximately 4°F less. Water temperature changes from the Proposed Project would be less than 1°F at the confluence with the Salmon River (RM 66) in agreement with the Klamath River TMDL model results (Perry et al. 2011). Thus, despite the anticipated warming under climate change, long-term water temperature improvements under the Proposed Project would support continued achievement of the California temperature TMDLs for the mainstem Klamath River.

All of the existing water temperature model projections (2004/2005 KRWQM, TMDL, RBM10) indicate that dam removal under the Proposed Project would cause water temperatures in the Middle Klamath River to align better with historical anadromous migration and spawning periods for the Klamath River, warming earlier in the spring, and cooling earlier in the fall compared to existing conditions. Warmer springtime temperatures would result in fry emerging earlier, encountering favorable temperatures for growth sooner than under existing conditions, which could support higher growth rates and encourage earlier outmigration downstream, similar to what likely occurred under historical conditions, and reduce stress and disease (Bartholow et al. 2005; FERC 2007). In addition, fall-run Chinook salmon spawning in the mainstem Klamath River during fall would no longer be delayed (reducing pre-spawn mortality), and adult migration would occur in more favorable water temperatures than under existing conditions. Overall, these changes would result in water temperatures more favorable for salmonids in the mainstem Klamath River downstream from Iron Gate Dam (see also Section 3.3.5.4 *Aquatic Resources – Water Temperature*). While the return to a more natural thermal regime under the Proposed Project would potentially result in Klamath River water temperatures warming during portions of the year (e.g., 2 to 4°F in May) due to the combined effects of climate change and the Proposed Project, a Chinook Salmon Expert Panel concluded that the Lower Klamath dam removal offers greater potential than the existing conditions for Chinook salmon to tolerate climate change and changes in marine survival (Goodman et al. 2011). Similarly, the Coho Salmon and Steelhead Expert Panel concluded that dam removal would provide greater mitigation to climate change for coho salmon and steelhead than existing conditions (Dunne et al. 2011). The return to a more natural thermal regime compared with existing conditions would align better with the California Thermal Plan's prohibition on

increased temperature discharges above natural temperatures and would be beneficial.

As drawdown of the Lower Klamath Project reservoirs would begin in winter and would be largely complete by spring prior to thermal stratification in the reservoirs, the water temperature alterations resulting from dam removal under the Proposed Project in the Klamath River downstream from Iron Gate Dam would occur, either partially or fully, within the first one to two years following dam removal and would be considered short-term benefits. As noted above, removal of the Lower Klamath Project Reservoirs would rapidly and substantially move the Klamath River downstream of Iron Gate Dam towards achieving TMDL compliance. Additionally, water temperature alterations due to the Proposed Project would continue beyond three years following dam removal so they would also be long-term benefits. The Proposed Project's temperature benefits on late summer/fall water temperatures may be of additional assistance in helping to offset the impacts of climate change on late summer/fall Klamath River water temperatures.

In summary, under the Proposed Project, the short-term and long-term increases in spring water temperatures, increased diel temperature variation, and decreases in late summer/fall water temperatures in the Middle Klamath River for the reach from Iron Gate Dam to the confluence with the Salmon River would be beneficial. There would be no impact for water temperatures in the Middle Klamath River downstream from the Salmon River, Lower Klamath River, Klamath River Estuary, or Pacific Ocean nearshore environment.

The Definite Plan (see Appendix B: *Definite Plan – Appendix M*) includes a Water Quality Monitoring Plan to assess the Proposed Project's impacts to water quality, and this plan includes temperature monitoring. The State Water Board has authority to review and approve any final Water Quality Monitoring Plan through its water quality certification under Clean Water Act Section 401. The State Water Board has issued a draft water quality certification which sets forth monitoring and adaptive management requirements for any Water Quality Monitoring Plan to meet, as Condition 1.[32] Additionally, the Oregon Department of Environmental Quality has issued a final water quality certification[33] that sets forth water quality monitoring and adaptive management conditions for points upstream of California. The effect of the Proposed Project on water temperature

[32] The State Water Board's draft water quality certification is available online at: https://www.waterboards.ca.gov/waterrights/water_issues/programs/water_quality_cert/docs/lower_klamath_ferc14803/lkp_dwqc.pdf (Accessed December 11, 2018).

[33] The Oregon Department of Environmental Quality's final water quality certification is available online at: https://www.oregon.gov/deq/FilterDocs/ferc14803final.pdf (Accessed December 14, 2018).

is anticipated to be beneficial in both the short and long term, and this analysis of Potential Impact 3.2-1 does not further discuss the water quality monitoring and adaptive management conditions.

Significance

Beneficial for the Hydroelectric Reach and the Middle Klamath River to the confluence with the Salmon River, in the short term and in the long term

No significant impact for the Middle Klamath River downstream from the Salmon River, Lower Klamath River, Klamath River Estuary, and Pacific Ocean nearshore environment in the short term or the long term

Potential Impact 3.2-2 Short-term and long-term alterations in seasonal water temperatures in the Klamath River Estuary due to morphological changes induced by dam removal sediment release and subsequent deposition in the estuary.

Increased sediment deposition in the Klamath River Estuary due to sediment releases from dam removal may change the shape of the estuary in a way that could impact water temperatures. Such morphological changes could be from, for example, shifted bed elevations or changes to the contours of the bottom of the estuary. The amount of sediment deposition in the estuary as a result of dam removal is anticipated to be small, as sediment release would coincide with and be driven by high flows associated with dam removal; therefore, sediment deposition in the estuary associated with dam removal is not expected to be widespread, but it would occur in backwaters or vegetated areas, if at all (Stillwater Sciences 2008; USBR 2012) (see also Potential Impact 3.11-5). Morphological changes that decrease the depth of Klamath River Estuary waters or the volume of the estuary waters could result in more solar radiation being absorbed by a smaller water volume, which would tend to increase estuary water temperatures. Additionally, morphological changes that reduce estuary mixing conditions can produce more backwater or slack water areas within the estuary. This could effectively reduce the amount of water absorbing solar radiation in these areas and could result in localized warming of estuary water in those backwater or slack water areas. Sediment deposition also could result in morphological changes that decrease the size of the salt wedge, either by increasing the frequency of mouth closure, or by elevating the bottom of the estuary above portions of the tidal range when the mouth is open. All of these morphological changes due to sediment deposition could potentially result in an increase in Klamath River Estuary water temperatures over the existing condition.

Estuary waters provide optimal habitat for juvenile salmonids that use the estuary to rear prior to returning to the Pacific Ocean. Additionally, the Klamath River Estuary is designated as critical habitat for Southern Oregon/Northern California Coast (SONCC) evolutional significant unit for coho salmon (NMFS 1999) and would benefit for cooler water temperatures. Sediment scouring would increase

the estuary depth, the size of the estuary, the mixing conditions, and/or the size of salt wedge, so the volume of water absorbing solar radiation would increase and estuary water temperatures would not be expected to increase. Therefore, should sediment scouring occur in association with the Proposed Project, it would be unlikely to increase short-term or long-term water temperature conditions in the Klamath River Estuary.

Under existing conditions, high concentrations of silt and clay are transported through the estuary on an annual basis. Sediment sampling by USBR (2010) documented the absence of fine material in the estuary except in the backwater and vegetated areas (see Section 3.11.2.4 *Sediment Load* for more details). Modeling of sediment transport due to reservoir drawdown indicates that only fine sediments (silts, clays, and organics) would be transported to the estuary, and fine sediments would not deposit in significant quantities in the estuary (USBR 2012). If dam removal occurs under dry water years conditions, small volumes of fine sediment may deposit in the backwater and vegetated areas in the estuary due to lower river flows in dry water years (USBR 2012). However, even under this scenario, since limited sediment deposition is expected to occur in the Klamath River Estuary as a result of the Proposed Project (see Potential Impact 3.11-6), small morphological changes in the estuary that may occur due to dam removal sediment releases would not be likely to increase short-term estuary water temperatures in an manner that would cause or substantially exacerbate an exceedance of water quality standards or would result in a failure to maintain existing beneficial uses currently supported.

With respect to the potential for long-term impacts, estimates of baseline sediment delivery for the Klamath Basin indicate that sediment delivery rates would not change substantially under the Proposed Project (Stillwater Sciences 2010) (see also Potential Impact 3.11-5). Accordingly, there would be no long-term morphological changes in the estuary that would affect water temperatures under the Proposed Project.

As discussed above for Potential Impact 3.2-1, the State Water Board has issued a draft water quality certification which sets forth proposed water quality monitoring and adaptive management requirements for the Proposed Project, as Condition 1.[34]

Significance
No significant impact

[34] The State Water Board's draft water quality certification is available online at: https://www.waterboards.ca.gov/waterrights/water_issues/programs/water_quality_cert/docs/lower_klamath_ferc14803/lkp_dwqc.pdf (Accessed December 11, 2018).

3.2.5.2 Suspended Sediments

For the purposes of the Lower Klamath Project EIR, "suspended sediment" refers to settleable suspended material in the water column. Bed materials, such as gravels and larger substrates, are discussed in Geology and Soils Section 3.11.5 *Potential Impacts and Mitigation*. Two types of suspended material are considered for water quality impacts in the Klamath River: algal-derived (organic) suspended material and mineral (inorganic) suspended material. Sources of each type of suspended material differ, as do spatial and temporal trends for each, within the Upper, Middle, and Lower Klamath River reaches (see Section 3.2.2.3 *Suspended Sediments*).

Potential Impact 3.2-3 Increases in suspended sediments due to release of sediments currently trapped behind the dams.

Increases in suspended sediment due to release of reservoir sediments currently trapped behind the Lower Klamath Project dams are discussed by Klamath River reach below. As discussed in Section 3.2.4.2 *Suspended Sediments*, the analysis for this EIR interprets USBR (2012) modeled suspended sediment concentrations (SSCs) during and after reservoir drawdown, based on KRRC's proposed reservoir drawdown rates, where the latter would increase peak SSCs, increase the rate SSCs would decrease, and decrease the overall duration of elevated SSCs relative to the drawdown rates that were previously modeled (USBR 2012). While the USBR (2012) model results would underestimate peak SSCs relative to the KRRC's Proposed Project, the modeled SSCs provide a conservative estimate of the short-term impacts of suspended sediment releases due to dam removal since the underestimate of peak SSCs would still be within model uncertainty (i.e., approximately a factor of two) and model results would overestimate the duration of elevated SSCs.

Additionally, the Proposed Project would support erosion and transport of sediments deposited within the Copco No. 1 and Iron Gate reservoir footprints by using barge-mounted pressure sprayers to jet water onto newly exposed reservoir-deposited sediments as the water level decreases during drawdown, a process called sediment jetting. The barge-mounted pressure sprayers would use water from the reservoir, so sediment jetting would only be conducted when reservoir levels are sufficiently high to safely operate the barge and no sediment jetting would occur once reservoir drawdown is complete. Sediment jetting would maximize the erosion of reservoir-deposited sediments during drawdown within the six areas where restoration actions are proposed within the Copco No. 1 Reservoir footprint (see enumerated areas for wetlands, floodplains, and off-channel habitat features, and associated yellow triangles depicting areas of tributary connectivity, in Figure 2.7-11) and the three areas where restoration actions are proposed within the Iron Gate Reservoir footprint (see enumerated areas for wetlands, floodplains, and off-channel habitat features, and associated yellow triangles depicting areas of tributary connectivity, in Figure 2.7-12). Sediment jetting would also minimize the potential for reservoir sediment erosion and the associated increase in SSCs outside of the reservoir drawdown period

by mobilizing sediments during drawdown. While sediment jetting would primarily transport reservoir deposited sediments that are already anticipated to be eroded during drawdown, some additional reservoir deposited sediments may be transported by the combination of drawdown and sediment jetting flows compared to only drawdown flows. The total sediment behind the dams by 2020[35] and the range of sediment volume anticipated to erode from each reservoir during dam removal was estimated by USBR (2012) as part of the sediment transport modeling. The range of sediment volume that potentially would be transported from sediment jetting during drawdown was estimated for Copco No. 1 and Iron Gate reservoirs from the approximate areas where the restoration actions would occur in the individual reservoirs (Figure 2.7-8 and 2.7-9) and the maximum and minimum sediment depths measured in the vicinity of those restoration actions. Sediment depths were measured in sediment cores taken by Shannon and Wilson (2006) and USBR (2009) and summarized in USBR (2012). Sediment jetting during drawdown would potentially transport between approximately 13 and 41 percent of the sediment volume expected to erode during dam removal (Table 3.2-12).

[35] Between 2020 and 2022 (i.e., dam removal year 2 when drawdown would primarily occur under the KRRC's revised schedule [KRRC 2019]), the sediment volume present behind the dams would increase by approximately 19,600 cubic yards per year (39,200 cubic yards for two years) in J.C. Boyle Reservoir, 81,300 cubic yards per year (162,600 cubic yards for two years) in Copco No. 1 Reservoir, and 100,000 cubic yards per year (200,000 cubic yards for two years) (USBR 2012). The increase in sediment volume between 2020 and 2022 is an order of magnitude less than the uncertainty of the 2020 total sediment volume estimates, so model results using the 2020 sediment volumes would still be applicable to the Proposed Project.

Table 3.2-12. Estimated Range of Sediment Volume Transported by Sediment Jetting During Drawdown Compared to Total Sediment Volume Anticipated to Erode with Dam Removal.

Reservoir	Total 2020 Sediment Volume[1,2,3] (cubic yards)	2020 Sediment Volume Erosion[3,4] (cubic yards)		Estimated 2020 Sediment Volume Transported by Sediment Jetting[3,5] (cubic yards)		Percentage of 2020 Sediment Volume Transported by Sediment Jetting (%)	
		Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
Copco No. 1	8,250,000	3,713,000	6,270,000	970,000	1,278,000	15%	34%
Iron Gate	5,690,000	1,366,000	1,821,000	237,000	554,000	13%	41%

1 Total 2020 sediment volume is from USBR (2012) which estimated the total sediment volume from the sediment cores taken in the individual reservoirs and projected to 2020 based on annual sedimentation rates for each reservoir.

2 Between 2020 and 2021 (i.e., dam removal year 2 when drawdown would primarily occur), the sediment volume present behind the dams would increase by approximately 81,300 cubic yards in Copco No. 1 Reservoir and approximately 100,000 cubic yards in Iron Gate Reservoir based on estimates of annual sedimentation rates for each reservoir (USBR 2012). The increase in sediment volume between 2020 and 2021 would be an order of magnitude less than the uncertainty of the 2020 total sediment volume estimates, so model results using the 2020 sediment volumes would still be applicable to the Proposed Project.

3 Rounded to nearest 10,000 cubic yards.

4 Sediment volume erosion is based on the USBR (2012) estimated total 2020 sediment volume and erosion rates during drawdown. The maximum and minimum erosion rates for each reservoir (see Table 2.7-11) are based on hydrologic conditions recorded for the March to June flow volume at Keno gage on the Klamath River from water year 2001 (90 percent exceedance) and 1984 (10 percent exceedance). Sediment volume from individual reservoirs may not equal the total amounts indicated because masses taken from USBR (2012) were rounded to the nearest 10,000 tons.

5 Sediment volume erosion transported by sediment jetting is estimated from the approximate areas where restoration actions would occur in the individual reservoirs (Figure 2.7-8 and 2.7-9) and the maximum and minimum sediment depth measured in the vicinity of those restoration actions.

SSCs that would occur during reservoir drawdown under the KRRC's Proposed Project would increase relative to the prior model results (USBR 2012) due to the influence of sediment jetting, while SSCs after drawdown completes are expected to be similar or less than the modeled SSCs since sediment jetting would increase transport of reservoir sediments during drawdown and less sediment would remain in the reservoir after drawdown. Variations in SSCs downstream of Copco No. 1 and Iron Gate reservoirs due to sediment jetting within the reservoir footprint are discussed in the relevant reaches below.

Hydroelectric Reach

Sediment transport modeling of the impacts of dam removal indicate high short-term SSCs in the Hydroelectric Reach under the Proposed Project (Stillwater Sciences 2008; USBR 2012, 2016). Modeled SSCs downstream of J.C. Boyle Reservoir would be high in the short term, but concentrations would be considerably less than those anticipated to occur downstream from Copco No. 1 and Iron Gate reservoirs due to the relatively small volume of the sediment deposits behind J.C. Boyle Dam (eight percent of total volume for the Lower Klamath Project, see also Tables 2.7-7 and 2.7-8). Model output indicates that SSCs immediately downstream of J.C. Boyle Dam under dry (WY 2004), median (WY 1968), and wet (WY 1999) water year types would exhibit peak values of 2,000 to 3,000 mg/L occurring within one to two months of reservoir drawdown. Model results indicate SSCs greater than 100 mg/L for two weeks or more would potentially occur downstream of J.C. Boyle Dam for one to three months under the Proposed Project, coinciding with the drawdown period. During these one to three months, modeled SSC exceed 100 mg/L over two weeks for several non-consecutive periods, with SSCs remaining above 100 mg/L for approximately two to seven consecutive weeks depending on the water year. The suspended sediments released from J.C. Boyle Reservoir would quickly move into the California portion of the Hydroelectric Reach. SSCs exceeding 100 mg/L for two consecutive weeks was selected as a threshold of significance because exposure for SSCs above 100 mg/L for two weeks would be a significant adverse impact to cold-water fishery species (i.e., salmonids, including rainbow trout) and associated designated beneficial uses, including cold freshwater habitat (COLD), rare, threatened, or endangered species (RARE), and migration of aquatic organisms (MIGR) in the Hydroelectric Reach (see Section 3.2.3.1 *Thresholds of Significance, Suspended Sediment*). Modeled SSCs downstream of J.C. Boyle Dam are greater than 100 mg/L for two consecutive weeks during drawdown, thus there would be a significant impact to SSCs in the short term in the Hydroelectric Reach due to increases in suspended sediment from releases of sediment trapped behind J.C. Boyle Dam. Modeled SSCs decrease to less than 100 mg/L within five to seven months following drawdown, and concentrations further decrease to less than 10 mg/L within six to 10 months following drawdown of J.C. Boyle Reservoir (Figure 3.2-11 through Figure 3.2-13).

The higher drawdown rate under the Proposed Project than under modeled conditions is expected to increase peak SSCs and decrease the duration of

elevated SSCs compared to modeled SSCs (see Section 3.2.4.2 *Suspended Sediments*), but variations in modeled SSCs due to a higher drawdown rate would be unlikely to reduce the duration of SSCs above 100 mg/L to less than two consecutive weeks under all water years types. Peak SSCs would be expected to double from approximately 2,000 to 3,000 mg/L under modeled conditions to approximately 4,000 to 6,000 mg/L under the higher drawdown rate in the Proposed Project, based on a previous analysis how suspended sediments vary under different drawdown rates in Lower Klamath Project reservoirs (Stillwater Sciences 2008). A higher drawdown rate would also be expected to decrease the duration of elevated SSCs by approximately one to two weeks (Stillwater Sciences). Modeled SSCs greater than 100 mg/L downstream of J.C. Boyle Dam occur for up to seven consecutive weeks, depending on the water year type (see Figure 3.2-11 to Figure 3.2-13), so SSCs under the Proposed Project with a higher drawdown rate would be likely to remain greater than 100 mg/L for two consecutive weeks. However, SSCs after drawdown would potentially decrease to less than 10 mg/L more rapidly under the Proposed Project than estimated by the modeled SSCs. Overall, the short-term impact based on an analysis of modeled SSCs downstream of J.C. Boyle Dam would remain the same under the higher drawdown rate in the Proposed Project since SSCs is expected to exceed 100 mg/L for two consecutive weeks regardless of the drawdown rate.

In the year following dam removal year 2 (post-dam removal year 1), modeling indicates suspended sediments would not be greater than 100 mg/L over a continuous two-week period under all water-year types. In dry and normal water-year types, modeled suspended sediment concentrations were always below 100 mg/L during post-dam removal year 1. In wet water-year types, the modeled suspended sediment concentrations are usually less than 100 mg/L during post-dam removal year 1, but there is an approximately one-week period when modeled suspended sediment concentrations are greater than 100 mg/L associated with storm conditions. Modeling indicates the suspended sediment concentrations return to modeled background levels (i.e., existing conditions) under all water year types during post-dam removal year 1 (USBR 2012).

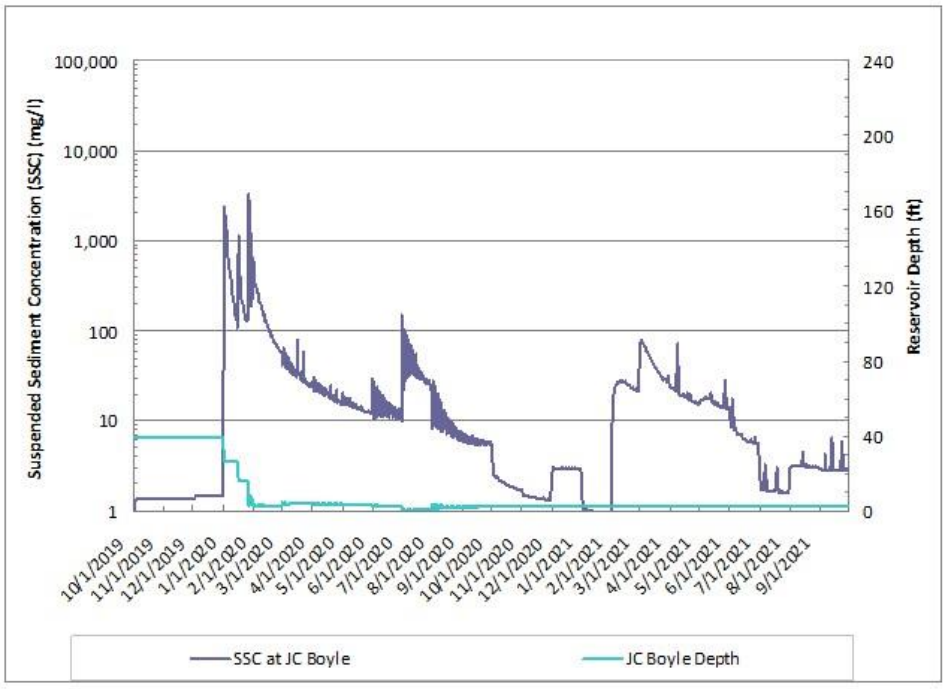

Figure 3.2-11. Suspended Sediment Concentrations Modeled at J.C. Boyle Reservoir Under the Proposed Project Assuming Typical Dry Hydrology (WY2001). Dam removal year 1 is represented by the year 2019, dam removal year 2 is represented by the year 2020, and post-dam removal year 1 is represented by the year 2021.

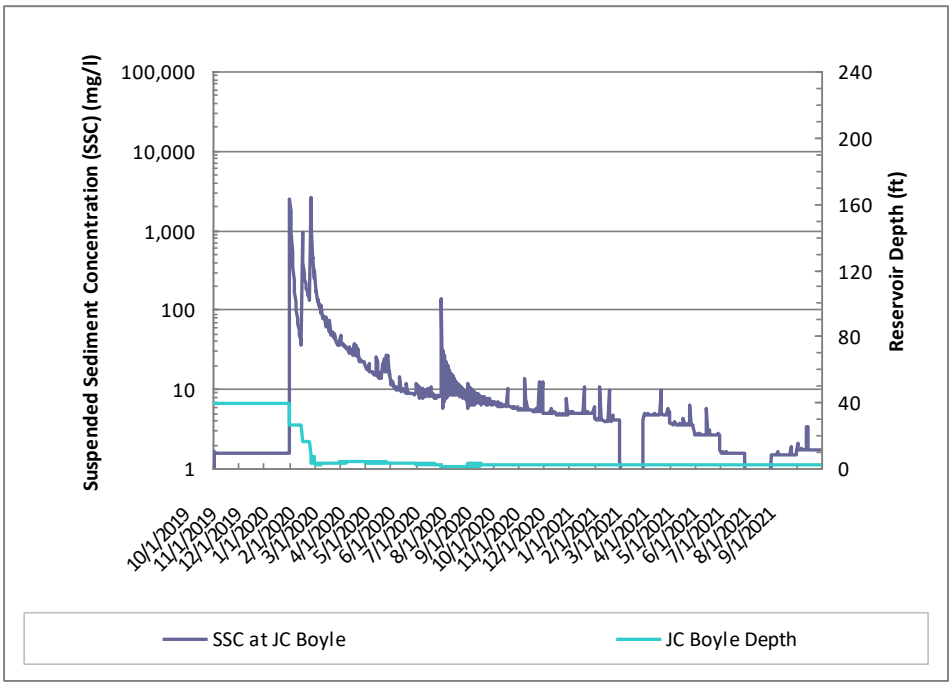

Figure 3.2-12. P-values based on the results of paired heteroscedastic t-tests of the average monthly KBRA and 2019 BiOp flows for the 1980 to 2011 time period for each month

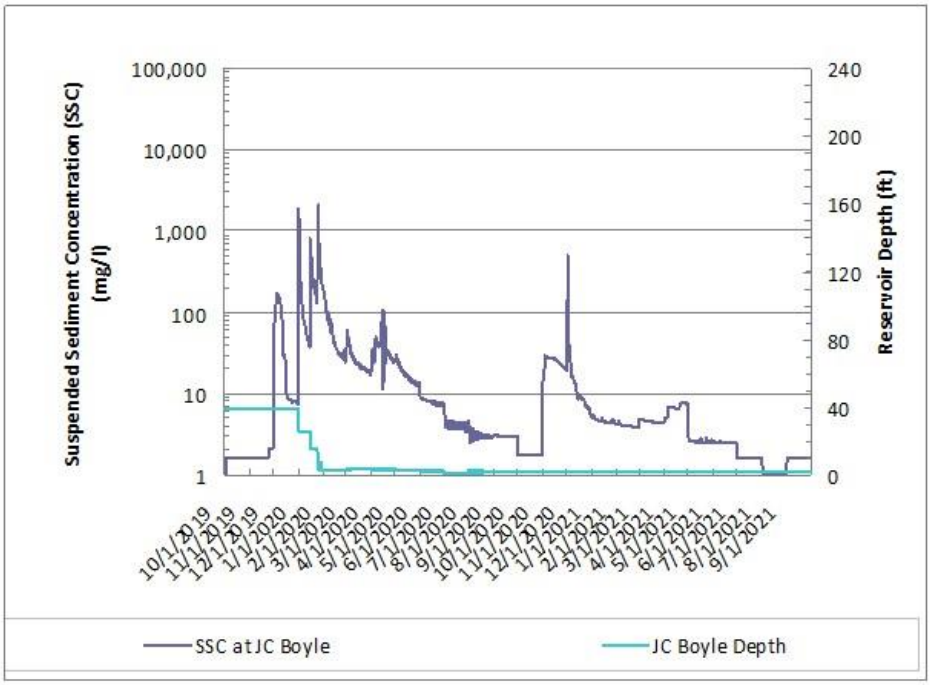

Figure 3.2-13. Suspended Sediment Concentrations Modeled at J.C. Boyle Reservoir Under the Proposed Project Assuming Typical Wet Hydrology (WY1984). Dam removal year 1 is represented by the year 2019, dam removal year 2 is represented by the year 2020, and post-dam removal year 1 is represented by the year 2021.

Modeling of sediment concentrations downstream of Copco No. 1 Reservoir during drawdown also indicates short-term sediment concentrations would be high in the California portion of the Hydroelectric Reach due to dam removal (Figure). Modeled SSCs downstream of Copco No. 1 Reservoir in dry, average and wet water year types peaked at approximately 7,000 to 8,000 mg/L within one to two months of initiation of reservoir drawdown; SSCs then decrease to generally less than 1,000 mg/L by approximately one and a half to two and a half months after initiation of reservoir drawdown. During this period, the modeled SSCs would exceed the suspended sediments potential short-term significance threshold of 100 mg/L over a continuous two-week period. Predicted spikes in SSC after one to two months of reservoir drawdown correspond to increases in Klamath River flow through the Hydroelectric Reach due to spring storm events (Figure 3.2-14).

Similar to conditions immediately downstream of J.C. Boyle, higher maximum drawdown rate under the Proposed Project (i.e., 5 feet per day) would not alter the short-term impact determination since the higher drawdown rate under the Proposed Project would be unlikely to reduce the duration of SSCs above 100 mg/L to less than two consecutive weeks under all water years types. Peak SSCs would be expected to double from approximately 7,000 to 8,000 mg/L

under modeled conditions to approximately 14,000 to 16,000 mg/L under the higher drawdown rate in the Proposed Project, based on a previous analysis how suspended sediments vary under different drawdown rates in Lower Klamath Project reservoirs (Stillwater Sciences 2008). The duration of modeled SSCs greater than 100 mg/L downstream of Copco No. 1 likely would decrease under the Proposed Project with a higher drawdown rate, but the overall all duration of SSCs greater than 100 mg/L would likely occur for two consecutive weeks or more. SSCs after drawdown would potentially decrease to less than 10 mg/L more rapidly under the Proposed Project than estimated by the modeled SSCs. Thus, the short-term impact, which is based on an analysis of modeled SSCs downstream of Copco No. 1 Dam, would remain the same under the higher drawdown rate in the Proposed Project since SSCs is expected to exceed 100 mg/L for two consecutive weeks regardless of the drawdown rate.

Sediment jetting is anticipated to also increase the magnitude of modeled SSCs downstream of Copco No. 1 during drawdown (USBR 2012), but it also would not alter the overall impact of suspended sediment in the Klamath River downstream of Copco No. 1 Dam during drawdown since the increase in SSCs due to sediment jetting would primarily occur during peak SSCs and sediment jetting would not increase the duration of SSCs greater than 100 mg/L by only mobilizing more sediment during the drawdown period. Klamath River flows during drawdown at Copco No. 1 Dam range from approximately 800 cfs in a Dry water year to 13,600 cfs in a Wet water year (see Appendix B: *Definite Plan – Section 4.6*). Assuming a sediment jetting flow of approximately 10 to 30 cfs (similar to sediment jetting flows used on the Mill Pond Dam removal project, Washington Department of Ecology [2016]). SSCs in sediment jetting flows would vary depending on the pressure of the water jet, the angle of the water jet, and the cohesiveness of the reservoir deposited sediments, but SSCs in sediment jetting flows would likely range from less than 1,000 mg/L to approximately 100,000 mg/L.

SSCs in the Klamath River downstream of Copco No. 1 during drawdown with sediment jetting compared to modeled SSCs without sediment jetting are estimated to typically increase by approximately 350 mg/L to 1,400 mg/L, but SSCs would potentially increase up to approximately 2,200 mg/L compared to modeled SSCs in the Klamath River during drawdown without sediment jetting. This projected increase in SSC is based on the estimated range of sediment volume to be transported by sediment jetting, the duration of drawdown when sediment jetting would occur, and the modeled flow and SSCs for the Klamath River and the estimated flow and SSCs for sediment jetting. The typical increase in SSCs would be the expected increase under the range of typical drawdown flows under all water year types, while the maximum increase in SSCs would only be likely to occur under Klamath River minimum flows during a dry water year. Additionally, the maximum increase in SSCs in the Klamath River downstream of Copco No. 1 is a conservative estimate since it assumes sediment jetting would mobilize all the sediment in the areas undergoing jetting in

the approximately three-month drawdown period. In actuality, drawdown flows would mobilize a portion of that sediment, so the actual maximum increase in SSCs downstream of Copco No. 1 would likely be less than 2,200 mg/L.

While sediment jetting would increase the magnitude of SSCs during drawdown, most of the variations in the modeled SSCs during sediment jetting would be within the range of modeled SSCs and the increase in the magnitude would not extend beyond the drawdown period since sediment jetting would only occur during drawdown. Peak SSCs during drawdown under sediment jetting would potentially increase above the range of modeled SSCs with the maximum SSCs downstream of Copco No. 1 potentially increasing from approximately 14,000 to 16,000 mg/L under the higher maximum drawdown flows (i.e., 5 feet per day) to approximately 16,200 to 18,200 mg/L under the higher maximum drawdown flows with sediment jetting. The SSCs under drawdown flows with or without sediment jetting would exceed the suspended sediments potential short-term significance criteria of 100 mg/L over a continuous two-week period. While the magnitude of SSCs would increase during drawdown with sediment jetting, the magnitude of SSCs would potentially decrease after drawdown is complete since sediment jetting would mobilize more sediment than anticipated under drawdown flows alone. Within the general uncertainty of the modeled SSCs and estimates of SSCs with sediment jetting (see Table 3.2-12), the SSCs in the Klamath River downstream of Copco No. 1 with sediment jetting would be similar to or less than the modeled SSCs without sediment jetting after drawdown ends in March.

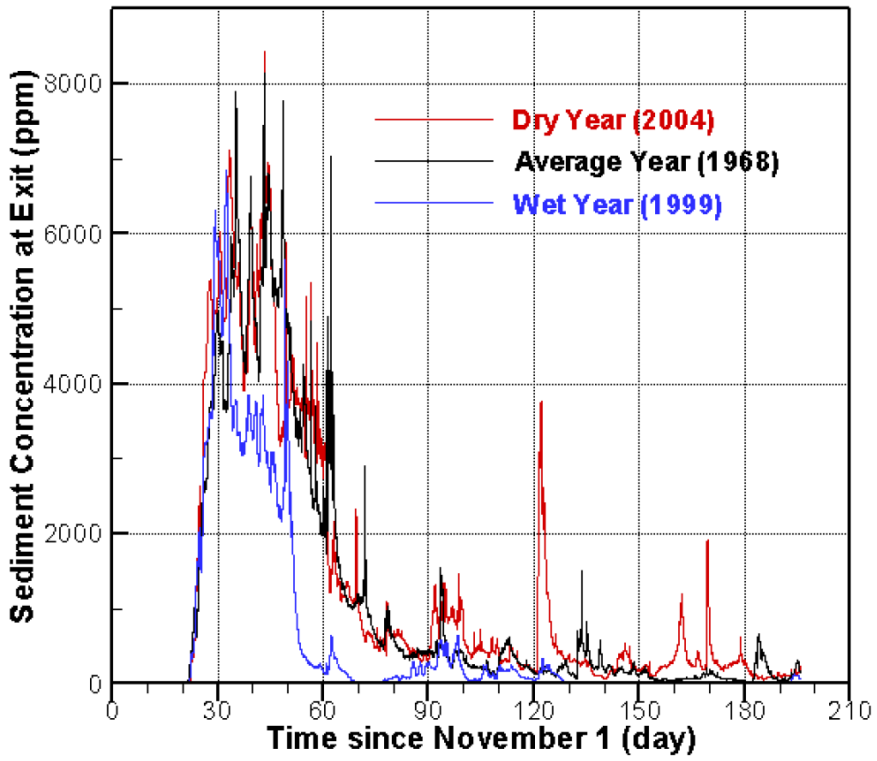

Figure 3.2-14. Sediment Concentration Downstream of Copco No. 1 Reservoir During Drawdown Using SRH-2D v3 Under Three Hydrological Scenarios. Drawdown began on November 15 and continued for six months. Source: USBR 2012.

Note that the shift in the Proposed Project Copco No. 2 drawdown timing from January 1 (Appendix B: *Detailed Plan*) to May 1 (Appendix B: *Definite Plan*) would not change the anticipated magnitude or timing of significant impacts due to elevated SSCs in the Hydroelectric Reach during dam removal year 2. SSCs associated with Copco No. 2 were not explicitly considered in the SRH-1D model, since 1) construction of Copco No. 2 dam was completed seven years after the substantially larger, upstream Copco No. 1 dam was completed, where the larger dam effectively cut off the source of sediments that would have been transported into Copco No. 2 Reservoir and potentially stored over time, and 2) Copco No. 2 Reservoir storage volume (70 ac-ft) is negligible compared with that of the upstream Copco No.1 (33,724 ac-ft) and J.C. Boyle (2,267 ac-ft) reservoirs, such that even if sediment deposits were to occur in Copco No. 2 Reservoir, either historically or during the Proposed Project drawdown of the upstream Copco No. 1 and J.C. Boyle reservoirs, the smaller Copco No. 2 Reservoir would not meaningfully increase downstream SSCs beyond currently predicted values for the period five to seven months following drawdown (May to July). Short-term increases in SSCs from removal of Iron Gate Dam are discussed for the Middle and Lower Klamath River (see below), since sediment

releases from Iron Gate Reservoir would primarily impact the Klamath River downstream of the Hydroelectric Reach.

After reservoir drawdown, a significant amount of sediment is expected to remain within the reservoir footprints. Reservoir sediment field sampling and laboratory testing in 2012 (USBR 2012) and 2018 (Appendix B: *Definite Plan – Appendix H*) indicates that sediments remaining in the reservoir footprint would strengthen (i.e., harden) as they dry out, but wetting and drying cycles of unvegetated reservoir sediment would cause the sediment to produce erodible fine particles and aggregates. There is the potential for unvegetated sediments to cause significant short-term or long-term elevated SSCs during fall rain events if not stabilized with vegetation, especially from Iron Gate Reservoir where the highest levels of fine sediment and particles were produced in response to the laboratory wetting and drying cycles. These results are consistent with suspended sediment modeling results (USBR 2012) indicating that SSCs can periodically increase during post-dam removal year 1 due to storm conditions.

The Proposed Project includes revegetation of reservoir sediments remaining on the floodplain and the surrounding slopes after drawdown to stabilize the sediments and reduce the potential for short-term and long-term elevated SSCs. Stabilization of sediments through planting is expected to be effective since laboratory revegetation "grow tests" showed vegetation stabilized sediments from Copco No. 1 (Appendix B: *Definite Plan – Appendix H, Section 8.1.1 Reservoir Sediment Characteristics*). The Proposed Project Reservoir Area Management Plan (Appendix B: *Definite Plan – Appendix H*; see also Section 2.7.4 *Restoration Within the Reservoir Footprint*) includes activities to promote revegetation and sediment stabilization such as sediment preparation and amendment, irrigation, aerial seeding using pioneer seed mixes, planting of pole cuttings, acorns, and container plants, and adaptively re-seeding/re-planting areas that do not sufficiently establish following initial restoration activities.

During the drawdown period in January to March of dam removal year 2, aerial seeding would occur as the reservoir water level drops before the exposed reservoir sediments dry and form a surface crust. Pioneer seed mixes would contain a variety of riparian and upland common native species and possibly a small amount of sterile non-native species to enhance the initial erosion protection. The species included in the seed mix typically germinate early in the spring (March to April) and their germination would be sustained by dispersal over moist reservoir sediments during drawdown in the winter and early spring (January to March). Reservoir footprint areas that are re-inundated by larger storm events would be re-seeded after the water level recedes.

Aerial seeding would not result in any further disturbance of soil on the exposed reservoir terraces in the Hydroelectric Reach and the establishment of vegetation on the terraces would potentially reduce erosion of fine sediments. In areas not accessible by ground equipment because of rough terrain, steep slopes, and

sediment instability, and as a potential alternative to aerial seeding, the Proposed Project may hydroseed from a barge located in Proposed Project reservoirs.[36]

During the dam removal period from March to December of dam removal year 2, additional revegetation efforts would be undertaken, including seed plantings, monitoring of plant growth and vegetation cover, re-seeding of areas with poor growth, continued installation of pole cuttings, and maintenance of existing and previously planted vegetation. Woody riparian species would be planted in the riparian areas to increase natural bank stability along with providing ecological benefits for fish. Irrigation systems would be installed along key segments of the river banks to expedite riparian bank zone development. Several repeated seedings and/or plantings would be adaptively performed as necessary during the first two years following reservoir drawdown in order to increase native vegetation coverage in underperforming areas.

In addition to planting and revegetation activities, the Proposed Project also includes creation of physical features or conditions (e.g., grading, swales, wetlands, floodplain roughness features, and river bank roughness features) that would stabilize remaining reservoir sediments deposits and reduce the potential for short-term and long-term increases in SSCs (Appendix B: *Definite Plan – Appendix H, Section 5.5 Description of Restoration Actions*). As detailed in the Proposed Project Reservoir Area Management Plan (see Section 2.7 *Proposed Project*), grading would only occur for reservoir deposited sediments between January and April of the drawdown year, with no grading below the historical ground surface prior to dam construction. In the newly exposed reservoir footprints under the Proposed Project, swales, wetlands, floodplain roughness features (e.g., partially buried brush or wood), and bank roughness features (e.g., large woody habitat) would be constructed to stabilize the remaining reservoir sediments, reduce velocities along the floodplain and riverbank that would increase suspended sediments, and reduce unnatural erosion that would potentially degrade water quality (i.e., by elevating suspended sediments) while still maintaining natural river processes. Creation of the other physical features and conditions are likely to be effective sediment stabilization and suspended sediment reduction methods because they slow down stormwater runoff, floodplain flows, and river flows along the river banks that would potentially cause elevated suspended sediments, allow for suspended sediments to settle out prior

[36] If it occurs, barge hydroseeding would be unlikely to exacerbate erosion impacts beyond the impacts of reservoir drawdown itself. Reservoir drawdown would extend potential wave-induced erosion impacts below the existing normal fluctuation zone with brief (i.e., hours to a day) periods of interaction with the "new shoreline" as drawdown continues. Barges tend to generate low wave heights due to their wide, flat bottoms and low operating speeds and any concentrated additional wave-induced erosion from barge hydroseeding would be limited to a shorter duration (i.e., over several hours within a single day) than that of wind-action on the slowly downward-moving reservoir surface.

to entering tributaries or Klamath River, and provide storage for sediment that may settle (CASQA 2003; Stubblefield et al 2006; Knox et al. 2008). The State Water Board's draft water quality certification requires submission of a Restoration Plan that incorporates the major elements discussed above regarding revegetation, and also other activities that can reduce sediment loading to the Klamath River over the long term, including grading, swales, and wetland construction.

Although revegetation of the reservoir sediment deposits would stabilize the sediment and reduce the potential for short-term and long-term elevated suspended sediment concentrations in the Hydroelectric Reach after vegetation begins to grow and establish (i.e., summer drawdown year 2 to post-dam removal year 1) and other restoration plan elements such as grading, swales, and wetland construction would reduce both short-term and long-term sediment loading, there still is the potential for short-term increases in SSCs in the months following reservoir drawdown prior to the establishment of vegetation to stabilize sediments. Laboratory tests of reservoir sediments determined repeated wetting (e.g., from rainfall) and drying of reservoir sediment deposits under conditions similar to those expected to occur in the reservoir footprints after drawdown would form easily erodible fine particles, so unvegetated sediments would potentially produce elevated SSCs during rainfall events (Appendix B: *Definite Plan – Appendix H, Section 8.1.1 Reservoir Sediment Characteristics*). Short-term potential increases in SSCs from rainfall on reservoirs sediments without established vegetation alone would be unlikely to result in SSCs greater than 100 mg/L for a continuous two-week period. However, the short-term potential increases in SSCs due to rainfall on reservoir sediments without established vegetation combined with the short-term increases in SSCs due to the release of reservoir sediments from behind the Lower Klamath Project dams would potentially result in SSCs greater than 100 mg/L for a longer duration than would occur due to only the short-term increases in SSCs from the release of reservoirs sediment from behind Lower Klamath Project dams, thus the short-term potential increases in SSCs from rainfall on reservoir sediments without established vegetation would have a significant adverse impact to salmonids and cause a substantial change in water quality (i.e., suspended sediment) that would result in a failure to maintain existing beneficial uses at the levels currently supported, resulting in a short-term significant impact to suspended sediments in the Hydroelectric Reach.

Physical removal of reservoir bottom sediments prior to drawdown is not feasible because dredging would remove only a maximum of 43 percent of erodible reservoir sediment, would only provide a marginal benefit to fish during drawdown with 57 percent of erodible sediment remaining, and would have a large environmental impact on terrestrial resources and possibly cultural resources (Lynch 2011). Slower drawdown to potentially mobilize less sediment or altering the timing of drawdown to lessen the potential of precipitation after drawdown and before plantings have stabilized sediments have also been

suggested as potential approaches to reduce sediment impacts. However, both of these alterations would increase the time elevated SSCs would occur during sensitive fish life-stages, resulting in greater adverse impacts to designated beneficial uses and/or fish (see Section 4.1.1.4 *Elimination of Potential Alternatives that Would Not Avoid or Substantially Lessen Significant Environmental Effects of the Proposed Project*). Thus, the short-term significant impact of increased SSCs due to dam removal in the Hydroelectric Reach cannot be avoided or substantially decreased through feasible mitigation.

With respect to the potential for long-term increases in SSCs in the Hydroelectric Reach due to the Proposed Project, modeling indicates SSCs return to modeled background levels (i.e., existing conditions) under all water year types during post-dam removal year 1 (USBR 2012). Potential long-term increases in SSCs due to production of erodible sediments from the remaining reservoir sediment deposits would likely be almost to completely offset by long-term decreases in SSCs due to revegetation of remaining reservoirs sediment deposits. To address uncertainties associated with revegetation and sediment stabilization activities (e.g., variations in plant germination success, plant growth rate, seasonal precipitation, reservoir sediment changes), monitoring and adaptive management of these revegetation and sediment stabilization activities would occur under the Proposed Project (Appendix B: *Definite Plan – Appendix H, Section 6 Monitoring and Adaptive Management*). Monitoring of the remaining reservoir sediment deposits would be conducted yearly for post-dam removal year 1 to 5 to evaluate the effectiveness of these activities using yearly visual inspection (aerial and ground photos) as well as yearly Light Detection and Ranging (LiDAR) flights of the reservoir area to estimate changes in the remaining reservoir sediment deposits. Adaptive management under the Proposed Project would utilize the monitoring data, threshold metrics for evaluating whether actions would be needed, and potential actions to be undertaken if threshold metrics are not achieved. For example, aerial and ground photos would be used to evaluate the percent relative vegetation cover with additional vegetation seeding or planting occurring if vegetation cover does not meet annually specified average percent relative vegetation cover targets. Overall, monitoring and adaptive management would likely result in revegetation that stabilizes remaining reservoirs sediments, so long-term potential increases in SSCs due to production of erodible sediments from the remaining would be unlikely to result in elevated SSCs in the Klamath River and there would be a long-term less than significant impact on SSCs in the Hydroelectric Reach.

Slowly, over several decades, high winter flows in the Hydroelectric Reach are expected to gradually widen the floodplain in the reservoir footprints through natural fluvial processes (USBR 2012). Erosion associated with the widening of the floodplain is not anticipated to result in SSCs above modeled background levels (i.e., existing conditions) due to the anticipated slow pace of this change (i.e., decades), so long-term erosion and associated SSCs from widening of the floodplain would not cause an exceedance of water quality standards related to

suspended sediments or cause changes in suspended sediments that would result in a failure to maintain existing designated beneficial uses at the levels currently supported. Therefore, there would be no significant impact to the Hydroelectric Reach in the long term due to the release of sediments currently trapped behind the Lower Klamath Project dams since SSCs are expected to resume modeled background levels (i.e., existing conditions) in the long term, regardless of the water year type present during the dam removal.

Middle and Lower Klamath River and Klamath River Estuary
Sediment transport modeling of the impacts of dam removal on suspended sediment also indicates high short-term loads immediately downstream from Iron Gate Dam under the Proposed Project (Stillwater Sciences 2008; USBR 2012, 2016). As described above, the Proposed Project involves drawdown for Copco No. 1 Reservoir beginning on November 1 and drawdown for J.C. Boyle and Iron Gate reservoirs beginning on January 1 (USBR 2012), which allows maximum SSCs to occur during winter months when flows and SSCs are naturally high in the mainstem river (see Appendix C, Figure C-15). Drawdown of Copco No. 2 occurs on May 1 (Appendix B: *Definite Plan*) under the Proposed Project, but Copco No. 2 Reservoir would not meaningfully increase downstream SSCs due to lack of sediment storage under current conditions and its small size relative to the upstream reservoirs, as discussed for the Hydroelectric Reach above.

Suspended sediment model predictions immediately downstream of Iron Gate Dam due to the release of sediments within J.C. Boyle, Copco No. 1, and Iron Gate reservoirs under the Proposed Project are presented in Figure 3.2-15 through Figure 3.2-17 for three water year types[37] (dry, median, wet) considered as part of the Klamath Dam Removal Secretarial Determination process. As discussed in Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*, model predictions made using hydrology assumptions adopted for the Klamath Dam Removal Secretarial Determination are still appropriate for assessing Proposed Project impacts since the 2013 BiOp Flows and 2019 BiOp Flows are typically similar to those used in the suspended sediment model for all water year types (generally within a few percentage points) and 2013 BiOp Flows or 2019 BiOp Flows outside the range modeled flows occur too infrequently to substantially alter the range of flow conditions in the Klamath River. Model predictions are discussed below and summarized in Table 3.2-13.

[37] SSCs downstream of Iron Gate Dam cannot be directly compared with the SSCs modeled downstream of Copco No. 1 Reservoir. SSC modeling downstream of Copco No. 1 Reservoir use different years to represent the three water year types than the SSC modeling downstream of J.C. Boyle Dam or Iron Gate Dam, so the specific hydrologic conditions (i.e., timing and magnitude of flow changes from storms) and resulting SSCs are different.

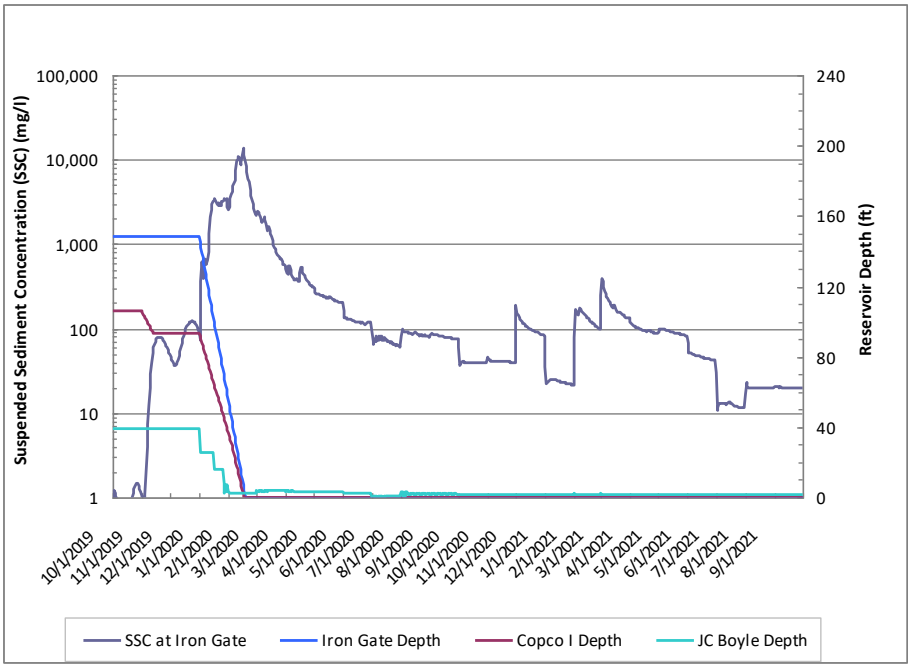

Figure 3.2-15. SSCs Modeled Downstream from Iron Gate Dam Under the Proposed Project Assuming Typical Dry Hydrology (WY2001). Dam removal year 1 is represented by the year 2019, dam removal year 2 is represented by the year 2020, and post-dam removal year 1 is represented by the year 2021.

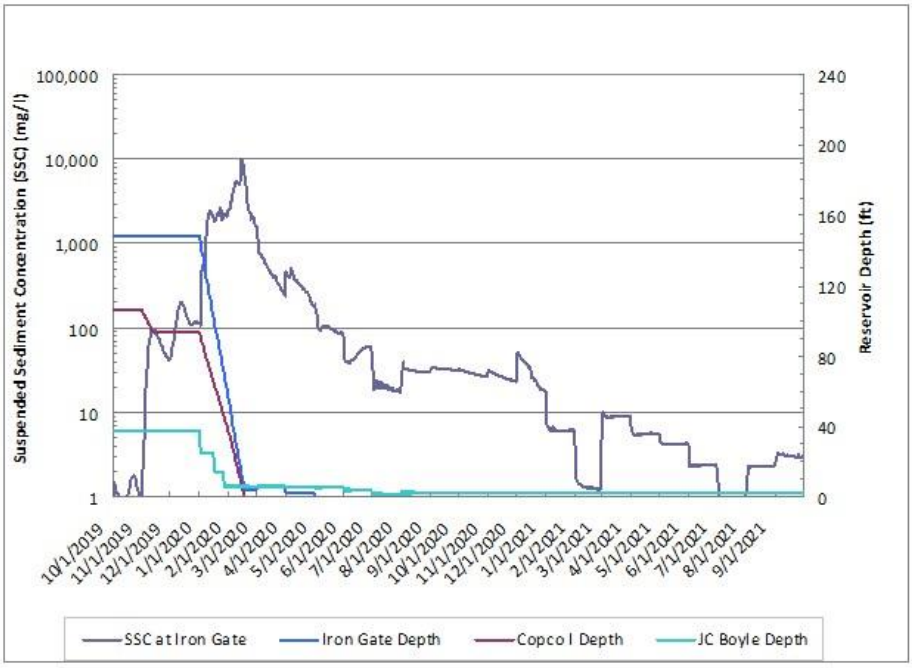

Figure 3.2-16. SSCs Modeled Downstream from Iron Gate Dam Under the Proposed Project Assuming Median Hydrology (WY1976). Dam removal year 1 is represented by the year 2019, dam removal year 2 is represented by the year 2020, and post-dam removal year 1 is represented by the year 2021.

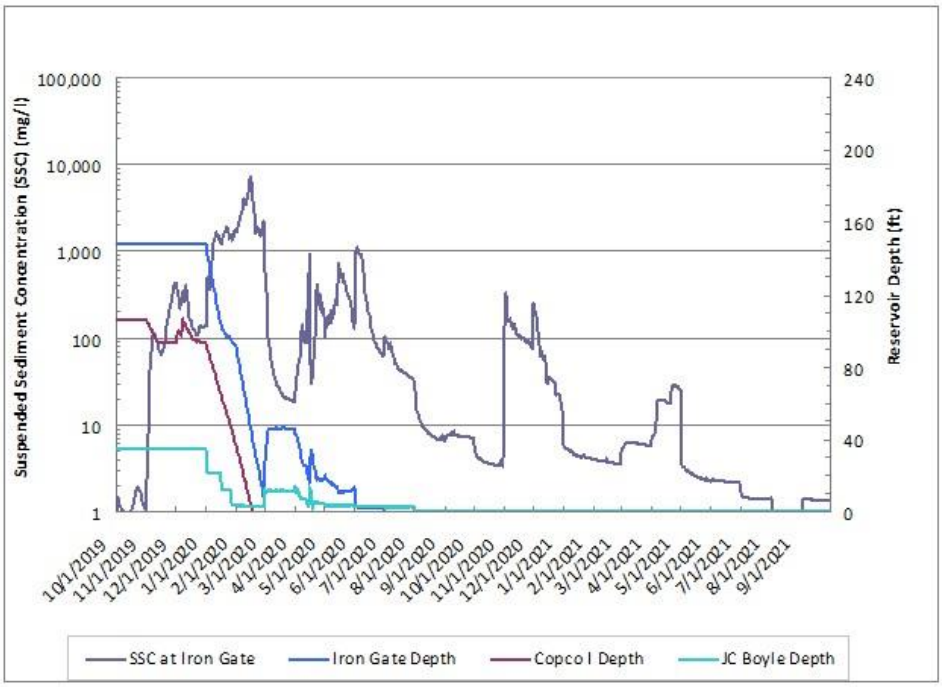

Figure 3.2-17. SSCs Modeled Downstream from Iron Gate Dam Under the Proposed Project Assuming Typical Wet Hydrology (WY1984). Dam removal year 1 is represented by the year 2019, dam removal year 2 is represented by the year 2020, and post-dam removal year 1 is represented by the year 2021.

Table 3.2-13. Summary of Model Predictions for SSCs in the Klamath River Downstream from Iron Gate Dam for the Proposed Project During Dam Removal Years 1 and 2

Water Year Type	Peak SSC[1] (mg/L)	SSC-1,000 mg/L		SSC-100 mg/L		SSC-30 mg/L	
		Duration (Months)	Time Period[2]	Duration (Months)	Time Period[2]	Duration (Months)	Time Period[2]
Dry (WY2001)	13,600	3	January–March	6	January–June	10	January–October
Median (WY1976)	9,900	2	January–February	5	January–May	6	January–June
Wet (WY1984)	7,100	2	January–February and April–July	7	November–February and April–July	9	November–July

[1] Actual peak concentrations may greater than predicted peak concentrations due to the proposed 5 feet per day maximum drawdown rate for the Proposed Project (see also Section 3.2.4.2 *Suspended Sediments*).

[2] All months shown are during dam removal year 2.

For typical dry year (WY2001) hydrologic conditions, modeled SSCs in the Klamath River immediately downstream from Iron Gate Dam experience a relatively small increase to near 100 mg/L in mid-November of dam removal year 1 as Copco No. 1 undergoes early drawdown at a maximum rate of two feet per day. A second, relatively large increase (greater than 1,000 mg/L) would occur in early January of dam removal year 2 when Iron Gate and J.C. Boyle begin drawdown at rates of two to five feet per day and Copco No. 1 enters a second phase of drawdown, also at a rate of two to 5 feet per day. Concentrations remain very high (greater than 1,000 mg/L) for approximately three months from January through April of dam removal year 2 (see Figure 3.2-11), with peak values exceeding 10,000 mg/L for a short period (four to five days) in mid-February of dam removal year 2. SSCs generally return to less than 100 mg/L by July, and to concentrations near 30 mg/L by October of dam removal year 2. Predicted SSCs increase again to levels between 200 to 400 mg/L during winter and spring of post-dam removal year 1 (2021) due to flushing of sediments that were not removed during the first year following drawdown.

Model predictions for median year (WY1976) hydrologic conditions follow a pattern similar to that of a typical dry year (WY2001), with a relatively small increase in SSCs (to near 200 mg/L) in mid-December of dam removal year 1, and a large increase (greater than 1,000 mg/L) again in early January of dam removal year 2. Peak SSCs downstream from Iron Gate Dam are predicted to be somewhat lower for the median year condition, reaching levels just under 10,000 mg/L. Relative to the typical dry year, the lower median year peak SSCs

are a result of greater flows flushing nearly the same volume of sediment out of the reservoir and downstream. Peak concentrations also occur in mid-February of dam removal year 2 for the median year hydrologic condition (see Figure 3.2-16). Predicted SSCs downstream from Iron Gate Dam remain very high (greater than 1,000 mg/L) for approximately two months following the beginning of drawdown in Iron Gate and Copco No. 1 reservoirs, from January through February of dam removal year 2. There is a slightly earlier return to SSCs less than 100 mg/L for the median year (WY1976), with concentrations decreasing by May of dam removal year 2 due to the higher Klamath River flow under a median year. Modeled SSCs decrease to less than 30 mg/L by June of dam removal year 2 and fluctuate between 10 mg/L and 100 mg/L through the remainder of dam removal year 2. Modeled SSCs do not exceed 100 mg/L for two consecutive weeks after June of dam removal year 2 since SSCs remain below 100 mg/L after June of dam removal year 2. The Proposed Project is not expected to increase SSCs above 100 mg/L for the typical median water year condition in post-dam removal year 1 (2021) with modeled SSCs always less than 100 mg/L, but SSCs may vary between approximately 1 and 100 mg/L in that year due to erosion of sediment deposits remaining in the reservoir footprint area. Thus, model results indicate SSCs would remain below the 100 mg/L for two consecutive weeks threshold of significance for SSCs after June of dam removal year 2.

Model predictions for typical wet year (WY1984) hydrologic conditions indicate a higher initial pulse of fine sediments following the Copco No. 1 Reservoir drawdown in early to mid-December of dam removal year 1, with concentrations at or near 400 mg/L. Model predictions indicate that for typical wet year conditions, the outlet capacity at Copco No. 1 Dam is exceeded during the same timeframe and the reservoir fills slightly (see Figure 3.2-17). Very high (greater than 1,000 mg/L) SSCs are experienced for approximately two months following the beginning of drawdown in the reservoirs, from January through February of dam removal year 2 (see Figure 3.2-17). SSCs reach approximately 7,100 mg/L, with peak values occurring in mid-February of dam removal year 2. SSCs generally return to less than 100 mg/L during the month of March, but then secondary peaks (approximately 1,000 mg/L) in SSCs occur in mid-April and June of dam removal year 2 for wet year (WY1984) hydrologic conditions. After the secondary peaks, SCCs again return to less than 100 mg/L by the beginning of July in dam removal year 2 and continues to decrease until SSCs are less than 30 mg/L by the end of July in dam removal year 2. Predicted SSCs increase again to levels between 200 to 400 mg/L during the end of dam removal year 2 (i.e., November) and the beginning of post-dam removal year 1 (2021) (i.e., January) before decreasing below 30 mg/L by February as high winter flows in the Klamath River flush sediments downstream that were not removed during drawdown. A secondary increase in SSCs to approximately 30 mg/L occurs around April to May in post-dam removal year 1 from a storm event, but rapidly decreases once Klamath River flows decrease.

As discussed for the *Hydroelectric Reach*, the shift in the Proposed Project Copco No. 2 drawdown timing from January 1 (Appendix B: *Detailed Plan*) to May 1 (Appendix B: *Definite Plan*) would not change the anticipated magnitude or timing of significant impacts due to elevated SSCs in the Hydroelectric Reach during dam removal year 2.

For all three water year types, predicted SSCs in the Middle and Lower Klamath River decrease to 60 to 70 percent of the Iron Gate Dam value by Seiad Valley (RM 132.7) and to 40 percent of the Iron Gate Dam value by about RM 58.9, downstream from Orleans (USBR 2012). SSCs in the Middle and Lower Klamath River and the Klamath River Estuary are predicted to resume modeled background levels (i.e., existing conditions) by the end of post-dam removal year 1 under all water year types, especially with revegetation of the reservoir sediments immediately following dam removal which would stabilize the sediment from erosion due to rainfall and reduce SSCs after drawdown compared to the modeled SSCs (USBR 2012). Modeled SSCs did not consider reductions in SSCs due to revegetation activities.

Modeled SSCs across the three water year types would have peak values of approximately 7,000 to 14,000 mg/L immediately downstream of Iron Gate Dam and these peak values would occur within two to three months of reservoir drawdown. Model results indicate SSCs in excess of 1,000 mg/L would occur on a timescale of weeks to months (see Table 3.2-13), as compared to SSCs greater than 1,000 mg/L that can occur during winter storm events on a timescale of days to weeks under existing conditions in the Klamath River downstream from Iron Gate Dam (see Appendix C, Section C.2.2.2 *[Suspended Sediments] Salmon River to Klamath River Estuary*). Predicted SSCs would remain greater than or equal to 100 mg/L for five to seven months following drawdown, and concentrations would remain greater than or equal to 30 mg/L for six to 10 months following drawdown (Table 3.2-13), as compared to suspended sediments downstream of Iron Gate Dam under existing conditions typically ranging from approximately 1 to 20 mg/L between May and December with only occasional peaks of approximately 56 to 437 mg/L (see Appendix C, Section C.2.2.2 *[Suspended Sediments] Salmon River to Klamath River Estuary*).

Similar to conditions downstream of J.C. Boyle and Copco No. 1, the higher maximum drawdown rate under the Proposed Project (i.e., 5 feet per day) than under modeled conditions is expected to increase peak SSCs and decrease the duration of elevated SSCs compared to modeled SSCs (see Section 3.2.4.2 *Suspended Sediments*), but variations in modeled SSCs due to a higher drawdown rate would be unlikely to reduce the duration of SSCs above 100 mg/L to less than two consecutive weeks under all water years types. Peak SSCs would be expected to double from approximately 7,000 to 14,000 mg/L immediately downstream of Iron Gate Dam under modeled conditions to approximately 14,000 to 28,000 mg/L under the higher drawdown rate in the Proposed Project, based on a previous analysis how suspended sediments vary

under different drawdown rates in Lower Klamath Project reservoirs (Stillwater Sciences 2008). The higher drawdown rate would also potentially decrease the duration of elevated suspended sediments by approximately one to two weeks since suspended sediments decrease more rapidly after peak SSCs occur due to the increased transport of reservoir deposits at the higher drawdown rate (Stillwater Sciences 2008). While potential decreases in the duration of elevated suspended sediments under a higher drawdown rate would be unlikely to significantly alter the duration of SSCs greater than 1,000 mg/L (i.e., peak SSCs) downstream of Iron Gate, the duration of modeled SSCs downstream of Iron Gate Dam greater than 100 mg/L would likely occur as SSCs decrease more rapidly following a higher drawdown rate. Modeled SSCs downstream of Iron Gate Dam were greater than 1,000 mg/L for two to three weeks and greater than 100 mg/L for five to seven weeks (Table 3.2-13), so SSCs still would likely be greater than 100 mg/L for at least three consecutive weeks under the higher drawdown rate in the Proposed Project. SSCs after drawdown would potentially decrease to less than 10 mg/L more rapidly under the Proposed Project than estimated by the modeled SSCs due to the increased transport of reservoir deposits at the higher drawdown rate. Thus, overall, the short-term impact based on an analysis of modeled SSCs downstream of Copco No. 1 would remain the same under the higher drawdown rate in the Proposed Project since SSCs is expected to exceed 100 mg/L for two consecutive weeks regardless of the drawdown rate.

Similar to Copco No. 1 Reservoir, sediment jetting within the Iron Gate reservoir footprint is anticipated to increase the magnitude of modeled SSCs downstream of Iron Gate during drawdown, but it would not alter the overall impact of suspended sediment in the Klamath River downstream of Iron Gate Dam during drawdown since the increase in SSCs due to sediment jetting would primarily occur during peak SSCs and sediment jetting would not increase the duration of SSCs greater than 100 mg/L by mobilizing more sediment only during drawdown. Klamath River flows during drawdown at Iron Gate Dam range from approximately 1,000 cfs in a Dry water year to 24,500 cfs in a Wet water year (see Appendix B: *Definite Plan – Section 4.6*). A typical sediment jetting flow would be approximately 10 to 30 cfs with SSCs the flow likely ranging from less than 1,000 mg/L to approximately 100,000 mg/L, assuming the Proposed Project operations would be similar to sediment jetting flows used on the Mill Pond Dam removal project, Washington Department of Ecology [2016]).

Sediment jetting in the Iron Gate Reservoir footprint during drawdown is estimated to typically increase SSCs by approximately 270 mg/L to 1,200 mg/L compared to modeled SSCs without sediment jetting, but SSCs would potentially increase up to approximately 1,700 mg/L based on the estimated sediment volume to transport by sediment jetting, the duration of drawdown, and the flow and SSCs for the Klamath River and the sediment jetting. The typical increase in SSCs would be the expected increase under the range of typical drawdown flows under all water year types, while the maximum increase in SSCs would only be

likely to occur under Klamath River minimum flows during a dry water year. Additionally, the maximum increase in SSCs from sediment jetting within the Iron Gate Reservoir footprint is a conservative estimate, since it assumes sediment jetting would mobilize all the sediment in the areas undergoing jetting. Drawdown flows would mobilize a portion of that sediment, so the actual maximum increase in SSCs would likely be less than 1,700 mg/L. SSCs in the Klamath River downstream of Iron Gate Dam would also be increased by sediment jetting activities in the Copco No. 1 reservoir footprint, so the overall SSCs increase in the Klamath River downstream of Iron Gate Dam from sediment jetting in both reservoirs during drawdown would typically range from 620 mg/L to 2,600 mg/L compared to modeled SSCs without sediment jetting, reaching up to approximately 3,900 mg/L if the maximum increase in SSCs from sediment jetting in Copco No. 1 and Iron Gate occurred simultaneously.

Sediment jetting would increase the magnitude of SSCs during drawdown, but most of the variations in the modeled SSCs during sediment jetting would be within the range of modeled SSCs and the increase in the magnitude would not extend beyond the drawdown period since sediment jetting would only occur during drawdown. Peak SSCs during drawdown under sediment jetting would potentially increase above the range of SSCs anticipated with the higher drawdown rate (i.e., 5 feet per day) with the maximum SSCs downstream of Iron Gate Dam potentially increasing from 14,000 to 28,000 mg/L (under only drawdown flows at a 5 feet per day drawdown rate) to approximately 17,900 to31,900 mg/L (under drawdown flows at a 5 feet per day drawdown rate with sediment jetting in both the Copco No. 1 and Iron Gate reservoir footprints). The SSCs under drawdown flows at the higher drawdown rate with or without sediment jetting would exceed the suspended sediments potential short-term significance criteria of 100 mg/L over a continuous two-week period. While the magnitude of SSCs would increase during drawdown with sediment jetting, the magnitude of SSCs would potentially decrease after drawdown is complete since sediment jetting would mobilize more sediment than anticipated under drawdown flows alone. Within the general uncertainty of the modeled SSCs and estimates of SSCs with sediment jetting (see Table 3.12-2), the SSCs in the Klamath River downstream of Iron Gate Dam with a higher drawdown rate (i.e., 5 feet per day) and sediment jetting would be similar to or less than the modeled SSCs without sediment jetting after drawdown ends in March.

Model results also indicate that tributary inflow would create dilution in the lower Klamath River that would decrease SSCs, so the SSCs at Seiad Valley (RM 132.7) would be 60 to 70 percent of the SSCs immediately downstream of Iron Gate Dam and SSCs at Orleans (approximately RM 59) would be 40 percent of the SSCs immediately downstream of Iron Gate Dam. However, modeled SSCs in the Middle and Lower Klamath River would be greater than 100 mg/L for two consecutive weeks or more during drawdown depending on the water year type (USBR 2012), thus there would be a substantial adverse impact on salmonids and beneficial uses throughout these reaches and in the Klamath River Estuary

in the short term. After consideration of the changes in modeled SSCs due to a higher maximum drawdown rate (i.e., 5 feet per day) and sediment jetting, SSCs in the Middle and Lower Klamath River and the Klamath River Estuary still would likely remain greater than 100 mg/L for two consecutive weeks or more. Accordingly, SSCs in the Middle and Lower Klamath River and Klamath River Estuary due to release of reservoir sediments under the Proposed Project would be a substantial adverse impact on water quality in the short term and also result in a substantial adverse impact to salmonids and associated designated beneficial uses. A more detailed analysis of the anticipated suspended sediment impacts on key fish species, including salmonids, in the lower river is presented in Section 3.3.5.1 *Suspended Sediment.*

Sediment release associated with the Proposed Project would cause short-term increases in suspended material (greater than 100 mg/L for two or more consecutive weeks) that would cause an exceedance of water quality standards. Additionally, sediment release associated with the Proposed Project would cause water quality changes that would result in a failure to maintain existing beneficial uses at the levels currently supported due to non-attainment of applicable Basin Plan water quality objectives for suspended material in the Middle and Lower Klamath River and the Klamath River Estuary; and substantial water quality changes that would adversely affect the cold freshwater habitat (COLD), rare, threatened, or endangered species (RARE), and migration of aquatic organisms (MIGR) beneficial uses. Sediment release associated with the Proposed Project would also result in non-attainment of applicable Hoopa Valley Tribe and Yurok Tribe narrative suspended material, settleable material, and sediment water quality objectives applicable the portions of the Klamath River within tribal boundaries.

Consistent with conditions described above in the *Hydroelectric Reach*, the short-term significant impact of increased SSCs due to dam removal in the Middle and Lower Klamath River and the Klamath River Estuary cannot be avoided or substantially decreased through reasonably feasible mitigation.

As discussed above for the *Hydroelectric Reach*, SSCs are expected to resume modeled background (i.e., existing conditions) SSCs by the end of post-dam removal year 1 regardless of the type of hydrology (dry, normal, or wet conditions) present during the drawdown period (USBR 2012). Thus, in the long term there would be no significant impact due to elevated SSCs in the Middle and Lower Klamath River and the Estuary due to the release of sediments currently trapped behind the Lower Klamath Project dams.

Pacific Ocean Nearshore Environment
Sediment transport modeling predicted that 1.2 to 2.3 million tons of sediment (5.4 to 8.6 million cubic yards, or 36 to 57 percent of the total sediments deposited behind the dams by 2020) would be eroded from the reservoir areas upon dam removal (USBR 2012) (see also Tables 2.7-7 through 2.7-9). The

range of potential erosion volumes is due to the range in potential water year types that could occur during the year of dam removal. The sediment transported by the Klamath River to the Pacific Ocean due to dam removal is expected to be less than the total amount transported in a typical wet year, but greater than that transported during a dry year. See Section 3.11.5 *[Soil, Geology, and Mineral Resources] Potential Impacts and Mitigation* and Figure 3.11-12 for further details.

The California Marine Life Protection Act (MLPA) 2008 Draft Master Plan identifies freshwater plumes as one of three prominent habitats with demonstrated importance to coastal species (California Marine Life Protection Act 2008). The California MLPA Master Plan Science Advisory Team (2011) Methods Report designates river plumes as a key habitat to be included in marine protected areas because they harbor a particular set of species or life stages, have special physical characteristics, or are used in ways that differ from other habitats. While Goal 4 of the California MPLA 2016 Final Master Plan for the North Coast specifies protection of habitats identified by the California MLPA Master Plan Science Advisory Team, the MPLA 2016 Final Master Plan does not explicitly consider freshwater plumes as one of the habitat types (CDFW 2016).

A recent USGS overview report on the sources, dispersal, and fate of fine sediment delivered to California's coastal waters (Farnsworth and Warrick 2007) found the following:

- Rivers dominate the supply of fine sediment to the California coastal waters, with an average annual flux of 34 million metric tons.
- All California coastal rivers discharge episodically, with large proportions of their annual sediment loads delivered over the course of only a few winter days.

Farnsworth and Warrick (2007) conclude that fine sediment is a natural and dynamic element of the California coastal system because of large, natural sediment sources and dynamic transport processes.

After exiting the river mouth, the high SSCs (greater than 1,000 mg/L) transported by the Lower Klamath River would form a surface plume of less dense (i.e., less salty), turbid, surface water floating on more dense, salty ocean water (Mulder and Syvitski 1995). No detailed investigations of the likely size and dynamics of the Klamath River plume have been conducted. Thus, it is not possible to predict the sediment deposition pattern and location in the nearshore environment with exactitude. However, the general dynamics and transport mechanisms of fine sediment can be surmised based upon regional oceanographic and sediment plume studies.

In northern California, plume zones are primarily north of river mouths because alongshore currents and prevailing winds are northward during periods of strong runoff (Geyer et al. 2000; Pullen and Allen 2000; Farnsworth and Warrick 2007;

California MLPA Master Plan Science Advisory Team 2011). Surface plumes occurring during periods of northerly upwelling-favorable winds will thin and stretch offshore, while in the presence of southern downwelling-favorable winds the plume may hug the coastline and mix extensively (Geyer et al. 2000; Pullen and Allen 2000; Borgeld et al. 2008). River plume area, location, and dynamics are also affected by the magnitude of river discharge, SSCs, tides, the magnitude of winter storms, and regional climatic and oceanographic conditions such as El Niño-Southern Oscillation (ENSO) and Pacific Decadal Oscillation climate cycles (Curran et al. 2002).

During several large flood events on the geographically near Eel River in the winter of 1997 and 1998, Geyer et al. (2000) found the following: (1) flood conditions were usually accompanied by strong winds from the southern quadrant; (2) the structure of the river plume was strongly influenced by the wind-forcing conditions; (3) during periods of strong southerly (i.e., downwelling favorable) winds, the plume [in the Pacific Ocean nearshore environment] was confined inside the 164 feet isobath (sea floor contour at 164 feet below the water surface), within about 4 miles of shore; (4) occasional northerly (upwelling favorable) winds arrested the northward motion of the plume and caused it to spread across the shelf; (5) transport of the sediment plume was confined to the inner shelf (water depths less than 164 feet), during both southerly and northerly wind conditions; (6) during southerly wind periods, fine, un-aggregated sediment was rapidly transported northward to at least 18 miles from the river mouth, but flocculated sediment was deposited within 0.6 to 6 miles of the river mouth; and (7) during northerly (upwelling favorable) winds, most of the sediment fell out within three miles of the mouth, and negligible sediment was carried farther offshore (Geyer et al. 2000). The Eel River mouth is 75 miles to the south of the Klamath River mouth and thus serves as a reasonable system for comparison.

Based upon Eel River plume studies and current knowledge of northern California oceanographic patterns, the fine sediment discharged to the Pacific Ocean nearshore environment under the Proposed Project would likely be delivered to the ocean in a buoyant river plume that hugs the shoreline as it is transported northward. However, since the flushing of sediments from behind the dams will occur over a number of weeks to months (and perhaps to some degree over one to two years), the plume carrying reservoir sediments would likely be influenced by a range of meteorological and ocean conditions (e.g., storm and non-storm periods, differing storm directions). Therefore, some of the time the plume would likely be constrained to shallower nearshore waters, while at other times it would likely extend further offshore and spread more widely, before depositing along the continental shelf in the vicinity of the mouth of the Klamath River.

The narrative California marine water quality objectives (Table 3.2-6) are applied as the threshold of significance rather than the freshwater numeric SSCs threshold of significance of 100 mg/L over a continuous two-week exposure

period since the Pacific Ocean nearshore environment is a marine environment and salmonids within the Pacific Ocean nearshore environment would have more of an opportunity to avoid elevated SSCs conditions compared to opportunities within the Klamath River. While elevated SSCs (10 to 100 mg/L) created in the nearshore plume would affect physical water quality characteristics specified in the Ocean Plan (e.g., visible floating particulates, natural light attenuation, the deposition rate of inert solids), the impacts would be within the range caused by historical storm events (i.e., less than that transported in a typical wet year). While the total amount of sediment delivered to the Pacific Ocean nearshore environment under the Proposed Project is within the historical range of annual sediment supplied to the Pacific Ocean nearshore environment by the Klamath River (USBR 2012; see Potential Impact 3.11-5), the duration of elevated SSCs under the Proposed Project would be greater than the range occurring under natural (i.e., storm) conditions. Natural storm conditions would be expected elevate SSCs in the Pacific Ocean nearshore environment on the time scale of days (Geyer et al. 2000), but SSCs would be elevated in the Pacific Ocean nearshore environment on the time scale of weeks to months based on duration of elevated SSCs modeled in the Klamath River downstream of Iron Gate Dam, at Seiad Valley (RM 132.7), and at Orleans (approximately RM 59) (USBR 2012). Thus, the elevated SSCs created in the nearshore plume under the Proposed Project in the short term would produce variations in the physical characteristics of the Pacific Ocean nearshore environment greater the duration occurring under natural (i.e., storm) conditions, potentially causing water quality changes that would result in a failure to maintain existing beneficial uses at the levels currently supported and resulting in a significant impact to the Pacific Ocean nearshore environment in the short term.

As discussed above for the Hydroelectric Reach and the Middle and Lower Klamath River and the Klamath River Estuary, model results indicate that the SSCs would resume modeled natural background levels by the end of post-dam removal year 1 regardless of the type of hydrology (dry, normal, or wet conditions) present during the drawdown period (USBR 2012). Thus, SSCs in the Pacific Ocean nearshore environment in the long term would be within the range of natural conditions, so the variations in the physical characteristics of the Pacific Ocean nearshore environment similar to natural conditions and there would be no significant impact on SSCs in the long term in the Pacific Ocean nearshore environment due to the release of sediments currently trapped behind the Lower Klamath Project dams. See Section 3.11.5 for analysis of sediment deposition along the nearshore environment due to dam removal.

In summary, the magnitude of SSCs released to the nearshore environment with the anticipated rapid dilution of an expanding sediment plume in the ocean is within the range of natural conditions, but the duration of elevated SSCs is greater than would occur under natural (i.e., storm) conditions. Therefore, elevated SSCs under the Proposed Project would potentially cause water quality changes that would result in a failure to maintain existing beneficial uses at the

levels currently supported, thus short-term increases in SSCs in the Pacific Ocean nearshore environment under the Proposed Project would be significant and unavoidable impact.

The Definite Plan (see Appendix B: *Definite Plan – Appendix M*) includes a Water Quality Monitoring Plan to assess the Proposed Project's impacts to water quality, and this plan includes turbidity and suspended sediment concentration monitoring along with adaptive management requirements. Please note that the State Water Board has authority to review and approve any final Water Quality Monitoring Plan through its water quality certification under Clean Water Act Section 401. The State Water Board has issued a draft water quality certification which sets forth water quality monitoring, adaptive management, and compliance requirements for any Water Quality Monitoring Plan to meet, as Condition 1 and Condition 2.[38] Condition 2 acknowledges that the Proposed Project will have temporary (short-term) exceedances of water quality objectives associated with reservoir drawdown and the export of reservoir sediments into the Klamath River and Pacific Ocean. Restoration projects may exceed water quality objectives in the short term in light of the long-term water quality and ecosystem benefits they provide.

Additionally, the Oregon Department of Environmental Quality has issued a water quality certification[39] that sets forth water quality monitoring and adaptive management conditions for points upstream of California, including an assessment of baseline river conditions upstream of dam removal operations.

Significance

Significant and unavoidable in the short term for the Hydroelectric Reach, Middle Klamath River, Lower Klamath River, Klamath River Estuary, and Pacific Ocean nearshore environment

No significant impact in the long term for the Hydroelectric Reach, Middle Klamath River, Lower Klamath River, Klamath River Estuary, and the Pacific Ocean nearshore environment.

[38] The State Water Board's draft water quality certification is available online at: https://www.waterboards.ca.gov/waterrights/water_issues/programs/water_quality_cert/docs/lower_klamath_ferc14803/lkp_dwqc.pdf (Accessed December 11, 2018).

[39] The Oregon Department of Environmental Quality's final water quality certification is available online at: https://www.oregon.gov/deq/FilterDocs/ferc14803final.pdf (Accessed December 14, 2018).

Potential Impact 3.2-4 Increases in suspended material from stormwater runoff due to pre-construction, dam deconstruction and removal, and restoration activities in the Hydroelectric Reach and the Middle Klamath River immediately downstream of Iron Gate Dam.

Under the Proposed Project, pre-construction activities with the potential to affect water quality include diversion tunnel modifications, road improvements, Iron Gate and Fall Creek hatchery modifications, Yreka pipeline modifications, and dam site preparation between June and November of dam removal year 1 (Table 2.7-1). Dam removal activities would begin in October of dam removal year 1 with removal of the Copco No. 1 Powerplant and would include demolition of the dams and their associated structures, power generation facilities, and transmission lines, installation of temporary cofferdams, hauling, recreation facilities removal, regrading of recreation access roads and parking areas, and other activities (Table 2.7-1). Immediately following dam removal, any potential non-natural fish barriers within the historical reservoir footprints would be modified as needed to enable volitional fish passage, which may include in-water work. Restoration activities would include irrigation system installation and maintenance, as well as active seeding, planting, and weed management in the reservoir footprint and disturbed upland areas within the Limits of Work (Table 2.7-1). For greater detail on these activities, please see Section 2.7 *Proposed Project*. All of the aforementioned activities could result in the disturbance of soil within the Limits of Work and result in loose sediment that could then be suspended in stormwater runoff during rainfall events. Please see Potential Impacts 3.2-16 and 3.22-2 for consideration of the accidental release of hazardous materials from construction equipment and/or vehicles under the Proposed Project.

Within the Limits of Work (Figures 2.2-5, 2.7-1, and 2.7-3), the Proposed Project includes the following construction and other ground-disturbing activities best management practices (BMPs) to reduce potential impacts to water quality in wetlands and other surface waters during construction and other ground-disturbing activities (Appendix B: *Definite Plan – Appendix J*):

- Pollution and erosion control measures will be implemented to prevent pollution caused by construction operations and to reduce contaminated stormwater runoff.
- Oil-absorbing floating booms will be kept onsite, and the contractor will respond immediately to aquatic spills during construction.
- Vehicles and equipment will be kept in good repair, without leaks of hydraulic or lubricating fluids. If such leaks or drips do occur, they will be cleaned up immediately.
- Equipment maintenance and/or repair will be confined to one location at each project construction site. Runoff in this area will be controlled to prevent contamination of soils and water.
- Dust control measures will be implemented, including wetting disturbed soils.

- A Stormwater Pollution Prevention Plan (SWPPP) will be implemented to prevent construction materials (fuels, oils, and lubricants) from spilling or otherwise entering waterways or waterbodies.

In addition, for the protection of wetlands, results of a wetland delineation would be incorporated into the Proposed Project design to avoid and minimize direct impacts on wetlands to the maximum extent feasible, and wetland areas adjacent to the construction Limits of Work would be fenced. As discussed in Potential Impact 3.5-1, there could be impacts to wetlands if the fencing does not include an appropriate buffer; implementation of Mitigation Measure TER-1, which stipulates a minimum 20-foot buffer requirement, would reduce potential short-term impacts on wetland communities to less than significant.

The BMPs identified above focus on general stormwater-related contamination, but their implementation is expected to also minimize or eliminate the potential for construction-related increases in suspended material that could enter wetlands and other surface waters located within the Limits of Work (Figures 2.2-5, 2.7-1, and 2.7-3), including the Hydroelectric Reach, tributaries of the Klamath River that enter this reach (as appropriate), or the Middle Klamath River immediately downstream of Iron Gate Dam. The Proposed Project does not, however, specifically identify BMPs for pre-construction, reservoir restoration, or upland restoration activities that would occur within the Limits of Work. Further, the proposed BMPs are not sufficiently comprehensive to avoid all potential violations of water quality standards or other degradation of water quality in affected portions of the wetlands, Hydroelectric Reach, tributaries to the Klamath River that enter this reach (as appropriate), or the Middle Klamath River immediately downstream of Iron Gate Dam, during these other periods of Proposed Project activity. Such violations of water quality standards or other related degradation of water quality would be a significant impact without mitigation. Implementation of mitigation measures WQ-1, TER-1, and HZ-1 would reduce any potential impacts not already addressed by the BMPs to less than significant.

Mitigation Measure WQ-1 Best Management Practices to reduce potential impacts to water quality due to pre-construction, dam removal, and restoration-related activities.
For the protection of all potentially affected waterbodies within the Limits of Work (see Figures 2.2-5, 2.7-2, and 2.7-4), the proposed construction BMPs (listed above) shall apply to all ground-disturbing activities occurring for the Proposed Project. Construction associated with these activities shall be subject to the BMPs required under the Construction General Permit.

Significance
No significant impact with mitigation

Potential Impact 3.2-5 Long-term alterations in mineral (inorganic) suspended material from the lack of continued interception and retention by the dams.

Under the Proposed Project, peak concentrations of mineral (inorganic) suspended material (silts and clays with a diameter less than 0.063 millimeters) during the winter/early spring (November through April) would likely continue to be associated with high-flow events following dam removal. Any long-term increases in mineral (inorganic) suspended material due to the lack of interception by the dams would not be large; estimates of baseline sediment delivery for the Klamath Basin indicate that a relatively small fraction of total sediment (151,000 tons per year or 2.4 percent of the cumulative average annual delivery from the basin) is supplied to the Klamath River on an annual basis from the watershed upstream of Iron Gate Dam due to the generally lower rates of precipitation and runoff, more resistant and permeable geologic terrain, and relatively low topographic relief and drainage density of the Upper Klamath Basin as compared with the lower basin (Stillwater Sciences 2010) (see also Section 3.11.2.4 *Sediment Load*). The majority of the mineral (inorganic) suspended material (6,086,471 tons per year or 97.6 percent of the cumulative average annual delivery from the basin) enters the Klamath River from tributaries downstream of Iron Gate Dam which is a pattern that is expected to continue following dam removal.

Long-term increases in suspended material from the lack of continued interception and retention of mineral (inorganic) suspended materials by the Lower Klamath dam are not expected to cause an exceedance or exacerbate an existing exceedance of a water quality standard or result in a failure to maintain a beneficial use. Accordingly, for the Hydroelectric Reach, the Middle and Lower Klamath River, the Klamath River Estuary, and the Pacific Ocean nearshore environment, there would be a less than significant long-term impact from removal of the dams on amounts or concentrations of mineral (inorganic) suspended material.

Significance

No significant impact

Potential Impact 3.2-6 Long-term alterations in algal-derived (organic) suspended material from the lack of continued interception and retention by the dams.

As discussed in Section 3.2.2 *Environmental Setting*, Section 3.4.2 *[Phytoplankton and Periphyton] Environmental Setting*, and Appendix C, Section C.2.1 *Upper Klamath Basin*, Upper Klamath Lake is a hypereutrophic system with considerable algae growth and suspended organic matter. Under existing conditions, the majority of the interception and retention of suspended material from upstream sources (Upper Klamath Lake, Klamath Straights Drain, Lost River) occurs in the Keno Impoundment/Lake Ewauna, with the largest relative decreases in TSS (total suspended solids) occurring between Link River and

Keno Dam (see Appendix C, Figure C-13). In addition to interception by the dams, concentrations of organic suspended material from upstream decrease in the rivers due to mechanical breakdown of dead and decaying algae in the turbulent river reaches between J.C. Boyle and Copco No. 1 reservoirs, and dilution from the springs downstream from J.C. Boyle Dam (see Appendix C, Section C.2.1). Mechanical breakdown and dilution from springs are ongoing processes that would continue under the Proposed Project.

Episodic increases (10 to 20 mg/L) in algal-dominated (organic) suspended material resulting from in-reservoir algal productivity are not expected to occur in the Hydroelectric Reach following dam removal (see Section 3.2.2.3 *Suspended Sediments*). At the upstream end of the Hydroelectric Reach (i.e., at the upstream of J.C. Boyle Reservoir) and prior to mechanical breakdown or dilution downstream of J.C. Boyle Dam, suspended materials may attain levels similar to those observed upstream of J.C. Boyle Dam under existing conditions during May through October (greater than 15 mg/L; see Appendix C) as algal-dominated organic suspended material is transported downstream. In the Hydroelectric Reach downstream of the J.C. Boyle Dam location to Iron Gate, mechanical breakdown in the existing and newly created free-flowing river reaches, along with dilution, would be likely to reduce concentration of algal-derived (organic) suspended material, but the exact magnitude of the reduction in algal-derived (organic) suspended material cannot be quantified with available data or models. Periphyton colonization and growth in the new free-flowing river portions of the Hydroelectric Reach (see Potential Impact 3.4-4 for more details) and potential macrophyte growth within slow-moving habitats in the Hydroelectric Reach may contribute to organic suspended material concentrations, but there are no data or models available for the Klamath River to quantify the magnitude of these potential increases in organic suspended material. Measurements of organic suspended sediment between 2001 and 2003 and median turbidity values over the long-term historical record (1950 to 2001) both follow a similar pattern, with values decreasing with distance downstream to J.C. Boyle Reservoir, indicating it is likely that the suspended sediment concentrations crossing the Oregon-California state line under the Proposed Project would not increase beyond typical existing conditions concentrations of 10 to 15 mg/L (see Section 3.2.2.1 and Appendix C, Section C.2).

While it is likely that mechanical breakdown and dilution within the Hydroelectric Reach would reduce algal-derived (organic) suspended material concentrations entering the Hydroelectric Reach, it is conservatively assumed that there would be no decrease in algal-derived (organic) suspended material within the Hydroelectric Reach since the reservoirs would no longer provide calm, slow-moving water conditions for algal-derived (organic) suspended material to settle out of the water column, and because potential increases in organic suspended material produced within the Hydroelectric Reach by possible periphyton and/or macrophyte growth cannot be quantified with available data and models. Thus, downstream of Iron Gate Dam, there potentially would be a slight relative long-

term increase in algal-dominated (organic) suspended materials under the Proposed Project, due to the conservative assumption that there would be no decrease in suspended material through the Hydroelectric Reach.

Following completion of the Proposed Project, it is very unlikely that suspended material would be produced in the Hydroelectric Reach at levels that would increase summertime algal-dominated (organic) suspended material in the Middle and Lower Klamath River beyond a sustained 100 mg/L for two weeks, or a lower concentration sustained over a longer period of time that would result in an adverse impact on the most sensitive beneficial use (cold freshwater habitat [COLD]) (e.g., 15 mg/L for 90 consecutive days, assuming sublethal effects – indications of major physiological stress). Note that 100 mg/L for two weeks is the water quality criterion adopted for significant adverse impacts on the COLD beneficial use during reservoir drawdown (see Section 3.2.3.1 *[Water Quality] Thresholds of Significance*). If slight long-term increases in suspended materials did occur during transit through the Hydroelectric Reach, such increases would be well below the algal-derived suspended material previously produced in Copco No. 1 and Iron Gate reservoirs and would not exceed levels that would substantially adversely affect the COLD beneficial use, or any other existing designated beneficial use at the levels currently supported, exacerbate an existing exceedance of water quality standards, or result in a failure to maintain an existing beneficial use. Future potential adverse impacts to beneficial uses could be determined using a "dose-response" approach such as the one adopted for this analysis (i.e., 100 mg/L for two consecutive weeks, or a lower concentration sustained over a longer period of time) or another approach appropriate to conditions under a dam removal scenario.

Significance
No significant impact

3.2.5.3 Nutrients

Potential Impact 3.2-7 Short-term increases in sediment-associated nutrients due to release of sediments currently trapped behind the dams.
Hydroelectric Reach, Middle and Lower Klamath River, and Klamath River Estuary
As discussed in Section 2.7.3 *Reservoir Sediment Deposits and Erosion During Drawdown*, a significant portion of the sediment anticipated to be removed during reservoir drawdown is dead phytoplankton [algae] that have settled on the reservoir bottom. These sediments are very high in nutrients. Short-term increases in total nitrogen (TN) and total phosphorus (TP) concentrations in the Hydroelectric Reach, Middle Klamath River, Lower Klamath River, Klamath River Estuary, and the Pacific Ocean nearshore environment would occur because the transported sediments are nutrient-rich. However, minimal deposition of fine suspended sediments, including associated nutrients, would occur in the river channel and the estuary (USBR 2012; Stillwater Sciences 2008). Further, reservoir drawdown under the Proposed Project would occur during winter

months when rates of primary production and microbially mediated nutrient cycling (e.g., nitrification, denitrification) are also expected to be low, such that nutrient uptake potential in the river reaches will be low during drawdown. Light limitation for primary producers that do persist during winter months is also likely to occur because of high turbidity; this would further decrease the potential for uptake of the TN and TP that are released along with reservoir sediment deposits. While there would be a temporary upward pulse in TP and TN away from the numeric TMDL targets, this pulse would not support the growth of nuisance and/or noxious phytoplankton or nuisance periphyton. Particulate nutrients released along with sediment deposits are not expected to be bioavailable, should be well-conserved during transport through the mainstem river and the estuary, therefore in the short-term sediment-associated TP and TN are not expected to result in a failure to maintain a beneficial use, or cause an exceedance or exacerbate an existing exceedance of a water quality standard. Overall, this short-term impact would be less than significant.

Pacific Ocean Nearshore Environment

Under the Proposed Project, fine sediments and associated nutrients released during reservoir drawdown would be dispersed as a buoyant river plume into the Pacific Ocean nearshore environment, where the sediments and associated nutrients would likely deposit along the continental shelf in the vicinity of the mouth of the Klamath River. Similar to conditions in the Klamath River and Klamath River Estuary, the biostimulatory effect of nutrient uptake from suspended or recently deposited fine sediments is expected to be low in the Pacific Ocean nearshore environment because reservoir drawdown would occur in winter when light availability is relatively low and primary productivity (i.e., phytoplankton growth) and microbially-mediated nutrient cycling are correspondingly low. In the summer following drawdown (dam removal year 2), resuspension of nutrients deposited on the continental shelf by coastal upwelling would make a negligible contribution to overall nutrient availability in the Pacific Ocean nearshore environment. This is because coastal upwelling near the mouth of the Klamath River supplies approximately 1,700 tons to 4,000 tons of nitrate per day per 100 meters of coastline, and approximately 225 tons to 450 tons of phosphate per day per 100 meters of coastline, using estimates for average California Current coastal upwelling near the Klamath River latitude (Bruland et al. 2001) and typical nutrient concentrations in coastal upwelling off the California coast (Bograd et al. 2009). Lower Klamath Project reservoir sediments would deposit between 1,200 tons to 5,500 tons of TN and 190 tons to 680 tons of TP along the continental shelf in the Pacific Ocean nearshore environment, based on the range of sediment TN (130 mg/kg to 2,800 mg/kg) and sediment TP (92 mg/kg to 370 mg/kg) from reservoir sediment cores (USBR 2011) and the range of sediment expected to erode during dam removal (1,460,000 tons to 2,310,000 tons; see also Section 2.7.3 *Reservoir Sediment Deposits and Erosion During Drawdown* and USBR [2012]). While only a fraction of the nutrients deposited on the continental shelf would have the potential to be resuspended during summer coastal upwelling, more nutrients would be supplied

to marine nearshore surface waters by coastal upwelling in two days than the maximum amount of nutrients associated with the Lower Klamath Project reservoir sediments that would be mobilized during dam removal.

In addition to TN and TP, micronutrients in the Lower Klamath Project reservoir sediments could act as biostimulatory substances in the Pacific Ocean nearshore environment, where micronutrient availability can limit biological production in coastal waters (Bruland et al. 1991). Iron in the Lower Klamath Project reservoir sediments is the most abundant micronutrient that could influence phytoplankton productivity in the Pacific Ocean nearshore environment, since iron is important in photosynthetic and respiratory electron transport, nitrate reduction, and N-fixation (Morel et al. 1991; Bruland et al. 2001; Street and Paytan 2005). Iron is typically supplied at very low rates (0.04 tons to 0.10 tons per day per 100 meters of coastline) by coastal upwelling (Bruland et al. 2001; Bograd et al. 2009), such that river discharges are the primary source of iron to the California nearshore coastal environment (Bruland et al. 2001). During high-flow winter conditions, iron associated with riverine suspended particles is delivered to the continental shelf, and during summer, iron is remobilized by coastal upwelling (Chase et al. 2007). In coastal regions with large riverine inputs and a broad continental shelf, phytoplankton productivity in the Pacific Ocean nearshore environment is not considered to be iron-limited, since the combination of riverine supply and continental shelf storage can meet phytoplankton iron needs through particle resuspension (Chase et al. 2005; Lohan and Bruland 2006). Coastal regions with narrower shelves (less storage) and lower river discharge (less supply) can have iron-limited phytoplankton productivity (Hutchins and Bruland 1998; Bruland et al. 2001).

Studies of iron availability along the Oregon coast (Chase et al. 2007) and the central California coast between Monterey Bay and Point Reyes (Bruland et al. 2001) have found the shape of the continental shelf in those regions to be sufficiently large that enough iron can be stored from winter deposition that the Pacific Ocean nearshore environment is not iron-limited. Narrower continental shelf regions, like those found along the central California coast near Big Sur, have been found to be iron-limited (Bruland et al. 2001). The iron availability in the Pacific Ocean nearshore environment at the mouth of the Klamath River is unknown, but the shape of the continental shelf near the mouth of the Klamath River is similar to the shape of the continental shelf along the Oregon coast and central California coast between Monterey Bay and Point Reyes, suggesting that Pacific Ocean nearshore environment along the Klamath River is not iron-limited.

Estimates of typical sediment transport to the Pacific Ocean nearshore environment from the Mid- and Lower Klamath Basin downstream of Iron Gate Dam (Stillwater Sciences 2010) combined with estimates of the iron content of soils in the Mid- and Lower Klamath Basin (USGS NGS 2008) indicate that the total iron delivered to the nearshore coastal environment and the continental shelf near the Klamath River ranges from approximately 194,000 tons to 390,000

tons per year. Estimates of the amount of sediment expected to be released during dam removal (Table 2.7-11) combined with estimates of the iron content of the sediment trapped behind the Lower Klamath Project dams (8,200 mg/kg to 32,000 mg/kg; USBR 2011) indicate that an additional 23,000 tons to 62,000 tons of iron would be contributed to the Pacific Ocean nearshore environment by sediment released during dam removal. The 6 percent to 32 percent short-term increase in total iron loading to the Pacific Ocean nearshore environment as a result of Lower Klamath Project dam removal would not significantly alter iron nutrient conditions in the Pacific Ocean nearshore environment, since only a fraction of the iron would be resuspended by coastal upwelling and only a fraction of the resuspended iron would occur in a bioavailable form (Morel et al. 1991; Bruland et al. 2001; Buck et al. 2007).

Overall, the short-term increases in sediment-associated nutrients (TN and TP) would be less than significant because any biostimulatory effects would be limited in winter months by naturally low phytoplankton productivity and diluted in summer months by much higher background levels of resuspended nutrients supplied by coastal upwelling. Short-term increases in sediment-associated micronutrients (iron) also would be less than significant since iron-limitation of phytoplankton is not expected to occur in the Pacific Ocean nearshore environment near the mouth of the Klamath River, and the additional iron loading from Lower Klamath Project sediment deposits would be small compared to typical annual iron loading rates from natural erosion processes in the Mid- and Lower Klamath Basin. Thus, TP and TN in the reservoir sediment releases would not cause objectionable aquatic growths or degrade indigenous biota (see Table 3.2-6), and these nutrients are not expected result in a failure to maintain a beneficial use or cause an exceedance or exacerbate an existing exceedance of a water quality.

The Definite Plan (see Appendix B: *Definite Plan – Appendix M*) includes a Water Quality Monitoring Plan to assess the Proposed Project's impacts to water quality, and this plan includes monitoring of total nitrogen and total phosphorous. Please note that the State Water Board has authority to review and approve any final Water Quality Monitoring Plan through its water quality certification under Clean Water Act Section 401. The State Water Board has issued a draft water quality certification which sets forth monitoring and adaptive management requirements for any Water Quality Monitoring Plan to meet, as Condition 1.[40] Additionally, the Oregon Department of Environmental Quality has issued a water

[40] The State Water Board's draft water quality certification is available online at: https://www.waterboards.ca.gov/waterrights/water_issues/programs/water_quality_cert/docs/lower_klamath_ferc14803/lkp_dwqc.pdf (Accessed December 14, 2018).

quality certification[41] that sets forth water quality monitoring and adaptive management conditions for points upstream of California. This EIR does not find that the effect of the Proposed Project on sediment-associated nutrients would be significant in either the short or the long term, and this analysis of Potential Impact 3.2-7 does not further discuss the water quality monitoring and adaptive management conditions.

Significance
No significant impact

Potential Impact 3.2-8 Long-term alterations in nutrients from the lack of interception and retention by the dams and conversion of the reservoir areas to a free-flowing river.
The two largest reservoirs in the Lower Klamath Project (Copco No. 1 and Iron Gate reservoirs) intercept and retain suspended material behind the dams, including nutrients (TP and TN) originating from upstream. Under the Proposed Project, these nutrients would be transported downstream and potentially be available for biological uptake (e.g., by periphyton [attached algae]). Analyses of the impacts of dam removal on nutrients have been conducted by PacifiCorp for its relicensing efforts (FERC 2007), the North Coast Regional Board for development of the California Klamath River TMDLs (North Coast Regional Board 2010), and the Yurok Tribe (Asarian et al. 2010) as part of an evaluation to improve previous nutrient budgets for the Klamath River and increase understanding of nutrient retention rates in free-flowing river reaches.

Hydroelectric Reach
The results of all the above-referenced evaluations (FERC 2007; North Coast Regional Board 2010; and Asarian et al. 2010) recognize the trapping efficiency of Copco No. 1 and Iron Gate reservoirs with respect to annual TP and TN, such that under the Proposed Project total nutrient concentrations in the Klamath River downstream from Iron Gate Dam would increase on an annual basis. However, the majority of the existing analyses results are focused on the Middle and Lower Klamath River downstream from Iron Gate Dam, rather than on the Hydroelectric Reach.

Modeling conducted for development of the California Klamath River TMDLs (North Coast Regional Board 2010) does provide some information applicable to the assessment of long-term impacts of the Proposed Project on nutrients at locations in the Hydroelectric Reach (Kirk et al. 2010). Klamath River TMDL model results indicate that if the Lower Klamath Project dams were to be removed ("TMDL dams-out, Oregon" [TOD2RN] scenario), TP and TN in the

[41] The Oregon Department of Environmental Quality's final water quality certification is available online at: https://www.oregon.gov/deq/FilterDocs/ferc14803final.pdf (Accessed December 14, 2018).

Hydroelectric Reach immediately downstream from J.C. Boyle Dam would increase slightly (by less than 0.015 mg/L TP and less than 0.05 mg/L TN) during summer months compared to existing conditions ("TMDL dams-in" [T4BSRN] scenario). This slight increase is due to the absence of nutrient interception and retention in both Keno Impoundment/Lake Ewauna and J.C. Boyle Reservoir. With respect to conditions in Keno Impoundment/Lake Ewauna, the Klamath River TMDL model assumes that the upstream Keno Dam is replaced by the historical natural Keno Reef in the "TMDL dams-out" scenario (TOD2RN and TCD2RN) but not in the "TMDL dams-in" scenario (T4BSRN). In the model, the Keno Reach is still partially impounded even though the reef's elevation is two feet lower than the current full pool elevation of Keno Impoundment/Lake Ewauna. While the Klamath River TMDL model assumption regarding Keno Reef does not materially influence model applicability to inform impact determinations for the Proposed Project and alternatives identified in this EIR, it could mean that the slight predicted increase in TP and TN under the modeled "TMDL dams-out" scenario (TOD2RN and TCD2RN) is an over-estimate under the Proposed Project, which does not propose any changes to Keno Dam, such that TP and TN concentrations in the Hydroelectric Reach immediately downstream from J.C. Boyle Dam would be the same as under existing conditions.

At the Oregon-California state line, the total nutrient supply also would be essentially the same under the Proposed Project as under existing conditions. The lack of hydropower peaking operations at J.C. Boyle Dam under the Proposed Project may result in decreased daily variation in TP and TN (North Coast Regional Board 2010). Overall however, the predicted nutrient changes are very small and thus this effect of the Proposed Project is not considered to be either a potential benefit or a potential impact. Further, the Klamath River TMDL model predictions generally agree with empirical data regarding J.C. Boyle Reservoir; with its shallow depth and short residence time, this reservoir does not retain high amounts of nutrients (PacifiCorp 2006a) (see Appendix C for more detail) and its removal would not be expected to increase long-term nutrient transport in the Hydroelectric Reach downstream of the Oregon-California state line.

It is important to note that the Klamath River TMDL model scenarios are useful for informing impacts associated with the Proposed Project and alternatives identified in Section 4 *Alternatives*, but they include as a starting assumption that there will be full implementation of the TMDLs. For example, the "TMDL dams-in" (T4BSRN) and "TMDL dams-out" (TOD2RN) scenarios for California both assume that water entering into California from Oregon meets California water quality standards for water temperature, organic enrichment/low dissolved oxygen, nutrients, pH, and microcystin. In other words, the starting point for the California models is that all necessary reductions in pollution to address the current impaired conditions at the Oregon-California state line for these constituents would already have been implemented upstream. The full TMDL

compliance modeling assumption does not reflect the existing conditions, and it would be speculative at this point to identify either the mechanisms necessary to implement the TMDLs or the timing required to achieve full compliance. However, the nutrient retention mechanism modeled for the reservoir reaches in the Klamath River TMDL would be the same even if model inputs for nutrients were increased to concentrations under existing conditions, such that the general trend indicated by the Klamath River TMDL model output (i.e., dam removal would slightly increase downstream transport of total nutrients) is still informative for conditions where full TMDL compliance has not occurred.

Based on available information, the slight nutrient increases in the Hydroelectric Reach would not be expected to result in exceedances of California North Coast Regional Board Basin Plan water quality objectives for biostimulatory substances beyond levels experienced under existing conditions. Further, the elimination of seasonal releases of dissolved forms of nutrients from anoxic reservoir bottom waters during periods of reservoir stratification would reduce nutrient availability for supporting large summer and fall phytoplankton blooms, including blue-green algae blooms, in Copco No. 1 and Iron Gate reservoirs (see also discussion for *Middle and Lower Klamath River and Klamath River Estuary*). While seasonal periphyton colonization would likely increase in this reach under the Proposed Project, the increases would be due to habitat increases (i.e., conversion of a reservoir into a riverine habitat) rather than nutrient increases (see Potential Impact 3.4-4). Further, the reservoir environment that supports the growth of nuisance phytoplankton blooms such as *Microcystis aeruginosa* and other blue-green algae would be eliminated under the Proposed Project (see Section 3.4 *Phytoplankton and Periphyton*), reducing the possibility of uptake of the slightly increased total nutrient concentrations by any nuisance and/or noxious phytoplankton blooms that might, however unlikely, occur in the riverine reaches that replace the reservoirs. The nuisance phytoplankton problem is mainly relevant for Copco No. 1 and Iron Gate reservoirs, where the longer residence times support seasonal nuisance phytoplankton blooms (see Section 3.4 *Phytoplankton and Periphyton*). Thus, under the Proposed Project, there would be a less than significant long-term increase in total nutrient levels in the Hydroelectric Reach from the lack of continued interception by the Lower Klamath Project dams and conversion of the reservoir areas to a free-flowing river, and a beneficial effect of eliminating seasonal releases of dissolved forms of nutrients from anoxic reservoir bottom waters.

Middle and Lower Klamath River and Klamath River Estuary
As described above in this potential impact analysis, Copco No. 1 and Iron Gate reservoirs currently intercept and retain suspended material behind the dams, including nutrients (TP and TN) associated with suspended material that originates upstream of the Hydroelectric Reach. Results of all the existing evaluations (FERC 2007; North Coast Regional Board 2010; Asarian et al. 2010) recognize the trapping function of the reservoirs with respect to TP and TN, and they provide results indicating that ending this trapping by converting the

reservoirs to free-flowing river reaches would, on an annual basis, result in a slight increase in *annual* TN and TP in the Middle and Lower Klamath River and the Klamath River Estuary. On a *seasonal* basis, the reservoirs can be a source of TP and TN in the form of dissolved nutrients (e.g., ortho-phosphorus, nitrate, and ammonium) to the Middle Klamath River, as nutrients contained within bottom sediments are released back into the water column under low dissolved oxygen conditions (see also Section 3.2.2.1 *Overview of Water Quality Processes in the Klamath Basin* and Figure 3.2-2). For example, in an analysis of nutrient dynamics in the Klamath River comparing the Klamath River TMDL model output against available empirical studies, while the *annual* modeled TP retention rate was approximately 6 percent for Iron Gate Reservoir and 1 percent for Copco No. 1, the model results indicated a *seasonal* TP release (2 percent to 40 percent) from Iron Gate Reservoir during late summer/fall, with the highest release (40 percent) occurring at reservoir fall turnover (see Figure 3.2-2 for a schematic of reservoir turnover), and a *seasonal* TP release (2 percent to 26 percent) from Copco No. 1 Reservoir during late summer/fall and into winter months. Similarly, albeit to a lesser degree, the *annual* modeled TN retention was approximately 18 percent for Iron Gate Reservoir, with a 4 percent *seasonal* release of TN in winter of the model year. For Copco No. 1, the annual modeled TN retention was 4 percent for Copco No. 1, with a *seasonal* release of 3 to 15 percent in winter months (North Coast Regional Board 2010, Appendix 3). Asarian et al. (2009) notes that the seasonal release of nutrients can occur periodically between the late summer and early winter, but on balance the annual retention of nutrients is greater than the seasonal releases.

Based on the Yurok Tribe analysis (Asarian et al. 2010), TP concentrations in the Middle and Lower Klamath River would increase by approximately 2 to 12 percent for the June through October period if the dams were to be removed, while increases in TN concentrations would be relatively larger, at an estimated 37 to 42 percent for June through October and 48 to 55 percent for July through September (see Figure 3.2-18). The Yurok Tribe conducted their analysis using two different approaches: (1) calculated reach-specific nutrient retention rates based on measured nutrient concentration data, and (2) predicted retention rates using an empirical relationship between observed retention rates and measured concentrations developed for the river from Iron Gate Dam to Turwar (this approach was only applicable to TN because TP data demonstrated a weak relationship between retention rate and measured TP concentrations). The two approaches used by the Yurok Tribe implicitly include nutrient recycling processes such as assimilative uptake for seasonal phytoplankton and periphyton growth and subsequent downstream release, as these processes were ongoing and inherently included in the retention estimates determined for existing conditions. The first (and only TP-applicable) approach indicated small increases in TP concentrations downstream from Iron Gate Dam under the Proposed Project, and a diminishment of this effect with distance downstream due to both tributary dilution and nutrient retention (i.e., uptake of nutrients). Both approaches yielded similar TN results, indicating relatively larger increases

in TN concentrations than the TP concentration, following the same diminishment pattern due to dilution and nutrient retention.

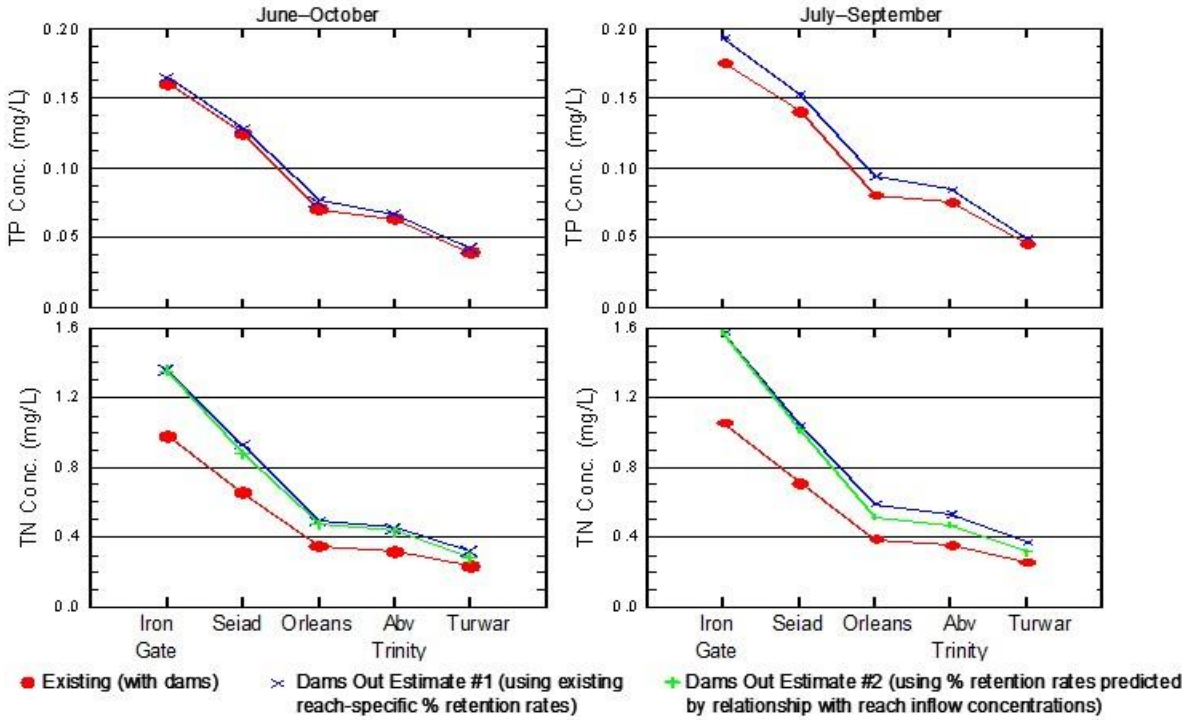

Figure 3.2-18. Comparison of Annual TP and TN Concentrations from Iron Gate Dam to Turwar (RM 5.6) for June–October and July–September 2007–2008: (a) Measured Current Conditions (Red Circle), (b) Dams-Out Estimate using Calculated Percent Retention Rates by Reach (Blue Cross), and (c) Dams-Out Estimate using Percent Retention Rates Predicted by the Empirical Relationship between Reach Inflow Concentration and Retention (Green Cross). Source: Asarian et al. 2010.

Unlike the Yurok Tribe analysis, the Klamath River TMDL modeling efforts include an assumption of full compliance with upstream TP and TN load allocations for California (North Coast Regional Board 2010). Despite this, results of the Klamath River TMDL model are in general agreement with PacifiCorp (FERC 2007) and Yurok Tribe (Asarian et al. 2010) analyses regarding dam removal impacts on nutrients, with very small annual increases in TP (0.01 to 0.015 mg/L) and relatively larger annual increases in TN (0.1 to 0.125 mg/L) immediately downstream from Iron Gate Dam due to dam removal. Increases in nutrients would diminish with distance downstream from Iron Gate Dam. It should be noted that while following the same relative trend as the Yurok Tribe analysis, the absolute increases predicted by the Klamath River TMDL model for the "TMDL dams-out" California scenario (TCD2RN) are much lower (e.g., 0.1 to 0.125 mg/L TN increase for the TMDL model vs. 0.1 to 0.5 mg/L TN

increase for the Yurok Tribe analysis). This finding is in accord with the prediction in Asarian et al. (2010) that decreased nutrient input into California would decrease the annual TN and TP effect of dam removal.

Variability in TP and TN are predicted by the Klamath River TMDL model (see Appendix D) under the "TMDL dams-out" California scenario (TCD2RN) during summer months, presumably due to nutrient uptake dynamics by periphyton and macrophytes in the free-flowing river segments that would replace the reservoirs. The Klamath River TMDL model does not include denitrification as a possible nitrogen removal term in river segments since it was determined the rocky river bed and high dissolved oxygen concentrations would not be favorable for denitrification bacteria and the corresponding denitrification process (Tetra Tech 2009). The absence of denitrification in the TMDL model is expected to have a minimal influence on modeled TN concentrations since river conditions are not favorable for the process, but TN concentrations being transported into the Middle Klamath River under the Proposed Project may be over-predicted. The magnitude of this potential over-prediction would be expected to increase with distance downstream (i.e., relatively lower over-prediction at Iron Gate Dam and the Upper Klamath Basin, but relatively higher over-prediction at sites in the lowest portion of the Klamath River such as Orleans), due to a longer distance of river within which denitrification and other nitrogen removal processes would operate. Corresponding small differences in ortho-phosphorus, nitrate, and ammonium concentrations under the Proposed Project (as compared with existing conditions, including TMDL compliance) are predicted by the Klamath River TMDL model; however, within the uncertainty of future nutrient dynamics these differences are not clearly discernable as increases or decreases. Klamath River TMDL model "dams-out" (TCD2RN) results indicate that while resulting mean (average) TP levels in any 30-day period from May to October would always meet the existing Hoopa Valley Tribe numeric water quality objective (0.035 mg/L TP) in all months at the Hoopa reach (approximately RM 45) of the Klamath River, the mean TN levels in any 30-day period from May to October would exceed the existing objective (0.2 mg/L TN) in May and portions of June by approximately 0.025 mg/L TN or less. The mean TN levels in any 30-day period for the modeled "natural conditions" (T1BSR) also exceed the Hoopa Valley Tribe existing TN water quality objective, but it would only exceed the TN objective for only several days in May and by less than 0.01 mg/L TN. However, the mean TN levels in any 30-day period from May to October for the modeled "dams-in" scenario (T4BSRN) comply with the existing objective throughout the applicable May to October period (North Coast Regional Board 2010). As noted previously, TN concentrations in the model may be over-predicted and therefore the Hoopa Valley Tribe objective may be met under the Proposed Project.

While there would be an increase in absolute nutrient concentrations entering the Middle Klamath River under the Proposed Project, phytoplankton, especially blue-green algae, would be limited in their ability to use those nutrients for growth and reproduction without calm reservoir habitat (Potential Impact 3.4-2). Further,

the elimination of potential seasonal releases of dissolved forms of nutrients from anoxic reservoir bottom waters and into downstream reaches of the Klamath River would reduce nutrient availability for phytoplankton during the growing season. Overall, the slight increase in annual nutrient concentrations would not result in significant biostimulatory impacts on phytoplankton growth under the Proposed Project relative to existing conditions, and the elimination of potential seasonal releases of dissolved nutrients from the reservoir bottom waters would be beneficial.

For periphyton, despite the overall increases in absolute nutrient concentrations anticipated under the Proposed Project, the small but relatively greater increases in TN also may not result in significant biostimulatory impacts during the growth season (i.e., late spring through fall). Existing data regarding TN:TP ratios suggest the potential for the Klamath River to be N-limited to the extent that there is a nutrient limitation. However, concentrations of both nutrients are high enough in the Klamath River from Iron Gate Dam to approximately Seiad Valley (RM 132.7) (and potentially further downstream) that nutrients are not likely to be limiting primary productivity (e.g., periphyton growth) in this more upstream portion of the Middle Klamath River (FERC 2007; HVTEPA 2008; Asarian et al. 2010). In addition, N-fixing species dominate the periphyton communities in the lower portions of the Middle Klamath River as well as the Lower Klamath River where inorganic nitrogen concentrations are low (Asarian et al. 2010, 2014, 2015). Since these species can fix their own nitrogen from the atmosphere, increases in TN due to dam removal may not significantly increase algal biomass in these reaches (see also Section 3.4 *Phytoplankton and Periphyton*).

In general, although dam removal would result in a slight long-term increase in annual TP and TN away from the numeric targets, such an increase would not support the growth of nuisance and/or noxious phytoplankton or nuisance periphyton. Therefore, in the long term the lack of continued interception of TN and TP on an *annual* basis by the Lower Klamath Project dams and conversion of the reservoir areas to a free-flowing river would not result in a failure to maintain a beneficial use or cause an exceedance or exacerbate an existing exceedance of a water quality. Overall, this would be a less than significant long-term impact. The elimination of potential seasonal releases of dissolved nutrients from the reservoir bottom waters to downstream reaches of the Klamath River would be beneficial.

Pacific Ocean Nearshore Environment

Copco No. 1 and Iron Gate reservoirs currently intercept and retain suspended material behind the dams, including nutrients (TN, TP) and micronutrients (iron) that are potentially important for phytoplankton growth in the Pacific Ocean nearshore environment. Similar to conditions in the Middle and Lower Klamath River and Klamath River Estuary, under the Proposed Project the Pacific Ocean nearshore environment also would experience a small increase in total annual nutrient concentrations on an annual basis since nutrients would no longer be

trapped upstream by the Lower Klamath Project dams. The slight nutrient increases would not be expected to result in exceedances of water quality objectives for biostimulatory substances beyond levels experienced under existing conditions for the reasons described under Potential Impact 3.2-7 in the Pacific Ocean nearshore environment (because in the winter any biostimulatory effect would be limited by low productivity and light availability and during summer, any increase in nutrients in the Pacific Ocean nearshore environment would amount to considerably less than the background supply of nutrients from coastal upwelling (Bruland et al. 2001; Bograd et al. 2009). Overall, under the Proposed Project, there would be a less than significant long-term increase in nutrients in the Pacific Ocean nearshore environment due to the lack of continued interception by the Lower Klamath Project dams and conversion of the reservoir areas to a free-flowing river.

Significance

No significant impact in the long term due to lack of annual interception and retention of total nutrients

Beneficial in the long term due to elimination of potential seasonal releases of dissolved nutrients

3.2.5.4 Dissolved Oxygen

Potential Impact 3.2-9 Short-term increases in oxygen demand and reductions in dissolved oxygen due to release of sediments currently trapped behind the dams.

Hydroelectric Reach

Under the Proposed Project, high SSCs are expected to occur along the reaches of the Klamath River downstream of reservoirs and within the Klamath Estuary during and following drawdown (see Potential Impact 3.2-3). Because reservoir sediment deposits contain unoxidized organic matter from algal detritus (see Section 3.2.2.3 *Suspended Sediments*), resuspension of these materials during reservoir drawdown is likely to reduce oxygen concentrations in downstream reaches until oxygen consumption is balanced by reaeration as the river continues to flow. To put it more in terms of biochemical processes, decomposition of algal detritus is facilitated by natural bacteria associated with reservoir sediments. Once suspended during dam removal and exposed to the water column, these sediments would result in an oxygen demand generated by microbial oxidation and as well as chemical oxidation of reduced mineral compounds in the sediment (e.g., sulfides), especially from deeper in the sediment profile.

To estimate the potential magnitude of oxygen depletion and recovery at various SSC levels along the Klamath River, a modeling approach was adapted from Streeter and Phelps (1925) including laboratory estimates of dissolved oxygen depletion from both the rapid or immediate oxygen demand (IOD) of oxygen-demanding substances such as ferrous iron, followed by the slower microbially

mediated biological oxygen demand (BOD) (Stillwater Sciences 2011). Using modeled estimates of SSC corresponding to expected river discharges during three representative water year types (see Section 3.2.5.2), the analysis of this potential impact accounts for changes in oxygen demand and river reaeration with distance (i.e., travel time of suspended sediments) to estimate corresponding dissolved oxygen concentrations in the various reaches of the Klamath River. Because prior analyses indicated that IOD and BOD are generally met at all expected SSC levels within the Klamath River (Stillwater Sciences 2011), the analysis below does not separately address potential impacts to the Pacific Ocean.

Modeled short-term oxygen demand as a function of SSC is not available for the Hydroelectric Reach. However, the results for the mainstem Klamath River downstream from Iron Gate Dam can also be applied to the Hydroelectric Reach. As a worst-case scenario, the reduction in dissolved oxygen due to short-term oxygen demand from sediment release in the Hydroelectric Reach is assumed to be the same as those for the Middle and Lower Klamath River. This is a conservative assumption because peak SSCs downstream from J.C. Boyle Reservoir would be much lower and present for a shorter duration (2,000 to 3,000 mg/L occurring within one to two months of reservoir drawdown) than those predicted downstream from Iron Gate Dam (7,000 to 14,000 mg/L occurring within two to three months of reservoir drawdown) (Figure 3.2-11 through Figure 3.2-13). As is the case for the Middle Klamath River immediately downstream of Iron Gate Dam (see below), short-term reductions in dissolved oxygen due to release of sediment deposits within the Lower Klamath Project reservoir footprints would substantially exacerbate an existing exceedance of applicable water quality standards and therefore be a significant and unavoidable impact for the Hydroelectric Reach.

Middle and Lower Klamath River and the Klamath River Estuary
Based on results of short-term oxygen demand modeling of estimated SSCs across dam removal year 1 and 2 (see also Section 3.2.4.4), IOD downstream from Iron Gate Dam would be 0.0 to 8.6 mg/L and BOD would be 0.3 to 43.8 mg/L for all water year types considered (i.e., wet, median, dry) and for six months following initiation of reservoir drawdown (see Table 3.2-14). The highest predicted IOD and BOD levels are anticipated to occur during February of dam removal year 2, and they would correspond to the peak SSCs in the river (Figure 3.2-15 through Figure 3.2-17).

During dam removal year 1, with initial dissolved oxygen assumed to be on the order of 70 percent and 80 percent saturation in November and December, respectively, the low IOD and BOD from initial drawdown results in a less than 1 mg/L decrease in dissolved oxygen concentrations during these two months within the first mile downstream from Iron Gate Dam (Table 3.2-14), followed by gradual increases to near saturation at locations farther downstream. Under an assumption that high initial dissolved oxygen conditions persist into January

through May of dam removal year 2, dissolved oxygen concentrations downstream from Iron Gate Dam would generally be greater than 5 mg/L despite the relatively high predicted IOD and BOD values (Table 3.2-14). Exceptions include predicted concentrations in February of dam removal year 1 for median (WY1976) and typical dry year (WY2001) hydrologic conditions, which exhibit minimum values of 3.5 mg/L and 1.3 mg/L, respectively. For all water year types (wet, median, dry), the predicted dissolved oxygen minimum values would occur by approximately RM 191 to RM 193.1 (approximately 0 to 2 miles downstream from Iron Gate Dam) and would return to at least 5 mg/L by approximately RM 178 to 180 (within 12 to 15 miles of the dam), or near the confluence with the Shasta River (RM 179.5).

Recognizing that IOD/BOD model results are sensitive to initial dissolved oxygen concentrations (Stillwater Sciences 2011), an additional modeling simulation was conducted to examine results assuming complete anoxia (i.e., 0 percent saturation) during dam removal year 2 (January through May) as an initial condition at Iron Gate Dam. Modeled dissolved oxygen concentrations remained below 5 mg/L downstream to RM 145 near the Scott River confluence during February of Dry Water Years, and as far downstream as RM 121.7, or 10 miles downstream of Seiad Valley (RM 132) in Normal and Wet Water Years (Table 3.2-14). At other times, dissolved oxygen concentrations generally recover before RM 134, near Seiad Valley (RM 132).

The Basin Plan water quality objective for dissolved oxygen is expressed as percent saturation (90 percent saturation). Assuming average February (2009) water temperatures, the water quality objective for November through April would range from 9.6 mg/L to 10.6 mg/L. Based on oxygen demand model results assuming high initial dissolved concentrations in dam removal year 2, recovery to the Basin Plan water quality objective of 90 percent saturation would occur generally within the reach from Seiad Valley (RM 132.7) to the mainstem confluence with Clear Creek (RM 100), or within a distance of 62 to 93 miles downstream from Iron Gate Dam for all water year types. Assuming low initial dissolved oxygen concentrations, recovery to the Basin Plan water quality objective of 90 percent saturation would occur generally farther downstream and within the reach from Clear Creek (RM 100) to the mainstem confluence with the Salmon River (RM 66), or 93 to 127 miles downstream from Iron Gate Dam for all water year types.

Thus, upstream of the Salmon River on the Middle Klamath River, short-term increases in IOD and BOD and reductions in dissolved oxygen due to release of sediments currently trapped behind the Lower Klamath Project dams would be a significant impact because reductions in dissolved oxygen below Basin Plan water quality objectives of 90 percent saturation for November through April (see also Table 3.2-5) would cause an exceedance of a water quality objective and a failure to maintain a beneficial use (COLD). Because physical removal of reservoir bottom sediments prior to drawdown is not feasible (Lynch 2011), and

dam removal alternatives to the Proposed Project that would alter the timing and amount of sediment mobilization would result in the same or greater adverse impacts to designated beneficial uses and/or fish (see Section 4.1.1.4 *Elimination of Potential Alternatives that Would Not Avoid or Substantially Lessen Significant Environmental Effects of the Proposed Project*), the short-term significant impact of increased IOD and BOD and decreased dissolved oxygen in the Middle Klamath River upstream of the Salmon River cannot be avoided or substantially decreased through reasonably feasible mitigation. Because re-aeration through the water surface is sufficient to satisfy the most conservative assumptions of low initial dissolved oxygen (0 percent saturation) combined with high initial IOD and BOD (February conditions of Normal and Wet Water Year hydrology), there would be no significant impact from reduced dissolved oxygen concentrations due to sediment releases at any locations downstream of the Salmon River confluence on the Middle Klamath River, including the Lower Klamath River and the Klamath River Estuary.

Table 3.2-14. Estimated Short-term Immediate Oxygen Demand (IOD) and Biochemical Oxygen Demand (BOD) by Month for Modeled Flow and SSCs Immediately Downstream from Iron Gate Dam Under the Proposed Project.

Date [1]	Boundary Conditions at Iron Gate Dam					Model Output Assuming High Initial Dissolved Oxygen[5]				Model Output Assuming Zero Initial Dissolved Oxygen[5]			
	Flow (cfs)[2]	SSC (mg/L)[3]	IOD (mg/L)	BOD (mg/L)	Avg. Temperature (deg C)[4]	Initial Dissolved Oxygen Downstream of Iron Gate Dam (mg/L)[6]	Minimum Dissolved Oxygen (mg/L)	Location of Minimum Dissolved Oxygen (RM)[7]	Modeled Location at Which Dissolved Oxygen Returns to 5 mg/L (RM)[7]	Initial Dissolved Oxygen Downstream of Iron Gate Dam (mg/L)[6]	Minimum Dissolved Oxygen (mg/L)	Location of Minimum Dissolved Oxygen (RM)[7]	Modeled Location at Which Dissolved Oxygen Returns to 5 mg/L (RM)[7]
Typical Wet Hydrology (WY 1984 Conditions Assumed)													
11/30	3,343	444	0.3	1.6	9.9	7.3	7.1	192.5	NA[8]	7.3	7.1	192.5	NA[8]
12/1	7,139	430	0.3	1.5	5	9.4	9.2	191.9	NA[8]	9.4	9.2	191.9	NA[8]
1/21	8,675	1,962	1.2	6.9	3.7	9.7	8.6	191.2	NA[8]	0.0	0.0	193.1	172.7
2/15	3,949	7,116	4.5	25.1	4.4	9.6	5.2	191.9	NA[8]	0.0	0.0	193.1	121.7
3/1	4,753	593	0.4	2.1	6.7	9.0	8.7	191.9	NA[8]	0.0	0.0	193.1	182.6
4/15	4,374	939	0.6	3.3	8.4	8.6	8.1	191.9	NA[8]	0.0	0.0	193.1	166.5

Date [1]	Boundary Conditions at Iron Gate Dam					Model Output Assuming High Initial Dissolved Oxygen[5]				Model Output Assuming Zero Initial Dissolved Oxygen[5]			
	Flow (cfs)[2]	SSC (mg/L)[3]	IOD (mg/L)	BOD (mg/L)	Avg. Temperature (deg C)[4]	Initial Dissolved Oxygen Downstream of Iron Gate Dam (mg/L)[6]	Minimum Dissolved Oxygen (mg/L)	Location of Minimum Dissolved Oxygen (RM)[7]	Modeled Location at Which Dissolved Oxygen Returns to 5 mg/L (RM)[7]	Initial Dissolved Oxygen Downstream of Iron Gate Dam (mg/L)[6]	Minimum Dissolved Oxygen (mg/L)	Location of Minimum Dissolved Oxygen (RM)[7]	Modeled Location at Which Dissolved Oxygen Returns to 5 mg/L (RM)[7]
5/15	4,169	711	0.4	1.5	17.4	7.0	6.7	192.5	NA[8]	0.0	0.0	193.1	134.2
Median Hydrology (WY 1976 Conditions Assumed)													
11/30	2,074	96	0.1	0.3	9.9	7.3	7.3	193.1	NA[8]	7.3	7.1	193.1	NA[8]
12/1	2,156	203	0.1	0.7	5	9.4	9.3	192.5	NA[8]	9.4	9.2	192.5	NA[8]
1/21	6,533	2,594	1.6	9.1	3.7	9.7	8.2	191.2	NA[8]	0.0	0.0	193.1	164.6
2/15	2,933	9,893	6.2	34.8	4.4	9.6	3.5	191.9	178.2	0.0	0.0	193.1	121.7
3/1	3,016	1,461	0.9	5.1	6.7	9.0	8.2	191.9	NA[8]	0.0	0.0	193.1	176.4
4/15	2,657	509	0.3	1.8	8.4	8.6	8.4	191.9	NA[8]	0.0	0.0	193.1	179.5
5/15	2,355	191	0.1	0.7	17.4	7.0	7.0	192.5	NA[8]	0.0	0.0	193.1	155.3

Date [1]	Boundary Conditions at Iron Gate Dam					Model Output Assuming High Initial Dissolved Oxygen[5]				Model Output Assuming Zero Initial Dissolved Oxygen[5]			
	Flow (cfs)[2]	SSC (mg/L)[3]	IOD (mg/L)	BOD (mg/L)	Avg. Temperature (deg C)[4]	Initial Dissolved Oxygen Downstream of Iron Gate Dam (mg/L)[6]	Minimum Dissolved Oxygen (mg/L)	Location of Minimum Dissolved Oxygen (RM)[7]	Modeled Location at Which Dissolved Oxygen Returns to 5 mg/L (RM)[7]	Initial Dissolved Oxygen Downstream of Iron Gate Dam (mg/L)[6]	Minimum Dissolved Oxygen (mg/L)	Location of Minimum Dissolved Oxygen (RM)[7]	Modeled Location at Which Dissolved Oxygen Returns to 5 mg/L (RM)[7]
Typical Dry Hydrology (WY 2001 Conditions Assumed)													
11/30	1,141	79	0	0.3	9.9	7.3	7.3	193.1	NA[8]	7.3	7.1	193.1	NA[8]
12/1	1,284	122	0.1	0.4	5	9.4	9.4	193.1	NA[8]	9.4	9.2	193.1	NA[8]
1/21	4,245	3,514	2.2	12.4	3.7	9.7	7.6	191.2	NA[8]	0.0	0.0	193.1	158.4
2/15	1,040	13,574	8.6	47.8	4.4	9.6	1.3	191.9	180.1	0.0	0.0	193.1	144.7
3/1	1,344	2,421	1.5	8.5	6.7	9.0	7.6	191.9	NA[8]	0.0	0.0	193.1	178.9
4/15	1,150	551	0.3	1.9	8.4	8.6	8.4	191.9	NA[8]	0.0	0.0	193.1	185.1
5/15	1,143	296	0.2	1.0	17.4	7.0	7.0	192.5	NA[8]	0.0	0.0	193.1	172.7

Source: Stillwater Sciences 2011

[1] Dam removal year 1 is represented by November and December, with dam removal year 2 represented by January through May.

[2] Predicted daily flow values from USBR hydrologic model output (USBR 2012). Daily flow values correspond to the peak suspended sediment concentration (SSC) for each month.

[3] Predicted peak suspended sediment concentration (SSC) by month from USBR model output (USBR 2012)

[4] Raw daily water temperature data for 2009 from https://www.pacificorp.com/energy/hydro/klamath-river/water-quality.html (PacifiCorp 2009a).

[5] Assumes 70% and 80% saturation during November and December of dam removal year 1, respectively, with either high (80%) or low (0%) initial dissolved oxygen during January through May of dam removal year 2

[6] Initial dissolved oxygen concentration downstream from Iron Gate Dam was calculated using average monthly water temperature, salinity = 0 ppt, and elevation = 707 m (2,320 ft).

[7] River miles (RM) listed are those used in Stillwater Sciences (2011). The river miles listed are different from those used in this EIR, because the river miles have been updated since 2011 based on slight changes in the river path.

[8] NA = not applicable because dissolved oxygen consistently remains greater than 5 mg/L at all locations downstream of Iron Gate Dam.

The Definite Plan (see Appendix B: *Definite Plan – Appendix M*) includes a Water Quality Monitoring Plan to assess the Proposed Project's impacts to water quality, and this plan includes turbidity and suspended sediment concentration monitoring along with adaptive management requirements. Please note that the State Water Board has authority to review and approve any final Water Quality Monitoring Plan through its water quality certification under Clean Water Act Section 401. The State Water Board has issued a draft water quality certification[42] which sets forth water quality monitoring, adaptive management, and compliance requirements for any Water Quality Monitoring Plan to meet, as Condition 1 *Water Quality Monitoring and Adaptive Management* and Condition 2 *Compliance Schedule.* Condition 2 acknowledges that the Proposed Project would have temporary (short-term) exceedances of water quality objectives associated with reservoir drawdown and the export of reservoir sediments into the Klamath River and Pacific Ocean. Restoration projects may cause exceedances of water quality objectives in the short term in light of the long-term water quality and ecosystem benefits they provide. Additionally, the Oregon Department of Environmental Quality has issued a water quality certification[43] that sets forth water quality monitoring and adaptive management conditions for points upstream of California, including an assessment of baseline river conditions upstream of dam removal operations.

Significance

Significant and unavoidable in the short term for Hydroelectric Reach and Middle Klamath River from Iron Gate Dam to the Salmon River

No significant impact in the short term for the Middle Klamath River downstream from the Salmon River, in the Lower Klamath River, or in the Klamath River Estuary

Potential Impact 3.2-10 Long-term alterations in dissolved oxygen concentrations and daily variability due to conversion of the reservoir areas to a free-flowing river.

Hydroelectric Reach

Modeling conducted for development of the Klamath River TMDLs indicates that in the long term under the "TMDL dams-out" scenario for Oregon reaches (TOD2RN), average dissolved oxygen concentrations in the Hydroelectric Reach downstream of J.C. Boyle Dam and at the Oregon-California state line would be the same or slightly greater during July through October than those under the

[42] The State Water Board's draft water quality certification is available at: https://www.waterboards.ca.gov/waterrights/water_issues/programs/water_quality_cert/docs/lower_klamath_ferc14803/lkp_dwqc.pdf (Accessed December 14, 2018).

[43] The Oregon Department of Environmental Quality's final water quality certification is available at: https://www.oregon.gov/deq/FilterDocs/ferc14803final.pdf (Accessed December 14, 2018).

"TMDL dams-in" scenario (T4BSRN) (North Coast Regional Board 2010). The same pattern is predicted for 30-day mean minimum and 7-day mean minimum dissolved oxygen criteria. With respect to daily variability in dissolved oxygen, the Klamath River TMDL model predicts somewhat reduced variability under the "TMDL dams-out" scenario for California reaches (TCD2RN) as compared to the "TMDL dams-in" scenario (T4BSRN) (Figure 3.2-19). The predicted decreases in daily variability at the Oregon-California state line may be due to elimination of hydropower peaking operations; however, since daily variability in dissolved oxygen is not currently an issue in the J.C. Boyle Peaking Reach, slightly reducing this variability would not be considered a beneficial effect.

For the free-flowing reaches of the river replacing Copco No. 1 and Iron Gate reservoirs, long-term dissolved oxygen levels in the river would differ substantially from the super-saturation (i.e., greater than 100 percent saturation) that currently occurs in surface waters and the hypolimnetic oxygen depletion in that occurs in bottom waters of the reservoirs during the April/May through October/November period (see Section 3.2.2.5 *Dissolved Oxygen*). Dissolved oxygen in the free-flowing reaches of the river replacing the reservoirs would not exhibit such extremes and would instead show the typical dissolved oxygen concentrations of a flowing river. Long-term increases in summer and fall dissolved oxygen would be beneficial. Long-term dissolved oxygen levels or variability during winter and spring would not be significantly different under the Proposed Project compared to existing conditions, so the Proposed Project would not have the potential to cause or substantially exacerbate an exceedance of water quality standards or result in a failure to maintain existing beneficial uses currently supported, and would therefore have a less than significant impact on winter and spring dissolved oxygen concentrations for the Hydroelectric Reach.

Note that the Klamath River TMDL model scenarios are useful for informing impacts associated with the Proposed Project and alternatives identified in Section 4 *Alternatives*, but they include as a starting assumption that there will be full implementation of the TMDLs. For example, the "TMDL dams-in" (T4BSRN) and "TMDL dams-out" (TOD2RN) scenarios for California both assume that water entering into California from Oregon meets California water quality standards for water temperature, organic enrichment/low dissolved oxygen, nutrients, pH, and microcystin. In other words, the starting point for the California models is that all necessary reductions in pollution to address the current impaired conditions at the Oregon-California state line for these constituents would already have been implemented upstream. The full TMDL compliance modeling assumption does not reflect the existing conditions, and it would be speculative at this point to identify either the mechanisms necessary to implement the TMDLs or the timing required to achieve full compliance. However, the dissolved oxygen mechanism modeled in the Klamath River TMDLs would be the same even if model inputs for dissolved oxygen were changed to concentrations under existing conditions, such that the general trend indicated by the Klamath River TMDL model output (i.e., dam removal would

eliminate the seasonal thermal stratification and phytoplankton bloom patterns that occur in the reservoirs under existing conditions and affect dissolved oxygen) is still informative for conditions where full TMDL compliance has not occurred.

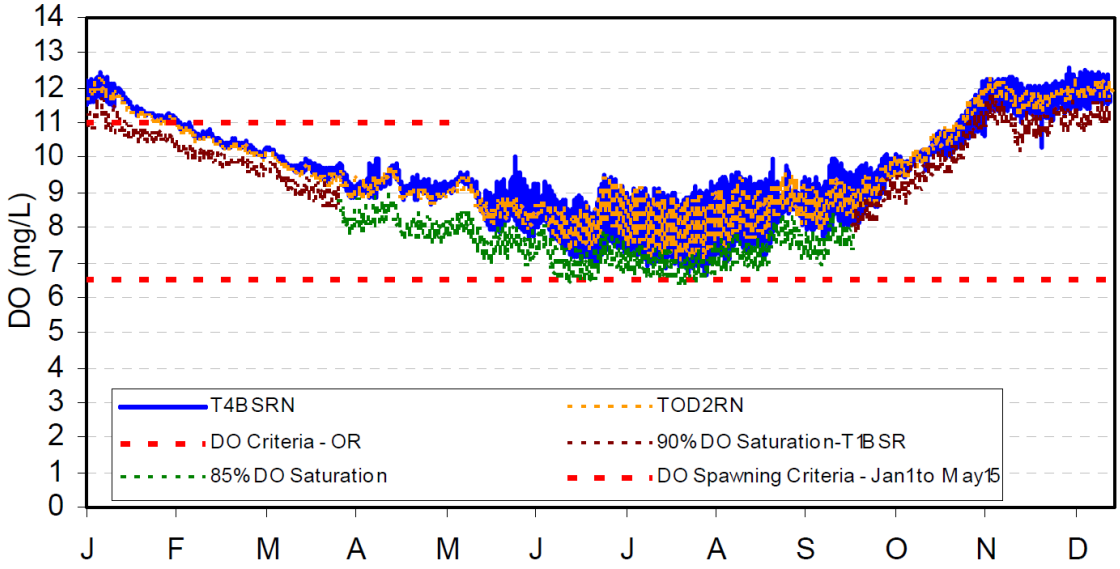

Figure 3.2-19. Predicted Dissolved Oxygen at the Oregon-California State Line (RM 214.1) for the Klamath River TMDL Scenarios Similar to the Proposed Project ("TMDL dams-out, Oregon" [TOD2RN] Scenario) and Existing Conditions ("TMDL dams-in" [T4BSRN] Scenario). Source: North Coast Regional Board 2010.

Middle and Lower Klamath River, Klamath River Estuary, and Pacific Ocean Nearshore Environment

The 2004/2005 KRWQM results using 2001 to 2004 data indicate that substantial improvements in long-term dissolved oxygen may occur immediately downstream from Iron Gate Dam if the Lower Klamath Project dams are removed, with increases of three to four mg/L possible during summer and late fall (PacifiCorp 2005a). The 2004/2005 KRWQM output also predicts greater daily variations in dissolved oxygen concentrations downstream from Iron Gate Dam to the Trinity River confluence (RM 43.3) in the absence of the Lower Klamath Project dams, based upon the assumption that periphyton growth would occur in this reach if the dams were removed and would increase daily dissolved oxygen fluctuations due to photosynthetic oxygen production and respiratory consumption. However, the magnitude and spatial trends in total nitrogen and chlorophyll-*a* concentrations estimated by the 2004/2005 KRWQM were different than measured total nitrogen and chlorophyll-*a* concentrations. The 2004/2005 KRWQM total nitrogen concentrations remained essentially unchanged from Iron Gate Dam to the Klamath River Estuary, but field measurements showed that total nitrogen concentrations typically decrease between Iron Gate Dam and the Klamath River Estuary. Additionally, a comparison of modeled and measured

chlorophyll-*a* concentrations indicated that the 2004/2005 KRWQM consistently overestimated the chlorophyll-*a* concentrations in the Iron Gate Dam to Klamath River Estuary reach of the Klamath River (Asarian and Kann 2006b), suggesting that the model was overestimating algal growth in the Klamath River. While the cause of the discrepancy between the modeled and measured total nitrogen and chlorophyll-*a* was not determined, the assumption of relatively high nutrient contributions from tributaries was identified as a potential source of the discrepancy (Asarian and Kann 2006b). Thus, the 2004/2005 KRWQM results likely consistently overestimate phytoplankton and periphyton growth in the Klamath River downstream of Iron Gate Dam and the associated dissolved oxygen production and respiration, and therefore the 2004/2005 KRWQM dissolved oxygen results would likely overestimate the daily variations in dissolved oxygen.

Like the 2004/2005 KRWQM model, the Klamath River TMDL model (see Appendix D) also indicates that under the "TMDL dams-out" scenario for California reaches (TCD2RN), long-term dissolved oxygen concentrations immediately downstream from Iron Gate Dam during July through November would be greater than those under the "TMDL dams-in" scenario (T4BSRN), due to the lack of stratification and oxygen depletion in bottom waters in the upstream reservoirs as compared with a free-flowing river condition (see Figure 3.2-20). Although the Klamath River TMDL model assumes full TMDL compliance (see below discussion regarding applicability of this assumption for analysis of the Proposed Project), the "TMDL dams-in" scenario (T4BSRN) results follow the same basic trend as existing conditions dissolved oxygen concentrations immediately downstream of Iron Gate Dam, where concentrations regularly fall below 8.0 mg/L and the Basin Plan minimum dissolved oxygen criteria of 85 to 90 percent saturation (depending on season) (see also Section 3.2.2.5 *Dissolved Oxygen*). Under existing conditions, low dissolved oxygen concentrations during late summer and fall continue to occur immediately downstream of Iron Gate Dam despite ongoing turbine venting at the Iron Gate Powerhouse required under KHSA Interim Measure 3.

The Klamath River TMDL model also predicts that daily fluctuations in dissolved oxygen immediately downstream of Iron Gate Dam during June through October would be greater under the "TMDL dams-out" scenario for California reaches (TCD2RN) than the "TMDL dams-in" scenario (T4BSRN) (Figure 3.2-20), a condition potentially linked to periphyton establishment in the free-flowing reaches of the river that are currently occupied by reservoirs, and associated daily swings in photosynthetic oxygen production and respiratory consumption. Again, although the Klamath River TMDL model assumes full TMDL compliance (see below discussion regarding applicability of this assumption for analysis of the Proposed Project), the "TMDL dams-in" scenario (T4BSRN) results follow the same basic trend as existing conditions dissolved oxygen percent saturation immediately downstream of Iron Gate Dam, where concentrations regularly fall below the Basin Plan minimum dissolved oxygen criteria of 85 to 90 percent

saturation during June through October (see also Section 3.2.2.5 *Dissolved Oxygen*).

Differences in long-term dissolved oxygen concentrations and percent saturation between the "TMDL dams-out" scenario and the "TMDL dams-in" scenario diminish with distance downstream from Iron Gate Dam, with similar or the same predicted dissolved oxygen concentrations and similar magnitude and duration of daily fluctuations by Seiad Valley (RM 132.7) and no differences by the confluence with the Trinity River (RM 43.3) (see Figure 3.2-20 to Figure 3.2-23). The Klamath River TMDL model trends are consistent with existing conditions for this reach (see also Section 3.2.2.5 *Dissolved Oxygen*).

At modeled locations, the Klamath River TMDL model indicates consistent compliance with the Basin Plan water quality objective of 85 percent saturation (see Figure 3.2-20 to Figure 3.2-23). Further downstream, near the confluence with the Trinity River (see Figure 3.2-23), results also indicate that while minimum values may occasionally dip below the current Hoopa Valley Tribe minimum water quality objective (8 mg/L, applicable at approximately RM 45), they would not fall below the 85 percent saturation objective modeled for the TMDL and would likely also not fall below the 90 percent saturation[44] Hoopa Valley Tribe objective[45]. Winter time (January through March) dissolved oxygen concentrations would be slightly lower under the Proposed Project but would not fall below Basin Plan minimum criteria for the winter season (90 percent saturation). The Klamath River TMDL model trends are consistent with existing conditions for this reach (see also Section 3.2.2.5 *Dissolved Oxygen*).

Note that the Klamath River TMDL model scenarios are useful for informing impacts associated with the Proposed Project and alternatives identified in Section 4 *Alternatives*, but they include as a starting assumption that there will be full implementation of the TMDLs. For example, the "TMDL dams-in" (T4BSRN) and "TMDL dams-out" (TOD2RN) scenarios for California both assume that water entering into California from Oregon meets California water quality standards for water temperature, organic enrichment/low dissolved oxygen, nutrients, pH, and microcystin. In other words, the starting point for the California models is that all necessary reductions in pollution to address the current impaired conditions at the Oregon-California state line for these constituents would already have been implemented upstream. The full TMDL compliance modeling assumption does not reflect the existing condition, and it would be speculative at this point to identify either the mechanisms necessary to

[44] This objective is not shown in Figure 3.2-23, but the general trend for 90 percent saturation can be estimated from the 85 percent saturation shown in the figure.

[45] As noted, there is no difference between the "TMDL dams-in" and "TMDL dams-out" scenarios by the confluence with the Trinity River where the Hoopa Valley Tribe's water quality standards are applicable.

implement the TMDLs or the timing required to achieve full compliance. However, the dissolved oxygen mechanism modeled in the Klamath River TMDLs would be the same even if model inputs for dissolved oxygen were changed to concentrations under existing conditions, such that the general trend indicated by the Klamath River TMDL model output (i.e., dam removal would eliminate the seasonal thermal stratification and phytoplankton bloom patterns that occur in the reservoirs under existing conditions and affect dissolved oxygen) is still informative for conditions where full TMDL compliance has not occurred.

Under the Proposed Project, the magnitude of the increased daily fluctuations in dissolved oxygen immediately downstream from Iron Gate Dam predicted by the PacifiCorp and Klamath River TMDL modeling efforts contain some uncertainty since the role of photosynthesis and community respiration from periphyton growth in the free-flowing reaches of the river that would replace the reservoirs at the Lower Klamath Project is unknown because nutrient cycling and resulting rates of primary productivity under modeled existing conditions are uncertain (see Section 3.4 *Phytoplankton and Periphyton*). Although the magnitude of the increased variability is somewhat uncertain, the overall daily fluctuations in dissolved oxygen are expected to increase in the Middle Klamath River from immediately downstream of Iron Gate Dam to Seiad Valley under the Proposed Project, especially during summer and fall. Even with the increase in daily fluctuations, the dissolved oxygen concentrations from immediately downstream of Iron Gate Dam to Seiad Valley would remain above Basin Plan dissolved oxygen saturation objectives throughout the year, so the Proposed Project would have a less than significant impact on dissolved oxygen in the long term. Downstream of Seiad Valley, the daily fluctuations in dissolved oxygen under the Proposed Project would be similar to existing conditions with the dams and the Proposed Project would have no impact. In addition to the increase in daily fluctuations, the removal of the Lower Klamath Project under the Proposed Project would cause beneficial long-term increases in summer and fall dissolved oxygen in the Middle Klamath River immediately downstream from Iron Gate Dam. Long-term decreases in winter and spring dissolved oxygen in the Middle Klamath River would be less than significant since the dissolved oxygen concentration would remain above Basin Plan dissolved oxygen saturation objectives. Effects would diminish with distance downstream from Iron Gate Dam, such that there would be no measurable impacts on dissolved oxygen by transition to the Lower Klamath River (i.e., the confluence with the Trinity River) and no impacts to the Klamath River Estuary or the Pacific Ocean nearshore environment.

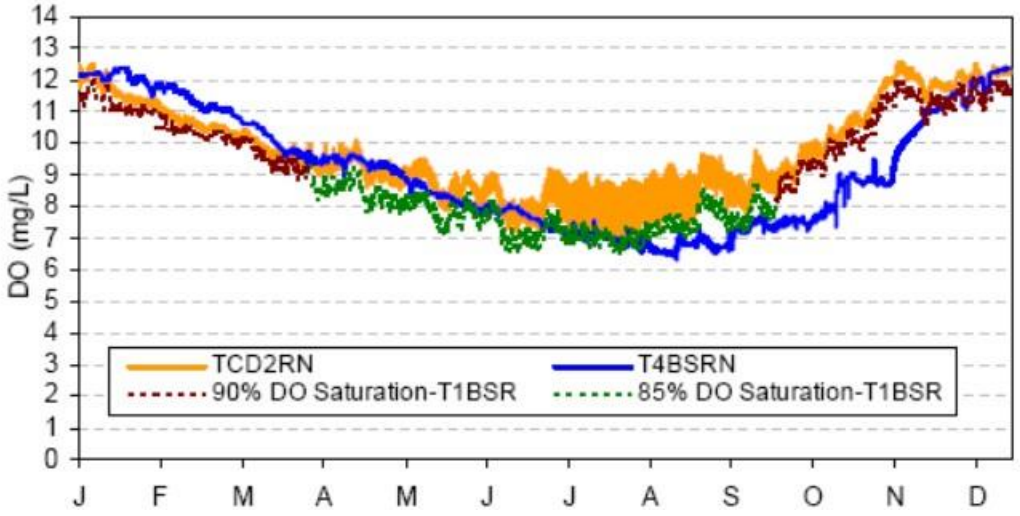

Figure 3.2-20. Predicted Dissolved Oxygen Downstream from Iron Gate Dam for the Klamath River TMDL Scenarios Similar to the Proposed Project ("TMDL dams-out, Oregon" [TOD2RN] Scenario) and Existing Conditions ("TMDL dams-in" [T4BSRN] Scenario). Source: North Coast Regional Board 2010.

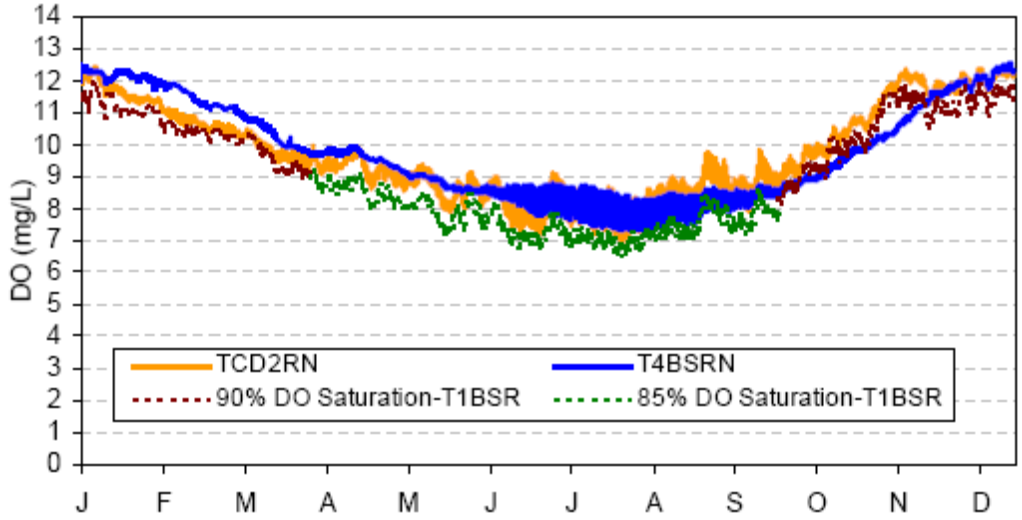

Figure 3.2-21. Predicted Dissolved Oxygen Downstream from the Mainstem Confluence with the Shasta River (RM 179.5) for the Klamath River TMDL Scenarios Similar to the Proposed Project ("TMDL dams-out, Oregon" [TOD2RN] Scenario) and Existing Conditions ("TMDL dams-in" [T4BSRN] Scenario). Source: North Coast Regional Board 2010.

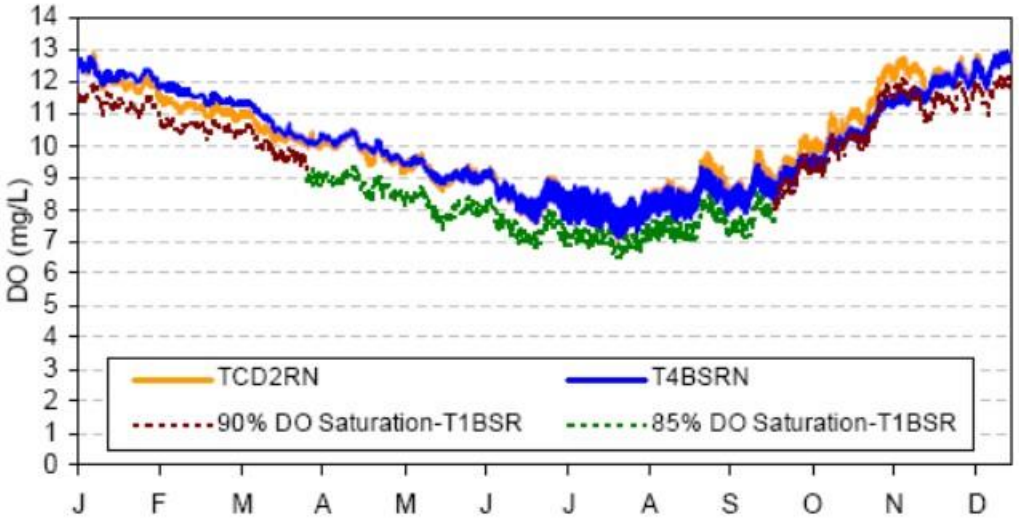

Figure 3.2-22. Predicted Dissolved Oxygen at Seiad Valley (RM 132.7) for the Klamath River TMDL Scenarios Similar to the Proposed Project ("TMDL dams-out, Oregon" [TOD2RN] Scenario) and Existing Conditions ("TMDL dams-in" [T4BSRN] Scenario). Source: North Coast Regional Board 2010.

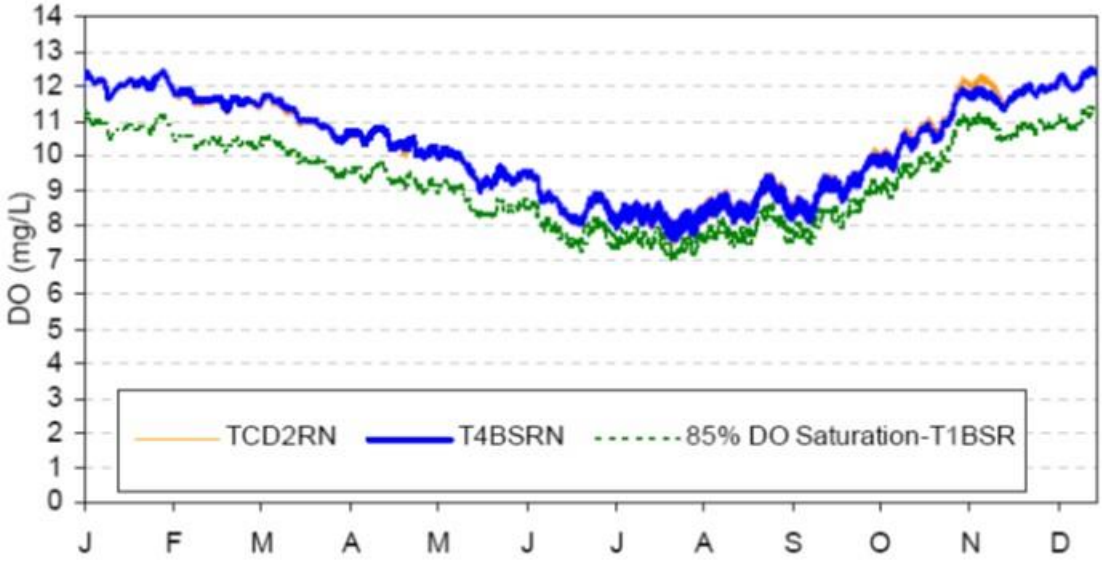

Figure 3.2-23. Predicted Dissolved Oxygen Just Upstream of the Confluence with the Trinity River (RM 43.3) for the Klamath River TMDL Scenarios Similar to the Proposed Project ("TMDL dams-out, Oregon" [TOD2RN] Scenario) and Existing Conditions ("TMDL dams-in" [T4BSRN] Scenario). Source: North Coast Regional Board 2010.

Significance

No significant impact for daily fluctuations in the Hydroelectric Reach and the Middle Klamath River immediately downstream of Iron Gate Dam

Beneficial for elimination of summer and fall extremes in the Hydroelectric Reach and the Middle Klamath River immediately downstream of Iron Gate Dam

No significant impact for winter and spring concentrations in the Hydroelectric Reach and Middle Klamath River

No significant impact in the Lower Klamath River, Klamath River Estuary, and Pacific Ocean nearshore environment

3.2.5.5 pH

Potential Impact 3.2-11 Alterations in pH and daily pH fluctuations due to a conversion of the reservoir areas to a free-flowing river.

Surface water pH in the water quality Area of Analysis may be affected by changes in the amount of photosynthesis occurring during the summer and fall in the Klamath River. Conversion of the reservoir areas to a free-flowing river would change the available habitat for phytoplankton and/or periphyton, and changes in the growth patterns of these organisms would then change overall pH levels and variability in pH over a diel cycle (i.e., 24-hour period). The Hoopa Valley Tribe water quality objective for pH (7.0 to 8.5) is met the vast majority of the time under the Proposed Project (similar to the TMDL dams-out" [TCD2RN] scenario) for the Middle Klamath River at the reach of Hoopa jurisdiction (approximately RM 45), with a small number of predicted pH values of approximately 8.6 in summer months (July and August).

Hydroelectric Reach

While the Hydroelectric Reach is not currently identified as being impaired for pH specifically and the California Klamath River TMDLs do not include specific allocations or targets for pH itself, pH is identified as a secondary indicator of biostimulation, and pH impacts (i.e., exceedances of Basin Plan numeric pH objectives, see Table 3.2-3) are closely related to excessive nutrient inputs to the Klamath River (North Coast Regional Board 2010). pH values in Copco No. 1 and Iron Gate reservoirs can exceed the Basin Plan instantaneous maximum pH objective of 8.5 s.u., with large (0.5 to 1.5 s.u.) daily fluctuations occurring in reservoir surface waters during summertime periods of intense phytoplankton blooms (see Section 3.2.2.6 *pH*).

Modeling of pH conducted for development of the Klamath River TMDLs (Kirk et al. 2010; North Coast Regional Board 2010) provides information applicable to the assessment of long-term impacts of the Proposed Project on pH levels in the Hydroelectric Reach. Klamath River TMDL model results indicate that under the "TMDL dams-out" scenario for Oregon reaches (TOD2RN), pH at the Oregon-California state line would exhibit less daily variability during spring (March to

May) and fall (October to November) (see Figure 3.2-24) than the "TMDL dams-in" scenario (T4BSRN). Daily variability in river pH during the summertime (June to September) would be similar or somewhat greater under the "TMDL dams-out" scenario (TOD2RN) than the "TMDL dams-in" scenario (T4BSRN), with the slight increase likely due to periphyton growth in the free-flowing river reaches currently occupied by the upstream J.C. Boyle Reservoir and the cessation of hydropower peaking flows in the Peaking Reach that may play a role in preventing establishment of mats under existing conditions. The "TMDL dams-out" scenario (TOD2RN) model results at the Oregon-California state line would occasionally exceed 8.5 s.u. However, because the frequency of exceeding 8.5 s.u. under the "TMDL dams-out" scenario (TOD2RN) would generally be the same as under existing conditions, removal of the Lower Klamath Project dams under the Proposed Project would not result in a failure to meet the instantaneous maximum pH objective at the levels currently supported in either the short term or the long term and there would be no significant impact.

Note that the Klamath River TMDL model scenarios are useful for informing impacts associated with the Proposed Project and alternatives identified in Section 4 *Alternatives*, but they include as a starting assumption that there will be full implementation of the TMDLs. For example, the "TMDL dams-in" (T4BSRN) and "TMDL dams-out" (TOD2RN) scenarios for California both assume that water entering into California from Oregon meets California water quality standards for water temperature, organic enrichment/low dissolved oxygen, nutrients, pH, and microcystin. In other words, the starting point for the California models is that all necessary reductions in pollution to address the current impaired conditions at the Oregon-California state line for these constituents would already have been implemented upstream. The full TMDL compliance modeling assumption does not reflect the existing condition, and it would be speculative at this point to identify either the mechanisms necessary to implement the TMDLs or the timing required to achieve full compliance. Further, the changes in daily fluctuations for pH indicated by the Klamath River TMDL modeling efforts are not entirely certain because growth rates of periphyton (attached algae) that could influence pH through photosynthesis in the free-flowing reaches of the river replacing Copco No. 1 and Iron Gate reservoirs are not precisely known. However, because modeled pH peak values and daily variability would be influenced by increasing nutrient concentrations in both the "TMDL dams-in" (T4BSRN) (from phytoplankton growth in reservoirs) and "TMDL dams-out" (TOD2RN) (from periphyton growth in river reaches) scenarios, the comparative model output is still informative with respect to general trends under conditions where full TMDL compliance has not occurred.

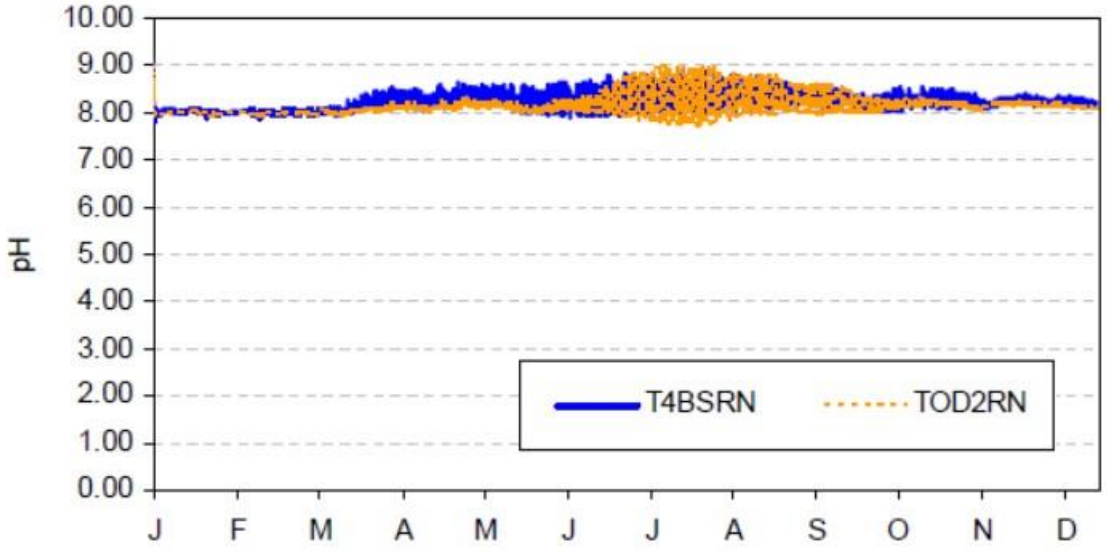

Figure 3.2-24. Predicted pH at the Oregon-California State Line (RM 214.1) for the Klamath River TMDL Scenarios Similar to the Proposed Project (TOD2RN Scenario) and the modeled existing conditions (T4BSRN Scenario). Source: North Coast Regional Board 2010.

The Proposed Project also would be expected to eliminate the occurrence of high pH (greater than 8.5 s.u.) and large daily fluctuations (0.5 to 1.5 s.u.) that occur in the surface waters of Copco No. 1 and Iron Gate reservoirs under existing conditions during periods of intense phytoplankton blooms (see Section 3.2.2.6 *pH*). The pH in the free-flowing reaches of the river replacing these reservoirs would not be likely to exhibit such extremes in daily pH and would not result in a failure to meet the existing instantaneous maximum pH objective at the levels currently supported and would be beneficial.

These beneficial pH changes, which would result from the conversion from a reservoir to a riverine system, would occur immediately following dam removal, in the spring of dam removal year 2. In contrast, the potential for the river reaches that replace Copco No. 1 and Iron Gate reservoirs to support periphyton growth along the river bed that increases variability in daily pH and potentially results in elevated pH values would be constrained in the short term because high SSCs and scour along the newly mobilized river bed during the winter and spring of dam removal year 2, and potentially also post-dam removal year 1, would limit establishment of extensive periphyton mats. Overall, in the short term, the Proposed Project would not result in a failure to meet the instantaneous maximum pH objective relative to the existing conditions in the reservoirs and would be beneficial.

In summary, based on Klamath River TMDL model results, dam removal under the Proposed Project would result in a similar frequency of exceeding 8.5 s.u. as existing conditions at the Oregon-California state line, and thus there would be

no significant impact the short term and the long term. The decrease in high summertime daily pH fluctuations in the free-flowing reaches of the river that replace Copco No. 1 and Iron Gate reservoirs in the Hydroelectric Reach would not result in a failure to meet the instantaneous maximum pH objective at the levels currently supported and would be beneficial in the short term.

Middle and Lower Klamath River, Klamath River Estuary, and Pacific Ocean nearshore environment

Modeling of pH conducted for the development of the California Klamath River TMDLs also provides information applicable to the assessment of long-term impacts of the Proposed Project on pH in the Middle and Lower Klamath River. In general, results from the Klamath River TMDL model (see Appendix D) indicate that the "TMDL dams-out" (TCD2RN) scenario for California would result in relatively large daily variations in pH and generally high pH levels during summer and fall in the Middle Klamath River downstream from Iron Gate Dam (Figure 3.2-25); this pattern is characteristic of periphyton growth in river reaches. Although this condition would be in contrast to the "TMDL dams-in" (T4BSRN) scenario, where the Klamath River TMDL model predicts relatively low daily variation in pH in summer and fall (Figure 3.2-25), the higher daily pH variation and overall pH levels indicated for the "TMDL dams-out" (TCD2RN) scenario downstream from Iron Gate Dam are very similar to those under existing conditions (see Section 3.2.2.6 *pH*). This indicates that dam removal under the Proposed Project would not result in a failure to meet the instantaneous maximum pH objective relative to the levels currently supported downstream from Iron Gate Dam and there would be no significant impact.

Note that while the Klamath River TMDL model scenarios are useful for informing impacts associated with the Proposed Project and alternatives identified in Section 4 *Alternatives*, they include as a starting assumption that there will be full implementation of the TMDLs. For example, the "TMDL dams-in" (T4BSRN) and "TMDL dams-out" (TOD2RN) scenarios for California both assume that water entering into California from Oregon meets California water quality standards for water temperature, organic enrichment/low dissolved oxygen, nutrients, pH, and microcystin. In other words, the starting point for the California models is that all necessary reductions in pollution to address the current impaired conditions at the Oregon-California state line for these constituents would already have been implemented upstream. Although the "TMDL dams-out" (TCD2RN) scenario downstream of iron Gate Dam produces predicted pH values that are very similar to existing conditions, the full TMDL compliance modeling assumption does not, in fact, reflect the existing condition, particularly within the existing reservoirs. As described in Section 3.2.2.6 *pH,* the reservoirs are characterized by high daily variability and pH values that exceed 8.5 s.u. on a seasonal basis due to large phytoplankton blooms in summer and fall. Because the "TMDL dams-in" (T4BSRN) scenario shown in Figure 3.2-26 represents full compliance, it also displays evidence of limited phytoplankton production in the upstream reservoirs

and hence lower pH peak values and daily variability as compared with existing conditions.

In general, because the changes in daily fluctuations for pH indicated by the Klamath River TMDL modeling efforts are not entirely certain, growth rates of periphyton (attached algae) that could influence pH through photosynthesis in the Middle and Lower Klamath River are not precisely known. However, because modeled pH peak values and daily variability would be influenced by increasing nutrient concentrations in both the "TMDL dams-in" (T4BSRN) (from phytoplankton growth in reservoirs) and "TMDL dams-out" (TCD2RN) (from periphyton growth in river reaches) scenarios, the comparative model output is still informative with respect to general trends under conditions where full TMDL compliance has not occurred.

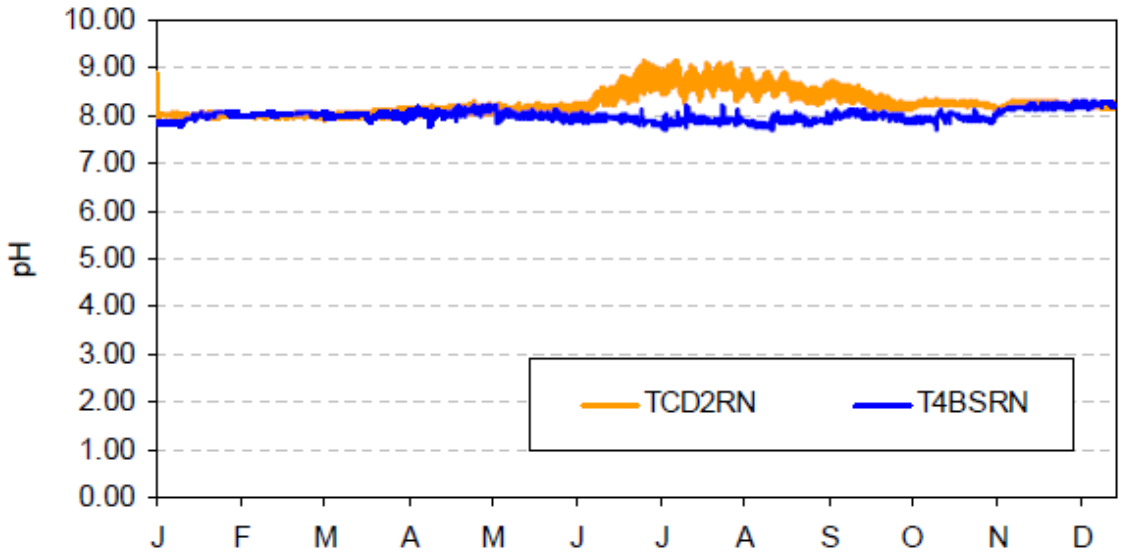

Figure 3.2-25. Predicted Klamath River pH Immediately Downstream from Iron Gate Dam for the Klamath River TMDL Scenarios Similar to the Proposed Project (TCD2RN Scenario) and the No Project Alternative (T4BSRN Scenario). Source: North Coast Regional Board 2010.

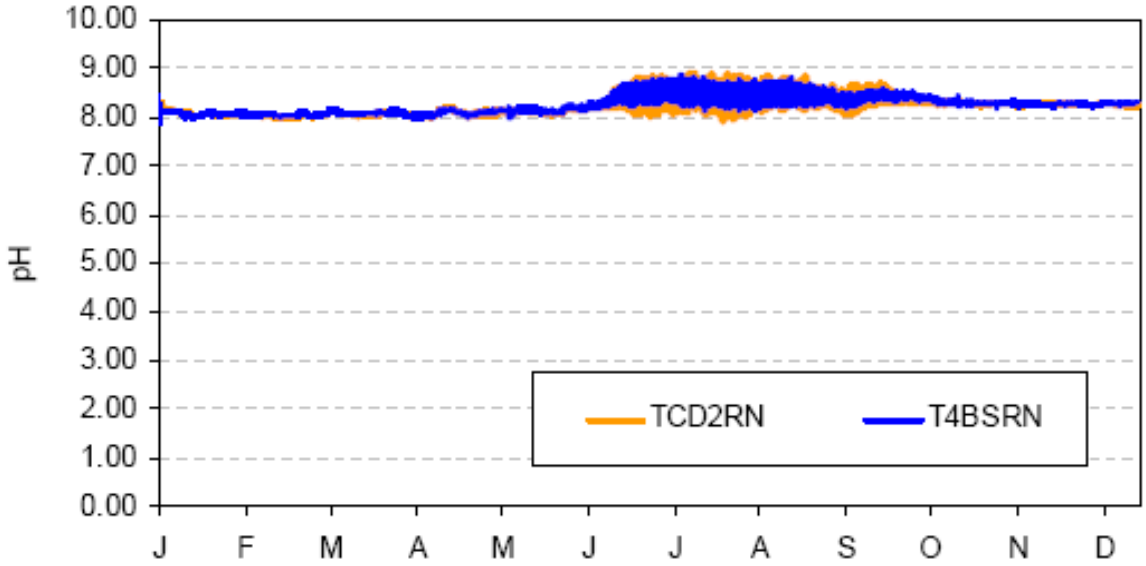

Figure 3.2-26. Predicted Klamath River pH upstream of the Scott River (RM 145.1) for the Klamath River TMDL Scenarios Similar to the Proposed Project (TCD2RN Scenario) and the No Project Alternative (T4BSRN Scenario). Source: North Coast Regional Board 2010.

As discussed above, the Proposed Project also would be expected to eliminate the occurrence of high pH (greater than 8.5 s.u.) and large daily fluctuations (0.5 to 1.5 s.u.) that occur in the surface waters of Copco No. 1 and Iron Gate reservoirs under existing conditions during periods of intense phytoplankton blooms, where the blooms can be transported downstream into the Middle Klamath River and adversely affect pH (see Section 3.2.2.6 *pH*). Consequently, under the Proposed Project pH in the Middle Klamath River immediately downstream of Iron Gate Reservoir would not be likely to exhibit extremes in daily pH due to seasonal phytoplankton blooms, which would reduce the potential for a failure to meet the instantaneous maximum pH objective at the levels currently supported and would be beneficial in the long term.

Klamath River TMDL modeling indicates that the Hoopa Valley Tribe water quality objective for pH (7.0 to 8.5) would be met the vast majority of the time under the Proposed Project (similar to the TMDL dams-out" [TCD2RN] scenario) for the Middle Klamath River at the reach of Hoopa jurisdiction (approximately RM 45), with a small number of predicted pH values of 8.5 or 8.6 in July and August. The Yurok Tribe water quality objective for pH (6.5 to 8.5) would be met at all times under the "TMDL dams-out" (TCD2RN) scenario for the Middle Klamath River at the reach of Hoopa jurisdiction (approximately RM 45). This suggests that dam removal under the Proposed Project would not increase the potential for exceedance of the instantaneous maximum pH objective relative to the existing conditions downstream from Iron Gate Dam.

While Klamath River TMDL modeling contains uncertainty about the periphyton response to dam removal within the Hydroelectric Reach and it assumes full TMDL compliance (see above discussion), monitoring data at multiple locations further downstream in the Middle and Lower Klamath River indicate that pH patterns over a 24-hour period are driven primarily by photosynthesis and respiration of periphyton (Ward and Armstrong 2010; Asarian et al. 2015; see Section 3.4.2.2 *Periphyton*) rather than phytoplankton. Since N-fixing species dominate the periphyton communities in the lower portions of the Middle Klamath River as well as the Lower Klamath River where inorganic nitrogen concentrations are low (Asarian et al. 2010, 2014, 2015), changes in nutrients due to dam removal are not expected to significantly alter the total periphyton biomass in these reaches (see Potential Impact 3.4-5). Thus, there is no evidence to indicate that there would be a change in pH relative to existing conditions that would have the potential to cause or substantially exacerbate an exceedance of water quality standards or result in a failure to maintain existing beneficial uses currently supported in these periphyton-dominated reaches, the downstream Klamath River Estuary, and the Pacific Ocean nearshore environment under the Proposed Project, and therefore there would be a less than significant impact to pH in the long term.

The beneficial pH changes in the Middle Klamath River immediately downstream of Iron Gate Dam that would result from the conversion from a reservoir to a riverine system in the upstream Hydroelectric Reach, would occur immediately following dam removal, in the spring of dam removal year 2. In contrast, the potential for this reach to support periphyton growth along the river bed that increases variability in daily pH and potentially results in elevated pH values would be constrained in the short term because high SSCs and scour along the newly mobilized river bed during the winter and spring of dam removal year 2, and potentially also post-dam removal year 1, would limit establishment of extensive periphyton mats. Overall, in the short term, the Proposed Project would reduce the potential for a failure to meet the instantaneous maximum pH objective relative to the existing conditions and would be beneficial.

The Definite Plan (see Appendix B: *Definite Plan – Appendix M*) includes a Water Quality Monitoring Plan to assess the Proposed Project's impacts to water quality, and this plan includes pH monitoring. Please note that the State Water Board has authority to review and approve any final Water Quality Monitoring Plan through its water quality certification under Clean Water Act Section 401. The State Water Board has issued a draft water quality certification which sets forth monitoring and adaptive management requirements for any Water Quality Monitoring Plan to meet, as Condition 1.[46] Additionally, the Oregon Department

[46] The State Water Board's draft water quality certification is available at: https://www.waterboards.ca.gov/waterrights/water_issues/programs/water_quality_cert/docs/lower_klamath_ferc14803/lkp_dwqc.pdf (Accessed December 14, 2018).

of Environmental Quality has issued a water quality certification[47] that sets forth water quality monitoring and adaptive management conditions for points upstream of California. Because the effect of the Proposed Project on pH is anticipated to be beneficial or would not result in a significant impact in either the short and long term, this analysis of Potential Impact 3.2-11 does not further discuss the water quality monitoring and adaptive management conditions.

Significance

No significant impact for the Hydroelectric Reach at Oregon-California state line in the short term and long term.

Beneficial for the Hydroelectric Reach from Copco No. 1 Reservoir to Iron Gate Dam in the short term and long term.

No significant impact for the Middle Klamath River downstream of Iron Gate Dam, the Lower Klamath River, the Klamath River Estuary, and the Pacific Ocean nearshore environment in the short term and long term.

3.2.5.6 Chlorophyll-a and Algal Toxins

Potential Impact 3.2-12 Alterations in chlorophyll-*a* and algal toxins due to a conversion of the reservoir areas to a free-flowing river.

While fast-moving rivers do not provide good habitat for phytoplankton growth, slow-moving, calm water like the reservoirs created by Copco No. 1 and Iron Gate dams provide ideal habitat conditions for phytoplankton growth, especially blue-green algae species (see Section 3.2.2.7 *Chlorophyll-a and Algal Toxins*, Section 3.4.2.1 *Phytoplankton*, and Appendix C – Section C.6 *Chlorophyll-a and Algal Toxins*). Chlorophyll-*a* is a pigment produced by phytoplankton, including blue-green algae, so concentrations of chlorophyll-*a* are often used to evaluate whether there is excessive phytoplankton growth in rivers, lakes, or reservoirs. Most importantly, several types of blue-green algae produce algal toxins, especially during excessive growth of blue-green algae (i.e., blooms), that can have negative health impacts on animals and humans (see Section 3.2.2.7 *Chlorophyll-a and Algal Toxins*, Section 3.4.2.1 *Phytoplankton*, and Appendix C – Section C.6 *Chlorophyll-a and Algal Toxins*). Thus, the potential changes to chlorophyll-*a* and algal toxins due to conversion of the reservoir areas to a free-flowing river are evaluated to determine the potential impacts to water quality.

Hydroelectric Reach

Despite the slightly increased total nutrient concentrations anticipated under the Proposed Project in the Hydroelectric Reach (see Potential Impact 3.2-8), elimination of the slow-moving reservoir environment that currently supports

[47] The Oregon Department of Environmental Quality's final water quality certification is available at: https://www.oregon.gov/deq/FilterDocs/ferc14803final.pdf (Accessed December 14, 2018).

growth for toxin-producing nuisance blue-green algae (e.g., *Microcystis aeruginosa*) would decrease the occurrence of high seasonal concentrations of chlorophyll-a (concentrations greater than 10 ug/L) and periodically high levels of algal toxins (e.g., concentrations greater than 0.8 and/or 4 ug/L microcystin; see Section 3.2.3.1 *Thresholds of Significance*) generated by suspended blue-green algae (see Potential Impact 3.4-2). This would be a beneficial effect.

Note that while some periphyton species are capable of producing algal toxins, including microcystin and anatoxin-a (Heath et al. 2011; Quiblier et al. 2013; see Section 3.2.2.7 *Chlorophyll-a and Algal Toxins*), available data indicate that algal toxin presence (i.e., microcystin and anatoxin-a) in the Klamath River corresponds to high concentrations of phytoplankton blue-green algae cells (i.e., algae blooms of *Microcystis aeruginosa* for microcystin or *Anabaena flos-aquae* for anatoxin-a) (Kann and Corum 2006, 2007, 2009; Kann 2006, 2007a,b,c,d, 2008b; Jacoby and Kann 2007; CH2M Hill 2008; Kann et al. 2010a; Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016, 2017; Otten et al. 2015).
Drawdown of the reservoirs would begin in winter and would be largely complete by March/April (i.e., the beginning of the algal growth season) of dam removal year 2, so complete elimination of the reservoir environment under the Proposed Project would occur by the end of dam removal year 2. Thus, the decrease in high seasonal chlorophyll-*a* concentrations and periodic high algal toxin concentrations would also occur by the end of dam removal year 2 due to the elimination of reservoir habitat that supported algal growth. Therefore, reductions in chlorophyll-*a* and algal toxins in the Hydroelectric Reach would be a short-term benefit as well as a long-term benefit since the reduction would begin during dam removal year 2 and it would continue beyond post-dam removal year 1.

In the long term, the Proposed Project would not alter the transport of chlorophyll-*a* into the Hydroelectric Reach from upstream sources. Under existing conditions, chlorophyll-*a* concentrations measured upstream of J.C. Boyle Reservoir, including episodic large fluxes of chlorophyll-*a* associated with algal blooms, are generally similar to or less than chlorophyll-*a* concentrations in Copco No. 1 and Iron Gate reservoirs and immediately downstream of Iron Gate Dam. The Proposed Project does not include any changes to Klamath River conditions upstream of J.C. Boyle Reservoir, so chlorophyll-*a* measured at the upstream end of J.C. Boyle Reservoir would represent the maximum chlorophyll-*a* entering the Hydroelectric Reach under the Proposed Project. Turbulent-mixing conditions in the river are expected to continue to decrease chlorophyll-*a* in the Hydroelectric Reach between J.C. Boyle Dam and the upstream end of Copco No. 1 Reservoir under the Proposed Project, as is the case under existing conditions. The conversion of the reservoirs to free-flowing, turbulent river reaches would likely result in a slight decrease in chlorophyll-*a* through the Hydroelectric Reach under the Proposed Project compared to existing conditions. Thus, under the Proposed Project long-term chlorophyll-*a*

concentrations in the Hydroelectric Reach due to transport of chlorophyll-*a* into this reach from upstream sources, including episodic large fluxes, would be similar to or less than existing conditions.

Middle and Lower Klamath River and the Klamath River Estuary
In addition to the decreases in the occurrence of high seasonal concentrations of chlorophyll-a (concentrations greater than 10 ug/L) and periodically high levels of algal toxins (concentrations greater than 0.8 and/or 4 ug/L microcystin; see Section 3.2.3.1 *Thresholds of Significance*) generated by toxin-producing nuisance blue-green algae that are described for the Hydroelectric Reach, transport and growth of *Microcystis aeruginosa* in the Middle and Lower Klamath River would be substantially reduced or eliminated in the absence of significant Lower Klamath Project reservoir blooms. Genetic and toxin analyses show that the *Microcystis aeruginosa* populations in Copco No. 1 and Iron Gate reservoirs are genetically distinct from each other and upstream populations, providing evidence that blue-green algae blooms in Iron Gate Reservoir are internally derived and not due to transport of *Microcystis aeruginosa* populations from Copco No. 1 Reservoir or further upstream (Otten et al. 2015). While algal toxins generated in Copco No. 1 could be transported downstream, Otten et al. (2015) document with genetic analysis that algal production in Iron Gate Reservoir is the principal source of *Microcystis aeruginosa* responsible for the observed public health exceedances occurring in the Klamath River downstream from Iron Gate Dam (see Section 3.2.2.7 *Chlorophyll-a and Algal Toxins*, Section 3.4.2.3 *[Phytoplankton and Periphyton] Hydroelectric Reach* and Appendix C, Section C.6 *Chlorophyll-a and Algal Toxins*). Therefore, removal of the reservoirs under the Proposed Project would eliminate *in situ* production of seasonal blue-green algae blooms and the associated algal toxins and chlorophyll-*a*. While algal toxins and chlorophyll-*a* produced in Upper Klamath Lake may still be transported downstream after dam removal, existing data indicate that microcystin concentrations in the Klamath River typically decrease to below California water quality objectives (see Section 3.2.3.1 *Thresholds of Significance*) by the upstream end of J.C. Boyle Reservoir, regardless of the microcystin concentration measured leaving the Upper Klamath Lake (Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016, 2017). Microcystin concentrations greater than California water quality objectives have been infrequently measured to increase in J.C. Boyle Reservoir adjacent to Topsy Campground compared to microcystin concentrations in the Klamath River upstream of the reservoir (Watercourse Engineering, Inc, 2016, 2017; E&S Environmental Chemistry 2018a), suggesting localized *Microcystis aeruginosa* growth and microcystin production within J.C. Boyle Reservoir. The potential for localized *Microcystis aeruginosa* growth within J.C. Boyle Reservoir and high microcystin concentrations in the reservoir that could be transported downstream of J.C. Boyle Dam (E&S Environmental Chemistry 2018a) would be eliminated under the Proposed Project since the slower-moving reservoir habitat in this reach would be eliminated under the Proposed Project. Thus, algal toxins and chlorophyll-*a* production upstream of J.C. Boyle Dam would not be expected to

be transported into California and result in algal toxin or chlorophyll-*a* concentrations in a manner that would cause or substantially exacerbate an exceedance of water quality standards or would result in a failure to maintain existing beneficial uses currently supported.

As discussed for the Hydroelectric Reach, while some periphyton species are capable of producing algal toxins, available data indicate that the algal toxin presence (i.e., microcystin and anatoxin-a) in the Klamath River corresponds to high concentrations of phytoplankton blue-green algae cells (i.e., algae blooms of *Microcystis aeruginosa* for microcystin or *Anabaena flos-aquae* for anatoxin-a) (Kann and Corum 2006, 2007, 2009; Kann 2006, 2007a,b,c,d, 2008b; Jacoby and Kann 2007; CH2M Hill 2008; Kann et al. 2010a; Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016, 2017; Otten et al. 2015).

The water velocity and constant mixing in the Middle and Lower Klamath River generally create an environment that is not supportive of toxin-producing blue-green algae growth or reproduction (Genzoli and Kann 2017). While higher concentrations of blue-green algae cells and algal toxins have been measured in calm, slow-moving habitats along shorelines, protected coves, and backwaters along the Klamath River than in the faster-moving open channel river habitats (Kann et al. 2010a; Genzoli and Kann 2017), growth and/or reproduction of blue-green algae within these habitats have not been documented. Measurements of blue-green algae (e.g., *Microcystis aeruginosa*) and algal toxins (e.g., microcystin) along shoreline habitats occasionally exceed 2016 CCHAB secondary thresholds and WHO guidelines under existing conditions, but these high concentrations of blue-green algae cells and associated algal toxins are generally attributed to entrapment and accumulation of cells and toxins transported downstream from the reservoirs rather than growth and/or reproduction within these slow-moving shoreline habitats (Falconer et al. 1999; Kann et al. 2010a; State Water Board et al. 2010, updated 2016; Genzoli and Kann 2016, 2017). Furthermore, longitudinal decreases in the measured *Microcystis aeruginosa* cell densities and microcystin downstream of Iron Gate Dam in both slow-moving shoreline and open channel habitats suggest *Microcystis aeruginosa* cells and microcystin are being transported downstream into these shoreline habitats and phytoplankton growth is limited in these slow-moving shoreline habitats (Genzoli and Kann 2017). While algal toxins upstream of J.C. Boyle Dam would not be expected to be transported into California and the transport of algal toxins from the Lower Klamath Project reservoirs would be eliminated under the Proposed Project, these calm, slow-moving shoreline, protected cove, and backwater habitats in the Middle and Lower Klamath River, especially during low-flow periods, would potentially continue to provide suitable slow-moving blue-green algae habitat. Thus, some blue-green algae growth and algal toxin production may still occur in these Middle and Lower Klamath River habitats after dam removal. Overall, the magnitude of the algal toxin concentrations in these calm, slow-moving shoreline, protected cove, and backwater habitats in the Middle and Lower Klamath River under the Proposed

Project would be similar to or less than existing conditions since these habitats already have elevated algal toxin concentrations periodically under existing conditions (Kann et al. 2010a; Genzoli and Kann 2017) and the transport of blue-green algae (e.g., *Microcystis aeruginosa*) and algal toxins (e.g., microcystin) from reservoirs in the Hydroelectric Reach into the Middle and Lower Klamath River would be eliminated under the Proposed Project.

Drawdown of the reservoirs would begin in winter and would be largely complete by March/April (i.e., the beginning of the growth season) of dam removal year 2, so complete elimination of the reservoir environment that transports blue-green algae, algal toxins, and chlorophyll-*a* in the Middle and Lower Klamath River and the Klamath River Estuary would occur by the end of dam removal year 2 under the Proposed Project. Thus, the decrease in high seasonal chlorophyll-*a* concentrations and periodic high algal toxin concentrations would also occur by the end of dam removal year 2 in the Middle and Lower Klamath River and the Klamath River Estuary due to the elimination of the upstream reservoir habitat. Therefore, reductions in chlorophyll-*a* and algal toxins in the Middle and Lower Klamath River and the Klamath River Estuary would be a short-term benefit as well as a long-term benefit.

The Definite Plan (see Appendix B: *Definite Plan – Appendix M*) includes a Water Quality Monitoring Plan to assess the Proposed Project's impacts to water quality, and this plan includes monitoring of microcystin-producing blue-green algae cell counts. Please note that the State Water Board has authority to review and approve any final Water Quality Monitoring Plan through its water quality certification under Clean Water Act Section 401. The State Water Board has issued a draft water quality certification which sets forth monitoring and adaptive management requirements for any Water Quality Monitoring Plan to meet, as Condition 1.[48] Additionally, the Oregon Department of Environmental Quality has issued a water quality certification[49] that sets forth water quality monitoring and adaptive management conditions for points upstream of California. The effect of the Proposed Project on chlorophyll-*a* and algal toxins is anticipated to be beneficial in both the short and long term, and this analysis of Potential Impact 3.2-12 does not further discuss the water quality monitoring and adaptive management conditions.

[48] The State Water Board's draft water quality certification is available online at: https://www.waterboards.ca.gov/waterrights/water_issues/programs/water_quality_cert/docs/lower_klamath_ferc14803/lkp_dwqc.pdf (Accessed December 11, 2018).

[49] The Oregon Department of Environmental Quality's final water quality certification is available online at: https://www.oregon.gov/deq/FilterDocs/ferc14803final.pdf (Accessed December 11, 2018).

Significance

Beneficial for the Hydroelectric Reach, the Middle and Lower Klamath River, and the Klamath River Estuary

3.2.5.7 Inorganic and Organic Contaminants

Potential Impact 3.2-13 Human exposure to inorganic and organic contaminants due to release and exposure of reservoir sediment deposits. This potential impact evaluates the potential human exposure to inorganic and organic contaminants in sediments remaining within the reservoir footprints and along the river banks in addition to potential inorganic and organic contaminant concentrations in the river water in the Hydroelectric Reach, the Middle and Lower Klamath River, and the Klamath River Estuary due to the release of sediments currently trapped behind the Lower Klamath Project dams. The two main ways people would be potentially exposed to inorganic or organic contaminants in reservoir sediments would be through direct contact with reservoir sediments or eating fish or shellfish exposed to inorganic or organic contaminants in reservoir sediments. Direct human exposure to reservoir sediments due to recreational uses (e.g., camping, fishing, rafting) are evaluated by comparing inorganic and organic contaminant levels measured in reservoir sediments with USEPA and CalEPA screening levels that are conservatively protective of human health, since those screening levels assume much greater exposure than would occur for reservoir sediments. Human exposure to inorganic and organic contaminants from eating fish or shellfish (e.g., mussels) is evaluated by comparison with available screening level values (SLVs) that assess whether contaminants in sediment would increase in fish or shellfish (i.e., bioaccumulate) to unhealthy levels for humans who eat them. While less likely than direct contact with remaining reservoir sediments after drawdown or eating fish exposed to inorganic and organic contaminants, people also would potentially be exposed to inorganic and organic contaminants from reservoir sediments in river water during drawdown when reservoir sediments and associated inorganic and organic contaminants were being transported. Human exposure to inorganic and organic contaminants from exposure to river water through consumption during drawdown and the transport of reservoirs sediments in the Klamath River is analyzed by comparing applicable human health drinking water standards[50] with the range of potential inorganic and organic contaminant concentrations in the elutriate samples, representing the highest potential concentration of these contaminants during drawdown. Comparison of the applicable human health drinking water standards with reservoir elutriate sample concentrations identified arsenic, aluminum, total PCB, chromium, and lead as detected potential chemicals of concern during reservoir drawdown (CDM 2011) and these are evaluated in more detail with consideration of actual

[50] Human Health drinking water standards are listed Table B-6 of the Screening-Level Evaluation of Contaminants in Sediments from Three Reservoirs and the Estuary of the Klamath River, 2009-2011 (CDM 2011), which is included by reference and provided in Appendix W of this EIR.

concentrations expected during drawdown below. In a review of records maintained by the State Water Board's Division of Water Rights and Division of Drinking Water, only two drinking water diversions were identified in the Klamath River below Iron Gate Dam: (1) CalTrans' Randolph E. Collier Northbound and Southbound Rest Areas located near Hornbrook; and (2) Klamath Community Services District in Del Norte County located near the mouth of the Klamath River. The analysis below addresses the potential drinking water impacts to the Klamath River between the Oregon-California state line to the Klamath River Estuary, with consideration of the Hydroelectric Reach between J.C. Boyle Reservoir and the Oregon-California state line only to the extent it would influence downstream conditions in California.

Hydroelectric Reach

Potential human health risks associated with exposure to remaining sediment deposits within the reservoir footprints (i.e., "exposed reservoir terraces" as defined by CDM [2011]) and river banks within the Hydroelectric Reach were evaluated using comparisons of the 2009 to 2010 Klamath Dam Removal Secretarial Determination reservoir sediment core data to USEPA and CalEPA residential soil screening levels, and calculation of human/mammal toxic equivalency values (TEQs) ("Exposure Pathway 2 and 3" in CDM [2011]) (Figure 3.2-27). The analysis of exposure pathways using the 2009 SEF screening levels was updated based on 2018 SEF screening levels, as appropriate (Appendix C – *Section C.7*).

Exposure Pathway		Freshwater biota	Marine biota	Terrestrial biota	Humans
Pathway 1	Short-term exposure to sediments flushed downstream	●	●	--	--
Pathway 2	Long-term exposure to exposed reservoir terrace and or river bank deposits	--	--	● (1)	● (2)
Pathway 3	Long-term exposure to new river channels and river bed deposits	●	--	--	●
Pathway 4	Long-term exposure to marine / near shore deposits	--	●	--	--
Pathway 5	Long-term exposure to reservoir sediments	●	--	--	●

●	No adverse effects based on lines of evidence
●	One or more chemicals present, but at levels unlikely to cause adverse effects based on the lines of evidence
●	One or more chemicals present at levels with potential to cause minor or limited adverse effects based on the lines of evidence
●	At least one chemical detected at a level with potential for significant adverse effects based on the lines of evidence
--	This exposure pathway is incomplete(3) or insignificant(4) for this receptor group

Note:
This does not include an evaluation of the physical effects (e.g., dissolved oxygen in the water, suspended sediment)
(1) Qualitative evaluation conducted for this exposure pathway
(2) Limited quantitative, along with qualitative evaluations conducted for this exposure pathway
(3) Incomplete - receptor group is unlikely to come in contact with sediment-associated contaminants under this exposure pathway
(4) Insignificant - exposure pathway not considered a major contributor to adverse effects in humans based on best professional judgment

Figure 3.2-27. Summary of Exposure Pathway Conclusions for Inorganic and Organic Contaminants. Source: CDM 2011.

As part of the Secretarial Determination process, the Water Quality Sub-Team identified USEPA soil screening levels and CalEPA California Human Health Screening Levels (CHHSLs) for soil as appropriate thresholds for determining the potential for sediment contaminants to adversely affect human health. USEPA residential exposure uses a 30-year exposure duration, 365 days per year exposure frequency with a soil ingestion rate of 200 mg/day for children over 6 years and 100 mg/day for adults over 24 years (USEPA 1991). CalEPA CHHSLs are based on the USEPA approach, with the residential exposure using a 30 year duration, 350 days per year exposure frequency with a soil ingestion rate of 200 mg/day for children over 6 years and 100 mg/day for adults over 24 years and the commercial exposure using a 25 year duration, 250 days per year exposure frequency with a soil ingestion rate of 200 mg/day for children over 6 years and 100 mg/day for adults over 24 years (Hristov et al. 2005). In the short term, human exposure to inorganic and organic contaminants in sediments deposited on exposed reservoir terraces and river banks within the Hydroelectric

Reach would be limited, short duration, non-residential exposure patterns (e.g., construction and restoration activities), resulting in less exposure to inorganic or organic contaminants (i.e., a lower ingestion rate of soil) than assumed for the USEPA and CalEPA screening levels. For example, construction/restoration worker exposure of 100 days per year for 5 years would result in only 4.8 percent of the CalEPA residential exposure. While the USEPA and CalEPA residential and commercial soil screening levels are used to evaluate the potential for adverse effects to humans, applying the USEPA and CalEPA screening levels considerably overstates the potential impact and the presence of a chemical at concentrations in excess of a USEPA and/or CalEPA screening level does not indicate that adverse impacts to human health would occur. Thus, the initial analysis of potential exposure and conclusions based on the USEPA and CalEPA screening levels would provide a very conservative estimate of potential adverse effects to humans and further interpretation of the comparisons of screening levels and inorganic and organic contaminant results, including an analysis of the exposure pathways, is necessary to assess the actual potential for human health impacts.

USEPA provides screening levels for both total carcinogenic (potentially cancer-causing) and total non-carcinogenic (not associated with cancer risk) contaminants. No reservoir sediment samples exceeded the total non-carcinogenic screening levels. Forty-five samples exceeded the USEPA total carcinogenic screening level for residential soils for arsenic or nickel, including samples from J.C. Boyle, Copco No. 1 and Iron Gate reservoirs. Those forty-five samples also exceeded the CalEPA residential and commercial screening levels for arsenic, but they did not exceed the CalEPA screening levels for nickel.

For arsenic, sampled concentrations in the reservoirs ranged from 4.3 to 15 mg/kg (see Section 3.2.2.8 *Inorganic and Organic Contaminants* and Appendix C, Table C-6), which is within the range of available measured arsenic soil concentrations for the Klamath Basin. Arsenic ranges from 0.8 to 23 mg/kg in regional soil samples from the Mid- and Lower Klamath Basin outside of the reservoir areas with typical arsenic concentrations between 2 and 7 mg/kg (USGS NGS 2008). Arsenic may be naturally elevated in the Upper Klamath Basin, with arsenic ranging from approximately 0.6 to 43.0 mg/kg and average regional background arsenic concentrations of 3.99 mg/kg ± 5.03 mg/kg in the vicinity of Upper Klamath Lake (Sturdevant 2010; ODEQ 2013; Sullivan and Round 2016). In comparison, the USEPA total carcinogenic screening level for soils is 0.39 mg/kg and the CalEPA specifies a California Human Health residential soil (0.07 mg/kg) and a commercial soil (0.24 mg/kg) screening levels.

In the long term, the Proposed Project includes the transfer of PacifiCorp lands immediately surrounding the Lower Klamath Project (“Parcel B lands”) (Figure 2.7-18) from PacifiCorp to the KRRC prior to dam removal. The Proposed Project provides that the KRRC will transfer Parcel B lands to the respective states (i.e., California, Oregon), as applicable, or to a designated third-party

transferee, following dam removal. The lands would thereafter be managed for public interest purposes (e.g., tribal mitigation, river-based recreation, wetland restoration, etc.) (KHSA Section 7.6.4). Pursuant to the KHSA, decisions about the land use would occur following dam removal, and the outcome of who the lands will ultimately be transferred to and what they will be used for is uncertain. Potential human exposure to arsenic measured in the Lower Klamath Project reservoir sediments under the Proposed Project would be less than that assumed for the USEPA or CalEPA screening levels since the reservoir footprint areas would be unlikely to support residential uses. Further, the exposure potential on the future public lands is likely to be considerably less than the exposure potential for residential uses. Limited, short duration, non-residential exposure patterns (e.g., recreational use) would result in less exposure to arsenic (i.e., a lower ingestion rate of soil). For example, recreational exposure of 10 to 90 days per year, every year for 30 years would result in only 3 to 25 percent of the residential exposure. Thus, overall the Proposed Project would be unlikely to result in short-term or long-term substantive adverse impacts on human health under possible "Exposure Pathway 2" due to arsenic.

For nickel, sampled concentrations in the reservoirs ranged from 18 to 33 mg/kg (see Appendix C, Table C-6), while the USEPA total carcinogenic screening level is 0.38 mg/kg and the CalEPA screening level is 1,600 mg/kg for residential exposure and 16,000 mg/kg for commercial exposure. As with arsenic, available Klamath Basin soil concentrations of nickel (median values 33 mg/kg and 65.7 mg/kg from two different studies) are in the same range as those measured in Lower Klamath Project reservoir sediments (see Appendix C – *Section C.7.1*) and they exceed the USEPA total carcinogenic screening level for residential soils by a similar factor. As discussed above for arsenic, the Parcel B lands would be transferred to the respective states as part of the Proposed Project and managed for public interest purposes, so potential human exposure to nickel measured in the Lower Klamath Project reservoir sediments under the Proposed Project would be less than that assumed for the USEPA or CalEPA screening levels. The exposure potential on the future public lands is likely to be considerably less than that for residential or commercial uses considered in USEPA and CalEPA screening levels, with recreational use resulting in only 3 to 25 percent of the residential exposure conservatively assuming 10 to 90 days per year, for 30 years exposure patterns. The highest concentrations of nickel were found in sediments from the Klamath River Estuary, which suggests that release of reservoir sediments downstream would not increase nickel concentrations in downstream reaches above existing conditions. Accordingly, the Proposed Project and release of sediments from behind the Lower Klamath Project dams is unlikely to increase the short-term or long-term exposure of humans to concentrations of nickel above Klamath Basin background levels and to result in substantive adverse impacts to human health under possible Exposure Pathway 2 from nickel.

There were 19 analytes measured during 2009 and 2010 that were not detected by laboratory tests; however, the laboratory analytical reporting limits were greater than the applicable human health screening levels (i.e., the standard laboratory tests used could not measure whether the analytes were present above human screening levels because the smallest amount the laboratory tests could detect [i.e., the reporting limit] for those analytes was greater than the human health screening level itself), including some PCBs, VOCs, and SVOCs (CDM 2011). While it is not possible to directly confirm that these compounds are above or below applicable human health screening levels, as described above for arsenic, potential human exposure to reservoir sediment deposits under the Proposed Project, in both the short-term and long-term, would involve limited, short duration, non-residential exposure patterns. Since these analytes were below levels of laboratory detection, and the potential exposure in the short and long-term would be less than the long-term residential levels of exposure, any undetected analytes would be unlikely to result in substantial adverse impacts on human health.

Elutriate concentration results (characterizing the potential chemical concentrations that may be released into the water from reservoir sediments during suspension) from the 2009 to 2010 sediment testing are used to evaluate human consumption exposure to inorganic and organic contaminants in river water during drawdown and transport of reservoirs sediments in the Klamath River. Elutriate concentration results represent the maximum potential concentration of contaminants in the Klamath River during drawdown since they do not take into account the mixing or dilution that would occur during transport of reservoir sediments (CDM 2011). Applicable human health drinking water standards are first compared with elutriate concentrations to provide an initial conservative assessment of human exposure to inorganic and organic contaminants, then elutriate concentrations with consideration of the expected dilution during drawdown are compared with the applicable human health drinking water standards to assess likely human exposure risk.

The dilution of inorganic and organic contaminant elutriate concentrations necessary during drawdown to meet applicable drinking water standards is determined from modeled SSCs since the SRH-1D sediment transport model uses drawdown flows similar to those expected under the Proposed Project in its estimates of SSCs. Variations in flow and dilution downstream of the reservoirs during drawdown would be inherently included in the modeled SSCs so variations in the contaminant concentrations with the potential to adversely impact human health would also be represented within these model results. The ratio of contaminant concentration to SSCs measured in laboratory elutriate tests is assumed to be equal to the ratio of the contaminant concentration to modeled SSCs in the Klamath River during drawdown (CDM 2011). Accordingly, the dilution would decrease as the SSCs increase and the range of dilution in the Klamath River during drawdown can be calculated from the range of maximum modeled SSCs.

In the Hydroelectric Reach downstream of J.C. Boyle to the upstream end of Copco No. 1 Reservoir, the maximum SSCs would range from 2,000 to 3,000 mg/L (see Potential Impact 3.2-3), so dilution of mobilized sediments with reservoir and river water is expected to range from 217- to 325-fold (i.e., concentration in the river would be 217 to 325 times less than the elutriate concentration) immediately downstream of J.C. Boyle during drawdown. In the remainder of the Hydroelectric Reach from the upstream end of Copco No. 1 Reservoir through Iron Gate Reservoir, short-term SSC generally increase in the downstream direction due to the larger sediment deposits in Copco No. 1 and Iron Gate reservoirs contributing to SSCs. The minimum dilution in the Klamath River would occur immediately downstream of Iron Gate Dam during drawdown, where the maximum SSCs would occur from release of sediments in J.C. Boyle, Copco No. 1, and Iron Gate reservoirs. The minimum dilution downstream of Iron Gate Dam would range from 48- to 66-fold (CDM 2011). As a conservative estimate, the J.C. Boyle dilution is used from J.C. Boyle Dam to the upstream end of Copco No. 1 Reservoir and the expected dilution immediately downstream of Iron Gate is used from Copco No. 1 Reservoir to Iron Gate Dam for the analysis of human exposure to inorganic and organic contaminants in the Hydroelectric Reach. The actual SSCs in the Hydroelectric Reach in Copco No. 1 Reservoir to Iron Gate Dam potentially would be less than the maximum SSCs estimated below Iron Gate Dam based on modeled SSCs below the J.C. Boyle and Copco No. 1 dams (see Potential Impact 3.2-3), so the inorganic and organic contaminant concentrations and human exposure to those contaminants in the Hydroelectric Reach of the Klamath River would be less than those estimated using the maximum SSCs estimated below Iron Gate Dam.

Before consideration of dilution, aluminum, arsenic, chromium, lead, and total PCB are the only chemicals present in elutriate sediment sample results at concentrations above Basin Plan, national priority, and national non-priority human health water quality criteria for samples from J.C. Boyle, Copco No. 1, and Iron Gate reservoirs (see Appendix W, Table B-6 for human health water quality criteria) (CDM 2011). After consideration of dilution, chromium, lead, and total PCB concentrations would be less than the most stringent human health drinking water standards in the Hydroelectric Reach from J.C. Boyle Dam to the upstream end of Copco No. 1 Reservoir since the dilution in that portion of the Hydroelectric Reach (217- to 325-fold) is greater than the dilution necessary to meet the most stringent human health drinking water standards for chromium (12-fold), lead (0.3-fold), and total PCB (45-fold). Even after consideration of dilution, aluminum and arsenic concentrations would be greater than the most stringent applicable drinking water standards in the Hydroelectric Reach from J.C. Boyle Dam to the upstream end of Copco No. 1 Reservoir, since the minimum dilution in this portion of the Hydroelectric Reach (217-fold) would be less the dilution necessary for aluminum (219-fold) and arsenic (13,635-fold). In the Copco No. 1 Reservoir to Iron Gate Dam portion of the Hydroelectric Reach after consideration of the range of dilution (48- to 66-fold), the concentrations of

chromium and lead would be less than the most stringent applicable drinking water standards. However, aluminum, arsenic, and total PCB concentrations would be greater than the most stringent applicable drinking water standards in this portion of the Hydroelectric Reach, since the range of anticipated dilution immediately downstream of Iron Gate Dam would be less than the dilution for aluminum (219-fold), arsenic (13,635-fold), and total PCB (100-fold) (CDM 2011).

While human exposure to contaminants in Klamath River water would be limited due to restricted access within the Hydroelectric Reach during drawdown, human exposure to concentrations of aluminum, arsenic, and total PCB greater than applicable drinking water standards would potentially occur during drawdown due to elevated SSCs and sediment-associated inorganic and organic contaminants and potentially cause substantial adverse impacts on human health if river water were to be used during drawdown as a drinking water supply. Dilution in the Klamath River necessary to meet the most stringent applicable drinking water standards (i.e., 13,635-fold for arsenic) would occur once SSCs decrease below 47 mg/L. Modeled SSCs are greater than 47 mg/L in the Hydroelectric Reach for approximately six to ten consecutive months after drawdown begins (see Potential Impact 3.2-3), so exposure to inorganic and organic contaminants in reservoir sediments that would potentially cause substantial adverse impacts on human health also would occur in the Hydroelectric Reach for approximately six to ten months during this period. In dry water year types, modeled SSCs downstream of Iron Gate Dam increase above 47 mg/L for approximately five to six months during the winter and spring after dam removal due to high flow associated with storms (see Figure 3.2-15), thus there also would be potential human exposure to contaminant concentrations (i.e., arsenic) above the most stringent applicable drinking water standards during this period. This would be a significant impact. Implementation of Mitigation Measure WQ-2 would reduce this impact to a less than significant level. Modeled SSCs downstream of Iron Gate Dam are consistently below 47 mg/L after July of post-dam removal year 1, (see Figures 3.2-15 to 3.2-17), indicating potential human exposure to contaminant concentrations that could cause substantial adverse impacts would be negligible after July of post-dam removal year 1 and thus there would be no significant impact after this point in time.

Long-term human exposure to concentrations of aluminum, arsenic, and total PCB greater than applicable drinking water standards due to dam removal is not anticipated since modeled SSCs would return to background levels (i.e., existing conditions) and there would be negligible deposition of reservoir sediments and the associated inorganic and organic contaminants in Hydroelectric Reach. Potential human exposure to inorganic and organic contaminants is associated with elevated SSCs, thus modeling that indicates SSCs would return to background levels (i.e., existing conditions) by the end of post-dam removal year 1 under all water year types (see Potential Impact 3.2-3) also indicates that potential human exposure to contaminants would return to background levels in this time period. Additionally, sediment modeling indicates little to no deposition

of the fine or coarser (e.g., sand) sediments in the Hydroelectric Reach (CDM 2011; USBR 2012), so there would be little to no potential exposure to reservoir sediments and associated contaminants due to deposition along the streambed.

As part of the Secretarial Determination process, the Water Quality Sub-Team identified ODEQ bioaccumulation SLVs as appropriate thresholds for determining the potential for sediment contaminants to bioaccumulate to the point where the contaminants adversely affect either the health of fish or other aquatic organisms, or the health of animals or humans that consume them. ODEQ bioaccumulation SLVs have been set for humans based on fish and shellfish consumption under both general/recreational and subsidence/tribal ingestion rates (ODEQ 2007). Bioaccumulation SLVs have not been set based on bioaccumulation within vegetation exposed to contaminants and the ingestion that vegetation. While ODEQ bioaccumulation SLVs are not applicable to water bodies in California, they provide a reference for comparison purposes. Toxicity equivalent quotients (TEQs) calculated for dioxin, furan, and dioxin-like PCBs were at concentrations above ODEQ bioaccumulation SLVs for mammals in sediments from each of the reservoirs (CDM 2011). Although site-specific background data is lacking, TEQs calculated for dioxin, furan, and dioxin-like PCBs are only slightly above regional background concentrations and thus have limited potential to cause adverse impacts to humans based on consumption of aquatic life exposed to sediment deposits from the river banks or streambed. This assessment is further supported by the limited duration contaminants would occur in the river water as they are transported with drawdown flows and the limited amount of deposition expected (see Potential Impact 3.11-5). The sources of the slightly elevated dioxin, furan, and dioxin-like PCB compounds are not known; however, sources may include atmospheric deposition, regional forest fires, and possibly burning of plastic items (CDM 2011).

Summary

Results from the 2009–2010 Klamath Dam Removal Secretarial Determination sediment chemistry analyses indicate potential human exposure to inorganic and organic contaminants in reservoir sediment deposits remaining within the reservoir footprints and along the river banks or through eating fish exposed to sediment deposits would be unlikely to result in substantive adverse impacts on human health in either the short-term or the long-term, but there is potential for short-term substantive adverse impacts on human health from exposure to inorganic and organic contaminants in reservoir sediments during drawdown due exposure to river water. For the Lower Klamath Project reservoir sediments remaining in the reservoir footprint and along the river banks, arsenic and nickel are the only compounds detected at levels exceeding USEPA and/or CalEPA residential screening levels to protect human health, but exposure to arsenic in these areas would be constrained by short-term activities and long-term future land use that would support only limited exposure patterns, such that human exposure to arsenic and nickel in sediments in the reservoir footprint would be a less-than-significant impact.

Evaluation of the bioaccumulation potential of inorganic and organic contaminants indicates there is limited potential for adverse impacts to humans from eating aquatic life exposed to sediment deposits from the river banks or streambed since the detected levels of dioxin, furan, and dioxin-like PCBs are only slightly above regional background concentrations. This assessment is further supported by the limited duration contaminants would occur in the river water as they are transported with drawdown flows and the limited amount of deposition expected (see Potential Impact 3.11-5). Thus, human exposure to these chemicals in aquatic life would be a less-than-significant impact.

For exposure to river water during drawdown, aluminum, arsenic, and total PCBs greater human health water quality criteria would potentially occur in the short term due to elevated SSCs and sediment-associated inorganic and organic contaminants and potentially cause substantial adverse impacts on human health; this would be a significant impact. Implementation of Mitigation Measure WQ-2 would reduce this impact to a less than significant level. There is little to no long-term potential for adverse impacts to human health from exposure to river water due the release of reservoir sediments and associated inorganic or organic contaminants trapped behind the Lower Klamath Project dams, so there would be no significant impact in the long term for human exposure to inorganic and organic contaminants in the Hydroelectric Reach.

Middle and Lower Klamath River and Klamath River Estuary
Downstream of Iron Gate Dam, short-term and long-term human exposure to contaminants from contact with residual sediments deposited on downstream river banks is possible and the mechanism for exposure would be the same as that for potential contaminants deposited on exposed reservoir terraces and river banks in the Hydroelectric Reach. Sediment deposition on the river floodplain and/or river banks is unlikely (see also Potential Impact 3.11-6), so the amount of sediment deposits on river floodplains and/or river banks are anticipated to be much lower than the amount exposed in the reservoir beds in the Hydroelectric Reach.

Relatively few compounds were detected in reservoir sediments exceeding human health screening levels for soil, with arsenic and nickel the only compounds exceeding USEPA and/or CalEPA residential screening levels to protect human health. The likelihood of substantial adverse impacts to human health from exposure to arsenic in reservoir sediments is low in the Middle and Lower Klamath River and the Klamath River Estuary since sediment modeling indicates sediment deposition on the river floodplain and/or river banks is unlikely (see also Potential Impact 3.11-6). Nickel concentrations in the Klamath River Estuary sediments were higher than those measured in reservoirs sediments, suggesting the release of reservoir sediments would not increase nickel concentrations in downstream reaches and the potential exposure to nickel in

potential deposits of reservoir sediment in the Middle and Lower Klamath River and the Klamath River Estuary would likely be within background conditions.

However, in an abundance of caution, since land use along the Middle and Lower Klamath River floodplain includes residential or agricultural (i.e., row crop) land use or the potential for residential or agricultural (i.e., row crop) land use, where human soil exposure patterns may approach those specified by the USEPA and CalEPA residential screening levels, implementation of Mitigation Measure WQ-3 would be required to ensure that short-term and long-term human exposure to inorganic and organic contaminants due to release of sediments currently trapped behind the Lower Klamath Project dams to a less-than-significant impact.

Similar to the Hydroelectric Reach, there also is potential for human exposure to inorganic and organic contaminants in reservoir sediments from contact with river water during drawdown when reservoir sediments and associated inorganic and organic contaminants are being transported. Elutriate concentration results from 2009 to 2010 sediment testing along with an evaluation of the elutriate concentrations results with consideration of dilution in the Middle and Lower Klamath River and the Klamath River Estuary indicate the potential for human exposure to inorganic and organic contaminants greater than applicable human health drinking water standards that may cause substantial adverse impacts to human health. This would be a significant impact. As detailed above in the Hydroelectric Reach, the maximum potential human exposure exists immediately downstream of Iron Gate Dam during drawdown, where the maximum SSCs and the minimum dilution (48- to 66-fold) would occur. Additional tributary inflows to the Klamath River downstream of Iron Gate Dam would decrease the maximum SSCs and increase the dilution (see Potential Impact 3.2-3), so potential human exposure gradually decreases in the Middle and Lower Klamath River with distance downstream. In the Klamath River at Seiad Valley, the maximum modeled SSCs range from approximately 9,000 to 10,000 mg/L, so dilution is expected to range from approximately 65- to 72-fold in that section of the Middle Klamath River. The maximum modeled SSCs range from approximately 3,000 to 6,000 mg/L in the Klamath River at Orleans, resulting in dilution ranging from approximately 108- to 217-fold. In the Lower Klamath River at Klamath, the maximum modeled SSCs range from approximately 800 to 2,000 mg/L, so dilution ranges from 325- to 813-fold.

In the Middle Klamath River, the human exposure to inorganic and organic contaminants immediately downstream of Iron Gate Dam would be the same as analyzed above for the Hydroelectric Reach from Copco No. 1 Reservoir to Iron Gate Dam. Before consideration of dilution, aluminum, arsenic, chromium, lead, and total PCB are the only chemicals present in elutriate sediment samples results at concentrations above applicable drinking water standards for samples from J.C. Boyle, Copco No. 1, and Iron Gate reservoirs (CDM 2011). After consideration of the dilution immediately downstream of Iron Gate Dam (48- to

66-fold), only aluminum, arsenic, and total PCB concentrations would be greater than the most stringent human health drinking water standards, since the anticipated dilution immediately downstream of Iron Gate would be less the maximum dilution necessary for aluminum (219-fold), arsenic (13,635-fold), and total PCB (100-fold), but the dilution immediately downstream of Iron Gate Dam would be greater than the maximum dilution necessary for chromium (12-fold) and lead (0.3-fold) (CDM 2011). While the maximum dilution necessary to meet the most stringent applicable human health drinking water standards would be met further downstream in the Middle and Lower Klamath for aluminum and total PCB as the dilution in the river increases, the dilution for arsenic would not be met in the Middle and Lower Klamath River and the Klamath River Estuary.

Elutriate sediment samples results from the Klamath River Estuary also show aluminum, arsenic, and total PCB concentrations greater than the most stringent applicable human health drinking water standards, indicating elevated concentrations of these chemicals occur under existing conditions in the Middle and Lower Klamath River and the Klamath River Estuary. However, the concentrations of these chemicals in the elutriate sediment samples results from the Klamath River Estuary are less than those measured in reservoir sediments. Arsenic concentrations in estuary elutriate sediment samples require a 999- to 2,726-fold dilution to meet the most stringent applicable human health drinking water standards, while aluminum requires a 14-fold dilution and total PCB requires a 1.0- to 1.5-fold dilution. Overall, human exposure to concentrations of aluminum, arsenic, and total PCB greater than applicable human health drinking water standards and existing conditions would potentially occur if river water were to be used during drawdown as a drinking water supply in the Middle and Lower Klamath River and the Klamath River Estuary. This would be a significant impact.

Similar to the Hydroelectric Reach, the dilution in the Middle and Lower Klamath River and the Klamath River Estuary necessary to meet the most stringent applicable human health drinking water standards (i.e., 13,635-fold for arsenic) would occur once SSCs decrease below 47 mg/L. As described for the Hydroelectric Reach, modeled SSCs immediately downstream of Iron Gate Dam are greater than 47 mg/L for approximately six to ten consecutive months after drawdown begins (see Potential Impact 3.2-3). While increased dilution with distance downstream of Iron Gate Dam would likely reduce the duration that SSCs exceed 47 mg/L and the duration of human exposure to elevated contaminant concentrations, this analysis conservatively applies the modeled SSCs immediately downstream of Iron Gate Dam for the entire Middle and Lower Klamath River and Klamath River Estuary. As such, the exposure to inorganic and organic contaminants in reservoir sediments that would potentially cause substantial adverse impacts on human health would occur in the Middle and Lower Klamath River and the Klamath River Estuary for approximately six to ten months after drawdown begins. In dry water year types, there also would be potential human exposure to contaminant concentrations (i.e., arsenic) above the

most stringent applicable human health drinking water standards for approximately five to six months during the winter and spring after dam removal, since modeled SSCs immediately downstream of Iron Gate Dam increase during this period due to high flows associated with storms (see Figure 3.2-15). This would be a significant impact. Implementation of Mitigation Measure WQ-2 would reduce this impact to a less than significant level. Modeled SSCs downstream of Iron Gate Dam are consistently below 47 mg/L after July of post-dam removal year 1, (see Figure 3.2-15 to 3.2-17), indicating potential human exposure to contaminant concentrations that could cause substantial adverse impacts would be negligible after July of post-dam removal year 1 and thus there would be no significant impact after this point in time.

Long-term human exposure to concentrations of aluminum, arsenic, and total PCB levels greater than applicable human health drinking water standards due to dam removal is unlikely since modeled SSCs would return to background levels (i.e., existing conditions) and fine reservoir sediments and associated inorganic and organic contaminants would be unlikely to form sediment deposits in the Middle and Lower Klamath River and the Klamath River Estuary (see Potential Impact 3.11-5). Potential human exposure to inorganic and organic contaminants is associated with elevated SSCs, thus modeling that indicates SSCs would return to background levels (i.e., existing conditions) by the end of post-dam removal year 1 under all water year types (see Potential Impact 3.2-3) also indicates that potential human exposure to contaminants would return to background levels in this time period. Additionally, sediment modeling indicates fine reservoir sediments would be unlikely to settle along the riverbed in the Klamath River in the Middle and Lower Klamath River and the Klamath River Estuary (Stillwater Sciences 2008; USBR 2012) (see Potential Impact 3.11-5). Coarser reservoir sediment would potentially deposit between Iron Gate Dam and Cottonwood Creek (USBR 2012), but these sediments are not typically associated with appreciable contaminant levels due to their lack of organic matter and chemical properties (i.e., lower cation exchange capacities) (CDM 2011). Thus, there would be little to no potential long-term potential for adverse impacts to human health from exposure to river water due the release of reservoir sediments and associated inorganic or organic contaminants trapped behind the Lower Klamath Project dams, and there would be no significant impact in the long term for human exposure to inorganic and organic contaminants in the Hydroelectric Reach.

Implementation of mitigation measures WQ-2 and WQ-3 would reduce the short-term significant impact of human exposure to inorganic and organic contaminants in the Middle and Lower Klamath River and the Klamath River Estuary to less than significant.

Mitigation Measure WQ-2 − Modifications and monitoring for transient non-community and community water systems using the Klamath River for their water supply.

The KRRC shall consult with community water systems, transient non-community water systems, or other drinking water providers that use Klamath River surface water for drinking water to identify appropriate measures to reduce impacts associated with the Proposed Project's impacts to their Klamath River water supply, such that Proposed Project implementation shall not result in service of water that fails to meet drinking water quality standards. At least two months prior to initiating drawdown, the KRRC shall submit to the State Water Board a report detailing drinking water mitigation measures for each potentially affected supply and demonstrating that such measures are sufficient to protect drinking water supplies. KRRC shall amend the measures if required to protect drinking water supplies and shall implement them sufficiently prior to reservoir sediment releases to ensure protection of water supplies. Potential measures shall include, as appropriate: (1) providing an alternative potable water supply; (2) providing technical assistance to assess whether existing treatment is adequate to treat the potential increase in sediments and sediment-associated contaminants so as to meet drinking water standards; (3) providing water treatment assistance to adequately treat Klamath River water to remove SSCs and associated constituents that may impact human health; (4) ensuring that transient, non-community supplies are temporarily shut off for drinking; or (5) ensuring that water not intended for drinking is clearly marked as non-potable

Mitigation Measure WQ-3 − Monitoring and potential remediation of reservoir sediments deposited along the Middle and Lower Klamath River floodplain.

By December of post-dam removal year 1, the KRRC, upon notice from property owners, shall assess visibly obvious sediment deposits along the Klamath River from below Iron Gate Dam to the mouth of the Klamath River Estuary that may have been deposited during reservoir drawdown activities in areas with a residential or agricultural (i.e., row crop) land use or the potential for residential or agricultural land use. Visibly obvious sediment deposits shall be assessed by the KRRC to determine if they are consistent with physical sediment properties associated with Lower Klamath Project reservoir sediments. Visibly obvious sediment deposits consistent with physical sediment properties associated with Lower Klamath Project reservoirs shall be tested for arsenic or remediated without testing per requirements of this condition, below. If testing is initiated, soil samples in the vicinity of the deposited reservoir sediments on the river bank and/or floodplain shall also be tested for arsenic to determine the local background concentrations of arsenic. No additional actions or remediation shall be required if the measured arsenic concentrations in the deposited reservoir sediments are less than or equal to measured local background soil arsenic concentrations. If the concentration of arsenic in deposited reservoir sediments on the river banks and floodplain in the Klamath River exceed local background levels and USEPA or CalEPA human health residential screening levels, the

deposited reservoir sediments shall be remediated to local background levels through removal of the deposited reservoir sediments or soil capping, if soil removal is infeasible or poses a greater risk than soil capping.

Within 30 days of a determination that a reported deposit does not require remediation, either because it is not consistent with reservoir sediment deposits or because testing does not indicate a need for further action, the KRRC shall submit a report to the Deputy Director, including location of the reported deposition, a summary of actions taken, and the grounds for the determination that further action is not required. If sampling occurred, the report shall include, at a minimum:

- Estimated quantity of reported sediment deposition;
- Sediment testing methods used to determine arsenic concentrations which shall include the number of sediment samples collected from both the reported sediment deposit and surrounding sediments; and
- Arsenic sediment testing results listing the amount of arsenic in reported deposits and surround sediments.

The Deputy Director shall have the authority to require additional testing or remediation.

Within 14 days of a following inspection of reported sediment deposition that requires further action, the KRRC shall submit a Sediment Deposit Remediation Plan to the Deputy Director for review and approval that shall include, at a minimum:

- Estimated location, and amount of reported sediment deposition;
- If testing occurred, the sediment testing methods used to determine arsenic concentrations which shall include the number of sediment samples to be collected from both the reported sediment deposit and surrounding sediments;
- If testing occurred, the arsenic sediment testing results listing the amount of arsenic in reported deposits and surround sediments; and
- Proposed remediation actions if arsenic is determined present above background levels.

The Deputy Director may require modifications to the Sediment Deposit Remediation Plan as part of its approval. The KRRC shall file the Deputy Director's approval, together with any required modifications, with FERC. The KRRC shall implement the Sediment Deposit Remediation Plan upon receiving Deputy Director and any other required approvals. Any changes to the Sediment Deposit Remediation Plan shall be approved by the Deputy Director prior to implementation. The KRRC shall file a report of completion within 30 days of completing remediation activities. If the Sediment Deposit Remediation Plan includes arsenic testing, the KRRC shall report arsenic results to the Director within 15 days, and proceed with remediation actions.

Significance
No significant impact with mitigation

Potential Impact 3.2-14 Freshwater and marine aquatic species exposure to inorganic and organic contaminants due to release of sediments currently trapped behind the dams.
This potential impact evaluates the potential for any inorganic and organic contaminants in reservoir sediments to result in a substantial adverse impact to aquatic organisms when the sediments are released downstream of the dams into the Klamath River. The release of reservoir sediments has the potential to increase the exposure of aquatic species to any harmful material in the sediment by moving the sediments and associated contaminants to new places in the river; mixing the sediments and associated contaminants into the water column where aquatic life may interact with them; and, for some materials, creating conditions where contaminants may enter the food chain. Sediment testing indicates that the amounts of contaminants in the sediments is not high, but this analysis evaluates the level of risk and potential impacts in more detail with consideration of the conditions in the Klamath River under the Proposed Project, especially during drawdown.

Hydroelectric Reach
Organic and inorganic contaminants have been identified in the sediment deposits currently trapped behind the dams (see Section 3.2.2.8 *Inorganic and Organic Contaminants*). Under the Proposed Project, the short-term pathway of contaminant exposure for freshwater aquatic species includes exposure during sediment transit through the Hydroelectric Reach ("Exposure Pathway 1" in CDM [2011]), while long-term pathways include exposure from river bed deposits ("Exposure Pathway 3" in CDM [2011]) (Figure 3.2-27). The CDM (2011) analysis of exposure pathways using the 2009 SEF screening levels has been updated based on 2018 SEF screening levels, as appropriate (Appendix C – *Section C.7*).

One path for short-term exposure to inorganic and organic contaminants for freshwater aquatic species would be associated with the transport of elevated suspended sediment concentrations (SSCs) through the Hydroelectric Reach during reservoir drawdown. Due to the relatively small volume of the sediment deposits behind J.C. Boyle Dam (approximately eight percent of total volume for the Lower Klamath Project, see also Tables 2.7-9 and 2.7-10), short-term SSCs in the Hydroelectric Reach between J.C. Boyle Dam and the upstream end of Copco No. 1 Reservoir would be considerably less than those anticipated to occur downstream of Iron Gate Reservoir (see Potential Impact 3.2-3). The ratio of the contaminant concentration to SSCs measured in laboratory tests is assumed to be equal to the ratio of the contaminant concentration to SSCs in the Klamath River during drawdown, so the amount of dilution necessary to meet water quality standards would vary based on changes in SSCs during drawdown.

Variations in flow and dilution downstream of the reservoirs during drawdown would be inherently included in the modeled SSCs since the model utilizes expected drawdown flows in its estimate of SSCs. Thus, the maximum dilution necessary to meet water quality standards for aquatic species would be calculated using the maximum SSCs.

In the Hydroelectric Reach downstream of J.C. Boyle to the upstream end of Copco No. 1 Reservoir, the maximum SSCs would range from 2,000 to 3,000 mg/L (see Potential Impact 3.2-3), so dilution of mobilized sediments with reservoir and river water is expected to range from 217- to 325-fold immediately downstream of J.C. Boyle during drawdown. Within the remainder of the Hydroelectric Reach from the upstream end of Copco No. 1 Reservoir through Iron Gate Reservoir, short-term SSCs would be relatively greater than upstream of Copco No. 1 Reservoir, generally increasing in the downstream direction due to the larger sediment deposits in Copco No. 1 and Iron Gate reservoirs contributing to SSCs. The minimum dilution in the Klamath River would occur immediately downstream of Iron Gate Dam during drawdown, where higher peak SSCs from release of sediments in Copco No. 1 and Iron Gate reservoirs would result in dilution ranging from 48- to 66-fold. As a conservative estimate, this analysis uses the J.C. Boyle dilution only for the J.C. Boyle Dam to the upstream end of Copco No. 1 Reservoirs portion of the Hydroelectric Reach and the dilution expected immediately downstream of Iron Gate Dam for the remainder of the Hydroelectric Reach when evaluating the dilution necessary to meet water quality standards for contaminant results. The actual SSCs in the Hydroelectric Reach in Copco No. 1 Reservoir to Iron Gate Dam potentially would be less than the maximum SSCs estimated below Iron Gate Dam based on modeled SSCs below the J.C. Boyle and Copco No. 1 dams (see Impact 3.2-3), so the inorganic and organic contaminant concentrations and the aquatic species exposure to those contaminants in the Hydroelectric Reach of the Klamath River would be less than those estimated using the maximum SSCs estimated below Iron Gate Dam.

Sediment chemistry data from 2006 collected from 25 cores representing both reservoir-deposited and pre-reservoir sediments within the historical Klamath River channel (“on-thalweg”) and on historical riverbanks and terraces along the edge of the Klamath River (“off-thalweg”) in J.C. Boyle, Copco No. 1, and Iron Gate reservoirs indicate generally low levels of metals, pesticides, chlorinated acid herbicides, PCBs, VOCs, SVOCs, cyanide, and dioxins (Shannon & Wilson, Inc. 2006; see also Section 3.2.2.8 *Inorganic and Organic Contaminants*). While two-dimensional sediment transport modeling of Copco No. 1 Dam and Reservoir during drawdown indicates that sediments would be mobilized from across the reservoir footprint, the sediments in the historical Klamath River channel would be the most likely to erode (USBR 2012) and thus the sediment chemistry of the on-thalweg sediment cores is more likely to be representative of eroded sediment conditions.

An additional 37 sediment cores were collected in 2009 to 2010 in the Lower Klamath Project reservoirs for the Klamath Dam Removal Secretarial Determination process to evaluate the sediment characteristics of reservoir-deposited and pre-reservoir sediments in the historical Klamath River channel ("on-thalweg") and terrace ("off-thalweg") locations at a finer spatial resolution. Testing results for the 2009 to 2010 cores indicate no exceedances of applicable screening levels, indicating a low risk of toxicity to freshwater sediment-dwelling organisms in the Hydroelectric Reach under the Proposed Project. Results from acute (10-day) sediment bioassays for exposure to undiluted reservoir sediments and elutriate samples for midges (*Chironomus dilutus*) and amphipods (*Hyalella azteca*), two national benchmark toxicity species, indicate generally equal survival in reservoir sediments as compared with laboratory control samples. The exception is J.C. Boyle Reservoir, which exhibited considerably lower survival for *Chironomus dilutus* in the on-thalweg sample as compared with the laboratory control (64 percent versus 95 percent) and somewhat lower survival for the off-thalweg sample (83 percent versus 95 percent) (CDM 2011).

While J.C. Boyle reservoir sediment results suggest potential toxicity to freshwater benthic organisms, the conditions in the bioassays would be very unlikely to occur during drawdown and dam removal in the Hydroelectric Reach downstream of J.C. Boyle Dam, so there is an overall low likelihood of acute toxicity to benthic organisms due to releases of reservoir sediments. The bioassays evaluated the survival of freshwater benthic organisms in composite[17] sediments from individual reservoirs, but undiluted composite sediments from the reservoirs would be very unlikely to occur outside of the reservoir footprints during drawdown and dam removal. Sediments from the reservoirs would mix with water and incoming suspended sediments from tributaries as they move downstream under the Proposed Project, exposing downstream aquatic biota to a diluted, "average" sediment composition rather than pure reservoir sediments. Under current conditions, the total volume of erodible sediments in Copco No. 1 and Iron Gate reservoirs (7.4 million and 4.7 million cubic yards, respectively; see also Tables 2.7-7 through 2.7-9) is considerably greater than that of J.C. Boyle Reservoir (1 million cubic yards; see also Tables 2.7-7 through 2.7-9), further diminishing the potential influence of J.C. Boyle Reservoir sediments on biota exposure. Additionally, fine sediments released during drawdown and dam removal would be transported by large water volumes, and sediment modeling indicates that fine sediments would be unlikely to settle along the riverbed in the Klamath River in the Hydroelectric Reach (Stillwater Sciences 2008; USBR 2012) and thus unlikely to result in riverine, floodplain, or estuarine sediment deposits that resemble existing conditions in the reservoirs.

More specifically, dilution would be expected to range from 217- to 325-fold downstream of J.C. Boyle Dam to the upstream end of Copco No. 1, so benthic organism exposure to inorganic and organic contaminants in J.C. Boyle Reservoir sediments would be much less during drawdown under the Proposed Project than in the bioassays. The intensity of exposure compared to the

bioassays would be further reduced due to considerable additional mixing occurring within the Hydroelectric Reach from the current Copco No. 1 Reservoir to Iron Gate Dam. While dilution would decrease downstream of Copco No. 1 due to higher SSCs, the mixing of sediments from J.C. Boyle and Copco No. 1 along with additional mixing of water from Copco No. 1 would reduce the overall intensity of exposure to J.C. Boyle reservoir sediments. In the absence of undiluted sediment deposits from J.C. Boyle Reservoir, freshwater benthic organisms in the Hydroelectric Reach are unlikely to experience the same intensity of exposure to reservoir sediments as in the bioassays that suggested potential for toxicity (CDM 2011). Overall, the freshwater sediment bioassays indicate a low likelihood of acute toxicity to benthic organisms in the Hydroelectric Reach of the Klamath River due to sediment release under the Proposed Project.

Elutriate concentration results (characterizing the potential chemical concentrations that may be released into the water from reservoir sediments during suspension) from the 2009 to 2010 sediment testing also provide important context for evaluating the potential effects of in-water column exposure to inorganic and organic contaminants from reservoir sediments on aquatic freshwater species. Elutriate sediment sample chemistry results indicate that, before consideration of dilution, ammonia, aluminum, chromium, copper, lead, and mercury are the chemicals present at concentrations above Basin Plan, national priority, and national non-priority fresh water quality criteria for samples from J.C. Boyle, Copco No. 1, and Iron Gate reservoirs (CDM 2011). Human health freshwater water quality criteria were also evaluated (CDM 2011) and those results are analyzed above in Potential Impact 3.2-13. Dilution of mobilized sediments with reservoir and river water is expected to range from 217- to 325-fold downstream of J.C. Boyle Dam to the upstream end of Copco No. 1 Reservoir and 48- to 66-fold immediately downstream of Iron Gate during drawdown. Thus, the elutriate sediment sample concentrations for all the chemicals currently present at concentrations above water quality criteria (i.e., ammonia, aluminum, chromium, copper, lead and mercury) would be below the freshwater water quality criteria with dilution in the portion of the Hydroelectric Reach from J.C. Boyle Dam to the upstream end of Copco No. 1 Reservoir. Inorganic and organic contaminants would be unlikely to cause adverse effects to freshwater aquatic species in the J.C. Boyle Dam to the upstream end of Copco No. 1 Reservoir portion of the Hydroelectric Reach since the dilution required to meet the most stringent criterion is 22-fold (i.e., the elutriate concentration would have to be 22 times higher than the water quality standard concentration to exceed criterion) for ammonia, 125-fold for aluminum, 0.2-fold for chromium, 2.3-fold for copper, 2.1-fold for lead, and 1.3-fold for mercury. However, the dilution in the Copco No. 1 Reservoir to Iron Gate Dam portion of the Hydroelectric Reach would be less than upstream, reaching a minimum of 48- to 66-fold at Iron Gate Dam due to release of additional sediment from Copco No. 1 and Iron Gate reservoirs and higher SSCs. Elutriate sediment sample concentrations in the Copco No. 1 Reservoir to Iron Gate Dam portion of the Hydroelectric Reach

would be below the freshwater water quality criteria for ammonia, chromium, copper, lead, and mercury after consideration of dilution with no potential to cause substantial adverse impacts on freshwater aquatic species.

For aluminum, the expected dilution at Iron Gate Dam is less than the dilution required for three of the six elutriate sediment samples to meet the most stringent freshwater criterion (87 ug/L) with those three samples requiring a 50- to 125-fold dilution. While some inorganic forms of aluminum can be toxic to aquatic organisms at high and low pH, insoluble and nontoxic forms of aluminum prevail in the environment under typical conditions (pH ranging from six to eight s.u. and alkalinity greater than 100 mg/L). The pH conditions at drawdown are not anticipated to be in the range that would cause inorganic aluminum to become toxic. Thus, any residual free (toxic) aluminum present in reservoir waters during drawdown is likely to form compounds with the dissolved organic matter abundant in eutrophic (nutrient-rich) waters such as the Lower Klamath Project reservoirs, rendering the aluminum non-bioavailable and nontoxic. Thus, water column toxicity due to the concentration of inorganic or organic substances under the Proposed Project is unlikely (CDM 2011) and would not result in substantial adverse impacts on environmental receptors.

Elutriate sediment sample bioassay results for J.C. Boyle Reservoir indicate that no further dilution would be required to prevent water column toxicity to freshwater fish, even without considering the dilution that will take place during drawdown and dam removal (CDM 2011). Elutriate sediment sample bioassay results indicate no statistically significant reduction of mean 96-hour rainbow trout survival for exposure to samples from Copco No. 1 and Iron Gate reservoirs, tested at one percent and 10 percent elutriate concentrations, but a significant reduction from Copco No. 1 Reservoir at 100 percent elutriate concentrations and from Iron Gate Reservoir at 50 percent and 100 percent elutriate concentration. Of these, the one percent and 10 percent concentrations are considered to be most representative of field conditions upon reservoir drawdown due to the expectation of substantial mixing and dilution with river water and tributary inputs, even during dry water years (CDM 2011).

Long-term exposure to reservoir sediments that are mobilized as a result of dam removal would not result in substantial adverse impacts on aquatic species due to negligible deposition of these sediments in Hydroelectric Reach and the overall infrequency and low magnitude of exceedances of screening levels for inorganic and organic contaminants. Sediment modeling indicates that the fine grain nature of the sediments (i.e., silts and clays) and the generally high gradient river channel within the Hydroelectric Reach would result in little to no deposition of the fine or coarser (e.g., sand) sediments in the Hydroelectric Reach of the Klamath River (CDM 2011; USBR 2012).

Additionally, no consistent pattern of elevated chemical distribution was observed across the reservoir samples, with only eight chemicals detected in the 77

samples that exceeded one or more available screening level (see Section 3.2.2.8 *Inorganic and Organic Contaminants*). Nickel was the only one of those eight chemicals that exceeded both SEF screening levels in all three reservoirs. However, nickel is higher in Klamath River Estuary sediments (representing current Klamath Basin background conditions) than reservoir sediments, so reservoir sediments would not elevate nickel concentrations above background conditions. The absence of a consistent pattern of elevated chemical concentrations in reservoir sediment samples supports the conclusion that mixing and dilution of mobilized sediments during drawdown would reduce the overall chemical concentrations in the water column and any sediment deposits and further reduce exposure potential in the newly formed river channels of the Hydroelectric Reach (CDM 2011).

Combined, results from the Shannon & Wilson, Inc. (2006) study and the 2009–2010 Klamath Dam Removal Secretarial Determination study (CDM 2011) indicate that currently one or more chemicals are present in the Lower Klamath Project reservoir sediments at levels with potential to cause minor or limited adverse impacts on freshwater aquatic species. However, chemicals present in the Lower Klamath Project reservoir sediments are expected to be mixed and diluted below water quality standards reducing the likelihood of causing even minor or limited adverse impacts on freshwater aquatic species in the short term. In the long term, one or more chemicals are present, but at levels unlikely to cause substantial adverse impacts on environmental receptors. Therefore, under the Proposed Project, the short-term and long-term impacts on freshwater aquatic species from exposure to sediment-associated inorganic and organic contaminants during sediment release and transit, and from potential downstream river-channel deposition, in the Hydroelectric Reach, would be a less-than-significant impact.

Middle and Lower Klamath River

Organic and inorganic contaminants have been identified in the sediment deposits currently trapped behind the dams (see Section 3.2.2.8). Under the Proposed Project, the short-term pathway of contaminant exposure for freshwater aquatic species includes exposure during sediment transit through the Middle and Lower Klamath River ("Exposure Pathway 1" in CDM [2011]), while long-term pathways include exposure from river bed deposits ("Exposure Pathway 3" in CDM [2011]). The CDM (2011) analysis of exposure pathways using the 2009 SEF screening levels has been updated based on 2018 SEF screening levels, as appropriate (Appendix C – *Section C.7*).

As detailed above for the Hydroelectric Reach, sediment chemistry data from 25 cores collected from Lower Klamath Project reservoirs in 2006 and from an additional 37 sediment cores collected in 2009 to 2010 indicate generally low levels of metals, pesticides, chlorinated acid herbicides, PCBs, VOCs, SVOCs, cyanide, and dioxins (Shannon & Wilson, Inc. 2006; see also Section 3.2.2.8 *Inorganic and Organic Contaminants*) and no exceedances of applicable

screening levels, indicating a low risk of toxicity to freshwater sediment-dwelling organisms in the Middle and Lower Klamath River under the Proposed Project. Acute (10-day) sediment bioassays for exposure to undiluted reservoir sediments and elutriate samples for midges (*Chironomus dilutus*) and amphipods (*Hyalella azteca*), two national benchmark toxicity species, indicate generally equal survival in reservoir sediments as compared with laboratory control samples, except for J.C. Boyle Reservoir sediments (see discussion in the Hydroelectric Reach above). Similar to the Hydroelectric Reach, the conditions in the bioassays would be very unlikely to occur during drawdown and dam removal in the Klamath River downstream of Iron Gate Dam because the downstream aquatic biota would be exposed to a diluted "average" sediment composition rather than pure reservoir sediments analyzed in the bioassays. As such, the potential toxicity of J.C. Boyle Reservoir sediments on downstream biota would be significantly reduced compared to the bioassays, especially downstream of Iron Gate Dam due to considerable mixing and dilution within the Hydroelectric Reach. Additionally, any natural background sediments or flows from tributaries (e.g., Bogus Creek, Shasta River) entering the Klamath River downstream of Iron Gate Dam would further mix and dilute sediments, reducing exposure relative to the bioassays. Fine sediments released during drawdown and dam removal would be transported and unlikely to settle along the riverbed in the Klamath River downstream of Iron Gate Dam (USBR 2012; Stillwater Sciences 2008), so any potential riverine, floodplain, or estuarine sediment deposits that resemble existing conditions in the reservoirs are very unlikely. In the absence of undiluted sediment deposits from J.C. Boyle Reservoir, freshwater benthic organisms downstream of Iron Gate Dam are unlikely to experience the same intensity of exposure to reservoir sediments as in the bioassays that suggested potential for toxicity (CDM 2011). Overall, the freshwater sediment bioassays indicate a low likelihood of acute toxicity to benthic organisms in the Middle and Lower Klamath River due to sediment release under the Proposed Project.

As previously discussed for the Hydroelectric Reach, elutriate concentration results from 2009 to 2010 also provide important context for evaluating the potential effects of in-water column exposure to inorganic and organic contaminants from reservoir sediments on aquatic freshwater species. Elutriate sediment sample chemistry results indicate that, before consideration of dilution, ammonia, aluminum, chromium, copper, lead, and mercury are the chemicals present at concentrations above Basin Plan, national priority, and national non-priority fresh water quality criteria for samples from J.C. Boyle, Copco No. 1, and Iron Gate reservoirs (CDM 2011). However, dilution of mobilized sediments with reservoir and river water is expected to range from 48- to 66-fold immediately downstream of Iron Gate during drawdown, with further dilution occurring downstream from Iron Gate Dam due to tributary inflows. Elutriate sediment sample concentrations of ammonia, chromium, copper, lead and mercury would be below the freshwater water quality criteria after consideration of dilution immediately downstream of Iron Gate Dam with no potential to cause substantial adverse impacts on freshwater aquatic species since the dilution required to

meet the most stringent criterion is 22-fold for ammonia, 0.2-fold for chromium, 2.3-fold for copper, 2.1-fold for lead, and 1.3-fold for mercury.

For aluminum, the expected dilution downstream of Iron Gate Dam is less than the dilution required for three of the six elutriate sediment samples to meet the most stringent freshwater criterion (87 ug/L) with those three samples requiring a 50- to 125-fold dilution. While some inorganic forms of aluminum can be toxic to aquatic organisms at high and low pH, insoluble and nontoxic forms of aluminum prevail in the environment under typical conditions (pH ranging from six to eight s.u. and alkalinity greater than 100 mg/L). The pH conditions at drawdown are not anticipated to be in the range that would cause inorganic aluminum to become toxic. Thus, any residual free (toxic) aluminum present in reservoir waters during drawdown is likely to form compounds with the dissolved organic matter abundant in eutrophic (nutrient-rich) waters such as the Lower Klamath Project reservoirs, rendering the aluminum non-bioavailable and nontoxic. Thus, water column toxicity due to the concentration of inorganic or organic substances under the Proposed Project is unlikely (CDM 2011).

Elutriate sediment sample bioassay results indicate no statistically significant reduction of mean 96-hour rainbow trout survival for exposure to samples from Copco No. 1 and Iron Gate reservoirs, tested at one percent and 10 percent elutriate concentrations, but a significant reduction from Copco No. 1 Reservoir at 100 percent elutriate concentrations and from Iron Gate Reservoir at 50 percent and 100 percent elutriate concentration. Of these, the one percent and 10 percent concentrations are considered to be most representative of field conditions upon reservoir drawdown due to the expectation of substantial mixing and dilution with river water and tributary inputs, even during dry water years (CDM 2011).

Long-term exposure to reservoir sediments that are mobilized as a result of dam removal downstream of Iron Gate Dam are similar to those analyzed in the Hydroelectric Reach and release of reservoir sediments is unlikely to result in substantial adverse impacts on aquatic species due to minimal deposition of these sediments in the downstream river channel and the overall infrequency and low magnitude of exceedances of screening levels for inorganic and organic contaminants. No consistent pattern of elevated chemical distribution was observed across the reservoir samples, with only eight chemicals detected in the 77 samples that exceeded one or more available screening level (see Section 3.2.2.8 *Inorganic and Organic Contaminants*). Nickel was the only one of those eight chemicals that exceeded both SEF screening levels in all three reservoirs. Nickel is higher in Klamath River Estuary sediments (representing current Klamath Basin background conditions) than reservoir sediments, so reservoir sediments would not elevate nickel concentrations above background conditions. The absence of a consistent pattern of elevated chemical concentrations in reservoir sediment samples supports the conclusion that mixing and dilution of mobilized sediments during drawdown would reduce that overall chemical

concentrations in the water column and any sediment deposits and further reduce exposure potential in the Middle and Lower Klamath River (CDM 2011).

Overall, one or more chemicals are currently present in the Lower Klamath Project reservoir sediments at levels with potential to cause minor or limited adverse impacts on freshwater aquatic species in the short term, based results from the Shannon & Wilson, Inc. (2006) study and the 2009–2010 Klamath Dam Removal Secretarial Determination study (CDM 2011), but chemicals present in the Lower Klamath Project reservoir sediments are expected to be mixed and diluted below water quality standards, reducing the likelihood of any substantial adverse impacts on freshwater aquatic species in the short term. In the long term, one or more chemicals are present, but at levels unlikely to cause substantial adverse impacts based on available evidence. Therefore, under the Proposed Project, the short-term and long-term impacts on freshwater aquatic species from exposure to sediment-associated inorganic and organic contaminants during sediment release and transit, and from potential downstream river-channel deposition, in the Middle and Lower Klamath River, would be a less-than-significant impact.

Klamath River Estuary and Pacific Ocean Nearshore Environment
Under the Proposed Project, pathways of contaminant exposure for estuarine and marine aquatic species include short-term exposure during sediment transport through the Klamath River Estuary and Pacific Ocean nearshore environment (”Exposure Pathway 1” in CDM [2011]), as well as the potential for long-term exposure following deposition in the Pacific Ocean nearshore environment (“Exposure Pathway 4” in CDM [2011]). See Potential Impact 3.11-6 for further discussion of sediment deposition patterns in the Pacific Ocean nearshore environment.

For the 2009–2010 Klamath Dam Removal Secretarial Determination study, there were no exceedances of the 64 applicable and available maximum marine screening levels (CDM 2011), with the exception of a small number of sediment samples from J.C. Boyle Reservoir, which exceeded the applicable marine screening level for dieldrin[51] and 2,3,4,7,8-PECDF[52] (CDM 2011). The concentrations of detected inorganic or organic contaminants in Lower Klamath

[51] Dieldrin is a pesticide developed in the 1940s as an alternative to DDT and widely used during the 1950s until early 1970s on crops such as corn and cotton. Its use on crops ceased in 1972 and its other use, killing termites, ceased in 1987, but it is still in the environment due to its past use and slow breakdown in soil (USDHHS 2002).

[52] 2,3,4,7,8-PECDF is a chlorodibenzofuran (i.e., dioxin-like) compound that can be released during burning of material, including wood, coal, and oil for home heating and production of electricity. It is also produced during the manufacture of some chlorinated chemicals and consumer products, such as wood treatment chemicals (e.g., creosote), some metals, and paper products (USDHHS 1994).

Project reservoir sediments were below the concentrations measured in Klamath River Estuary sediments for chromium and nickel, so the release of reservoir sediments from behind the Lower Klamath Project dams would not elevate estuarine concentrations of these inorganic or organic contaminants or increase exposure for freshwater aquatic species relative to existing conditions. In reservoir sediments total chromium concentrations ranged from 18 to 48 mg/kg and total nickel concentrations ranged from 18 to 33 mg/kg, but in Klamath River Estuary sediments total chromium concentrations ranged from 96 to 97 mg/kg and total nickel concentrations were consistently 110 mg/kg. Marine screening levels are designed to be protective of direct toxicity to benthic and epibenthic organisms, corresponding to a "no adverse effects level," so the majority of sediment sample results from 2009 and 2010 indicate a low risk of toxicity to sediment-dwelling organisms. Additionally, the Proposed Project would result in substantial mixing and dilution during sediment release and transit through the Klamath River estuarine and/or Pacific Ocean nearshore environment, exposing downstream aquatic biota to an "average" water column concentration rather than a reservoir- or site-specific concentration, further reducing the potential for toxicity. The standard laboratory tests used could not measure whether 33 analytes were present above marine screening levels because the smallest amount the laboratory tests could detect (i.e., the reporting limit) for those analytes was greater than the marine screening level itself (CDM 2011). Because it is not possible to determine whether these analytes are present in reservoir sediments either above or below levels of concern, the Lower Klamath Project EIR analysis relies upon the results of integrative bioassays (described below) to determine the potential for short-term sediment toxicity to estuarine and marine aquatic species during sediment transport through the Klamath River Estuary and Pacific Ocean nearshore environment.

Sediment bioassays from a single upper Klamath River Estuary sample included in the 2009–2010 Klamath Dam Removal Secretarial Determination study indicate greater survival (89 to 99 percent survival) of national benchmark toxicity species (midge [*Chironomus dilutus*] and amphipod [*Hyalella azteca*]) in the estuary sediment sample as compared with the laboratory control samples (81 to 94 percent survival) (see CDM 2011). A simple comparison between the estuary area composite acute toxicity results and the reservoir super-composite results indicates similar survival for *Chironomus dilutus* (89 percent vs. 64 to 94 percent, respectively) and greater survival for *Hyalella azteca* (99 percent vs. 80 to 94 percent, respectively). The toxicity tests of estuary and reservoir sediments show the existing background toxicity of estuary sediments is similar to the toxicity of reservoir sediments, so under the Proposed Project, sediment transport during drawdown and potential exposure to inorganic and organic contaminants in the reservoir sediments are unlikely to cause acute toxicity relative to background conditions in the estuary. For the Pacific Ocean nearshore environment under the Proposed Project, a comparison of the applicable marine water and sediment screening levels for ocean conditions with

elutriate chemistry results (prior to consideration for mixing and dilution) and sediment chemistry results does not indicate likely toxicity (CDM 2011).

With respect to bioaccumulation potential, there are no exceedances of applicable marine bioaccumulation screening levels (CDM 2011). Further, with the exception of four samples in J.C. Boyle Reservoir (CDM 2011), levels of other known bioaccumulative compounds did not exceed ODEQ bioaccumulation screening level values (SLVs) for marine fish. Note that ODEQ bioaccumulatory screening levels are not strictly applicable in the California marine offshore environment, but they are indicative of potentially bioaccumulative compounds.

Regarding analysis through the pathway of suspended sediment exposure, elutriate chemistry results indicate that several chemical concentrations in the elutriate samples from J.C. Boyle, Copco No. 1, Iron Gate reservoir sediments and Klamath River Estuary sediments exceed one or more water quality criteria for evaluation of surface water exposures for marine biota. Chemicals that exceed marine surface water criteria include those generally considered to be nontoxic (e.g., phosphorus) as well as those with substantial potential for contributing to adverse impacts (e.g., copper). Exposures to suspended sediment with elevated concentrations of potentially toxic chemicals are of lower concern for marine receptors than exposures to elevated concentrations of dissolved chemicals (CDM 2011). The chemicals with the greatest potential to cause adverse impacts due to their elutriate sample concentrations (e.g., copper) are, under field conditions associated with this exposure pathway, expected to bind to particulate matter and no longer be bioavailable, and therefore are unlikely to contribute substantially to elevated concentrations of dissolved forms in the water column. Further, 48- to 66-fold dilution of river water and associated suspended sediments is expected to occur immediately downstream of Iron Gate Dam with further dilution occurring downstream and in the marine environment. The dilution required to meet the most stringent marine water quality criteria for the detected elutriate chemicals ranges from 0.1- to 40-fold with the exception of phosphorus, so the expected dilution during dam removal would be greater than that required to meet marine water quality criteria. Phosphorous would require 1,299 to 5,399-fold dilution to meet the most stringent marine water quality criterion (0.1 ug/L[53]), but phosphorus is generally considered to be non-toxic (CDM 2011). Potential effects of elevated phosphorus concentrations in the estuarine and marine environment due to sediment releases during dam removal are discussed further under Potential Impact 3.2-7.

Although not conducted specifically for estuarine or marine organisms, additional lines of evidence from the 2009–2010 Klamath Dam Removal Secretarial Determination study support the conclusion that exposure to inorganic and organic compounds in sediments released from the reservoirs under the

[53] National Recommended Water Quality Criteria for Non-Priority Pollutants, Marine Criterion Continuous Concentration [chronic].

Proposed Project are unlikely to result in substantial long-term adverse impacts on estuarine and marine near shore aquatic species. These include the evaluation of elutriate toxicity bioassay results for rainbow trout, sediment toxicity bioassay results for benthic invertebrate national benchmark species, comparisons of tissue-based toxicity reference values (TRVs) to chemical concentrations in laboratory-reared freshwater clams and worms exposed to field collected sediments (see prior discussion of Proposed Project potential impacts on freshwater aquatic species), and comparisons of tissue-based TRVs and toxicity equivalent quotients (TEQs) to chemical concentrations in field-collected fish tissue.

Under the Proposed Project, the short-term and long-term impacts of sediment release, transit through the Klamath River Estuary, and deposition in the Pacific Ocean nearshore environment on aquatic species due to low-level exposure to sediment-associated inorganic and organic contaminants would be less-than-significant.

The Definite Plan (see Appendix B: *Definite Plan – Appendix M*) includes a Water Quality Monitoring Plan to assess the Proposed Project's impacts to water quality, and this plan includes potential toxicity monitoring, but no toxicity monitoring activities are currently included. The proposed Water Quality Monitoring Plan notes that the identified potential toxicity monitoring activities would only be performed if the additional testing is required by the State Water Board. The State Water Board has authority to review and approve any final Water Quality Monitoring Plan through its water quality certification under Clean Water Act Section 401. The State Water Board has issued a draft water quality certification which sets forth monitoring and adaptive management requirements for any Water Quality Monitoring Plan to meet, as Condition 1[54]. Additionally, the Oregon Department of Environmental Quality has issued a water quality certification[55] that sets forth water quality monitoring and adaptive management conditions for points upstream of California. The effect of the Proposed Project on inorganic and organic contaminants is anticipated to be less than significant in both the short and long term, and this analysis of Potential Impact 3.2-14 does not further discuss the water quality monitoring and adaptive management conditions.

[54] The State Water Board's draft water quality certification is available online at: https://www.waterboards.ca.gov/waterrights/water_issues/programs/water_quality_cert/docs/lower_klamath_ferc14803/lkp_dwqc.pdf (Accessed December 11, 2018).

[55] The Oregon Department of Environmental Quality's final water quality certification is available online at: https://www.oregon.gov/deq/FilterDocs/ferc14803final.pdf (Accessed December 11, 2018).

Significance
No significant impact

Potential Impact 3.2-15 Short-term increases in inorganic and organic contaminants from hazardous materials associated with construction and restoration activities in the Hydroelectric Reach and the Middle Klamath River immediately downstream of Iron Gate Dam.
Under the Proposed Project, pre-construction activities that would potentially affect water quality include diversion tunnel modifications, road improvements, Iron Gate and Fall Creek hatchery modifications, Yreka pipeline modifications, and dam site preparation between June and November of dam removal year 1 (Table 2.7-1). Immediately following dam removal, non-natural fish barriers would be modified to enable volitional fish passage. Facility removal activities would begin in October of dam removal year 1 with removal of the Copco No. 1 Powerplant, including demolition of the dams and their associated structures, power generation facilities, and transmission lines, installation of temporary cofferdams, hauling, recreation facilities removal, regrading of recreation access roads and parking areas, and other activities (Table 2.7-1). Short-term restoration activities would include irrigation system installation and maintenance, as well as active seeding, planting, and weed management in the reservoir footprint and disturbed upland areas within the Limits of Work (Table 2.7-1). For greater detail on these activities, please see Section 2.7 *Proposed Project*. The aforementioned activities could result in the disturbance of reservoir sediment deposits remaining within the reservoir footprints and result in inorganic and organic contaminants in those sediments entering the Klamath River. Additionally, use of heavy construction equipment and construction-related vehicles involves gasoline, other petroleum fuels, hydraulic and lubricating fluids and other materials, which have the potential to contaminate waters should they be captured in site stormwater runoff or due to accidents. Please see Potential Impact 3.2-4 potential stormwater-related impacts to water quality and Potential Impact 3.22-2 for consideration of the accidental release of hazardous materials from construction equipment and/or vehicles under the Proposed Project.

As discussed in Potential Impact 3.2-4, the Proposed Project includes construction and other ground-disturbing BMPs to reduce potential impacts to water quality in wetlands and other surface waters during construction (Appendix B: *Definite Plan – Appendix J*). Those BMPs focus on general stormwater-related contamination as well as fuels, oils, and lubricants; however, their implementation would also minimize or eliminate the potential for increases in inorganic and organic contaminants that could enter wetlands and other surface waters located within the Limits of Work (Figures 2.2-5, 2.7-2, and 2.7-4), including the Hydroelectric Reach, tributaries of the Klamath River that enter this reach (as appropriate), or the Middle Klamath River immediately downstream of Iron Gate Dam due to construction and other ground-disturbing activities. However, the Proposed Project does not specify BMPs for pre-construction, reservoir restoration, or upland restoration activities. Further, the proposed

BMPs are not sufficiently comprehensive to avoid all potential violations of water quality standards or otherwise degrade water quality in affected portions of the wetlands, Hydroelectric Reach, tributaries to the Klamath River that enter this reach (as appropriate), or the Middle Klamath River immediately downstream of Iron Gate Dam, during these other periods of Proposed Project activity. Thus, short-term increases in inorganic and organic contaminants from hazardous materials associated with construction and restoration activities would potentially result in substantial adverse impacts on human health or environmental receptors and there could be significant impacts without mitigation to water quality in the Hydroelectric Reach and the Middle Klamath River immediately downstream of Iron Gate Dam. Implementation of Mitigation Measures WQ-1, TER-1, and HZ-1 would reduce this impact to less than significant.

Significance
No significant impact with mitigation

Potential Impact 3.2-16 Short-term impacts to aquatic biota from herbicide application during restoration of the reservoir areas.
The Proposed Project Reservoir Restoration Plan includes active seeding and planting of vegetation in drained reservoir areas to stabilize the surface of the sediment and minimize erosion from exposed terrace surfaces following drawdown (Appendix B: *Definite Plan – Appendix H*). An invasive exotic vegetation (IEV) management plan would be implemented to control terrestrial invasive exotic plant species. As part of the management plan, IEV surveys would be undertaken prior to dam removal year 1 and year 2 and non-herbicide methods of integrative pest management (e.g., manual weed pulling, mowing or cutting, mechanical eradication by tilling in larger areas, grazing, shading, and solarization) would be used first to remove IEVs within the Limits of Work. As a last resort and only when other methods prove to be ineffective or potentially cause more harm than benefit within the environment, herbicides would be used to control the growth of invasive exotic vegetation species, with application by wicking or brushing occurring during dam removal year 2.

Herbicide use to control invasive exotic vegetation species has the potential to contaminate the Klamath River through runoff or drift without proper selection, handling, and application. KRRC has proposed to avoid this risk to the extent possible by only using herbicides after non-chemical control methods have proven ineffective or may cause more harm than benefit to the environment. The only herbicides used would be those approved for use by the Bureau of Land Management (BLM), California Department of Fish and Wildlife (CDFW), North Coast Regional Board, USFWS, and NMFS in California. If herbicide application becomes the necessary method for effective IEV control, the KRRC would consider only those application methods with the least side-effects to native vegetation and wildlife and would base application methods on plant reproduction, structure, and growth. Monitoring and management of invasive plant species would continue after dam removal year 2 with the potential for

further herbicide application, if the latter offers the most effective methods for control and eradication of noxious weeds (Appendix B: *Definite Plan – Appendix H*).

While the Proposed Project includes strategies to avoid and minimize runoff that is toxic to aquatic biota from herbicide application, the Reservoir Restoration Plan included in the Definite Plan (see Appendix B: *Definite Plan – Appendix H*) lacks specificity regarding certain herbicide formulations and application practices that could result in short-term aquatic toxicity within the Hydroelectric Reach during reservoir restoration activities, which would constitute a substantial adverse impact on aquatic biota and thus would be a significant impact.

Under the Proposed Project, the Reservoir Restoration Plan would be further developed by KRRC working with the appropriate agencies through the FERC process, and it would be subject to State Water Board approval. In addition, it would also be appropriate for the Final Reservoir Restoration Plan to include Mitigation Measure WQ-4, which provides further protections for aquatic biota in relation to control of terrestrial invasive exotic plant species via herbicide application.

Mitigation Measure WQ-4 Herbicide Characteristics and Application Approach.
Aquatic formulations of glyphosate (e.g., Glyfos Aquatic, Rodeo) are developed for use in sensitive protected environments such as habitat restoration sites and wetlands. If glyphosate is chosen as a suitable herbicide for IEV management, then an aquatic formulation shall be used and glyphosate formulations containing the surfactants POEA or R-11 shall be avoided to reduce risks to amphibians and other aquatic organisms. Additionally, glyphosate shall not be applied when weather reports predict precipitation within 24 hours of application, before or after. If another herbicide is chosen, it shall meet the characteristics of low soil mobility and low toxicity to fish and aquatic organisms and shall be applied using low use rates (i.e., spot treatments), avoidance of application in the rain, avoidance of treatments during periods when fish are in life stages most sensitive to the herbicide(s) used, and adherence to appropriate buffer zones around stream channels as specified in BLM (2010).

Significance
No significant impact with mitigation

3.2.5.8 General Water Quality

Potential Impact 3.2-17 Short-term and long-term influence of changes in Iron Gate and Fall Creek hatchery production on Klamath River and Fall Creek water quality.
Under the Proposed Project, the Iron Gate Hatchery facilities would be modified from existing conditions and the nearby Fall Creek Hatchery would be reopened (see Section 2.7.6 *Hatchery Operations* for more details). As part of the

Proposed Project, the existing adult fish ladder and holding tanks at the base of Iron Gate Dam and the cold-water supply and aerator for the hatchery would be removed, while other hatchery features would remain in place and would be altered for limited operations during dam removal year 2 and the subsequent seven years post-dam removal (eight years total) (see Section 2.7.6.1 *Iron Gate Hatchery* for more details). Fall Creek Hatchery has not been used to produce fish since 2003, so existing facilities would be upgraded for raising coho salmon and Chinook salmon as part of reopening Fall Creek Hatchery, and new facilities (e.g., a settling pond, vehicle parking, pertinent buildings, tagging trailer, etc.) would be constructed (see Section 2.7.6.2 *Fall Creek Hatchery* for more details). As with Iron Gate Hatchery, it would operate for eight years in total, starting in dam removal year 2. As the hatchery facilities would operate for eight years and then close, for this potential impact, short-term is defined as through the eight-year period of operation, and long-term is defined as the period thereafter.

Total hatchery production under the Proposed Project would be reduced from current levels. Iron Gate Hatchery Chinook salmon smolt production goals would be reduced to 3,400,000 under the Proposed Project and fall-run Chinook and coho yearling salmon and steelhead production goals would be reduced to zero since they would no longer be produced at Iron Gate Hatchery (Table 2.7-13). In tandem with fish production decreases at Iron Gate Hatchery, production at Fall Creek Hatchery would increase from zero under existing conditions to 75,000 coho yearlings and 115,000 Chinook yearlings. No Chinook smolts and no steelhead would be produced at Fall Creek Hatchery (see also Section 2.7.6.2 *Fall Creek Hatchery*). While the hatchery production goals have been set, the ability to meet the production varies annually based on adult returns and hatchery performance. At Iron Gate Hatchery, the fall-run Chinook salmon yearling smolt goals and coho salmon yearling smolt goals have been achieved on average since 2005 but fall-run Chinook salmon age zero smolts are typically approximately one million smolts less than production goals (K. Pomeroy, CDFW, pers. comm., 2018) and no steelhead have been released since 2012 (NMFS and CDFW 2018). After considering the actual production achieved, hatchery operations under the Proposed Project would constitute a reduction in production from existing conditions of approximately 87 percent for yearling fall-run Chinook salmon smolts, 20 percent for fall-run Chinook salmon age zero smolts, 100 percent for steelhead, and zero percent for coho salmon smolts (see Section 3.3.5.6 *Fish Hatcheries* for more details).

Hatcheries potentially alter water temperature through increasing exposure to direct sunlight (e.g., in raceways or settling ponds) and ambient air temperatures. Hatcheries also potentially increase suspended material, turbidity, and nutrients in streams by discharging water containing organic solids from uneaten commercial pelletized feed and fish waste. Hatchery discharges may also alter dissolved oxygen, pH, and salinity in streams by discharging water with dissolved oxygen, pH, or salinity different than the streams into which the discharge is released. Differences in dissolved oxygen can be due to hatchery fish

respiration, biochemical oxygen demand (BOD) from organic solids associated with fish feed, biological growth (e.g., algae and bacteria) in the hatchery and settling ponds or use of chemicals to manage hatchery conditions (e.g., fish disease). Use of water treatment chemicals, drugs, and/or vaccines to treat illnesses within hatchery fish or prevent detrimental fungal or bacterial conditions also has the potential to alter inorganic and organic contaminant concentrations in receiving waters (ICF 2010). The impacts of hatchery operations and discharges of hatchery effluent on Klamath River water quality would be similar or would decrease under the Proposed Project compared to existing conditions, as current production goals would be reduced, resulting in an overall decrease in potential suspended material, nutrient, or water treatment chemical releases in the system as a whole.

More specifically, under the Proposed Project, water temperature effects from Iron Gate Hatchery in the Klamath River downstream of this hatchery would likely be similar to existing conditions since lower production and proposed modifications at the hatchery would not significantly alter the area of the raceways and settling tanks that are exposed to sunlight or air temperatures. However, suspended material, turbidity, nutrients, dissolved oxygen, pH, salinity, and inorganic and organic chemical contaminants (including aquaculture drugs) from the combined operation of Iron Gate Hatchery and Fall Creek in the Klamath River downstream of Iron Gate Hatchery would decrease under the Proposed Project compared to existing conditions since lower fish production would require less feed and less frequent use of chemicals to manage hatchery conditions.

Feed is a major source of organic material, nutrients, and BOD; review of current hatchery sampling data shows that Iron Gate Hatchery discharges approximately 2,500 pounds of total nitrogen (TN) per year, 500 pounds of total phosphorus (TP) per year and 14,000 pounds of organic matter per year measured as biochemical oxygen demand (BOD) (North Coast Regional Board 2017). These amounts represent 0.03 percent of the overall loading of TN and TP and 0.02 percent of the overall loading of organic matter to the Klamath River every year (North Coast Regional Board 2017). Reductions in fish production and feed at Iron Gate Hatchery under the Proposed Project also would correspond to a reduction in TN, TP, and carbonaceous biological oxygen demand (CBOD)[56] loads from the hatchery. Thus, while Iron Gate Hatchery currently exceeds its TMDL allocation of zero net discharge of nitrogen, phosphorous and biochemical oxygen demand, these existing exceedances to the Klamath River would be reduced under the Proposed Project for eight years of hatchery operations and would then be eliminated.

[56] Carbonaceous biochemical oxygen demand (CBOD) is used instead of BOD to evaluate the organic matter loads in the Klamath River TMDL California Compliance Conditions. BOD is equal to the CBOD plus the nitrogenous biochemical oxygen demand (NBOD).

The chemicals and aquaculture drugs that the Iron Gate Hatchery facility uses, or can use under the Proposed Project, for the treatment and control of disease include oxytetracycline, florfenicol, formalin, providine-iodine complex, hydrogen peroxide, potassium permanganate, and sodium chloride (salt) (North Coast Regional Board 2017). Chemicals and aquaculture drugs used under existing conditions, or approved for use under the Proposed Project, for anesthesia include MS-222/Finquel, and carbon dioxide (North Coast Regional Board 2017). All the chemicals approved for use at Iron Gate Hatchery currently or under the Proposed Project are Food and Drug Administration (FDA) Center Veterinary Medicine (CVM) approved, low regulatory priority (LRP) compounds, or deferred decision (DD) chemicals (Table 3.2-15). The Iron Gate Hatchery is currently required to ensure that chemicals are properly stored and disposed of and that any accidentally spilled materials are contained, cleaned, and disposed of properly (North Coast Regional Board 2017). Any use, storage, or disposal of chemicals and/or aquaculture drugs would be reduced under the Proposed Project for eight years of hatchery operations and would then be eliminated.

Overall, the decrease in total hatchery fish production would maintain or improve water quality conditions downstream of Iron Gate Hatchery as compared to existing conditions, so there would be no significant impact on water quality downstream of Iron Gate Hatchery in the short term or long-term due to changes in fish production under the Proposed Project.

For the stretch of river that is between the Fall Creek Hatchery downstream to Iron Gate Hatchery, there would be a net increase in hatchery-related discharges as compared to the existing condition, because Fall Creek Hatchery is currently not operating. The reopening of Fall Creek Hatchery and production of fish at the hatchery for eight years (i.e., dam removal year 2 and the subsequent seven years post-dam removal) under the Proposed Project would potentially alter the short-term (dam removal year 2 through post-dam removal year 1) and long-term (after post-dam removal year 1) water quality conditions in Fall Creek downstream of the hatchery (Figure 2.7-15). The fish ladder would continuously discharge water from the rearing tanks, except during periods of cleaning, feeding, or chemical use to treat fish illnesses (i.e., therapeutics). The settling pond is proposed for construction on one of two potential nearby sites[57] and would discharge all water from the rearing ponds after cleaning, feeding, or therapeutic use along with all water from the incubation and spawning operations. Fall Creek water quality below Fall Creek Hatchery would be primarily influenced by the hatchery discharges downstream of the settling pond (maximum of approximately 0.35 mile upstream of Fall Creek's confluence with the Klamath River) but Fall Creek water quality potentially would also be

[57] Selection of the settling pond site is pending cultural resources investigations and consultation with tribes with historical and cultural connection to the area (see also Section 2.7.6.2 *Fall Creek Hatchery*).

influenced by hatchery discharges up to the adult fish ladder (approximately 0.87 mile upstream from Fall Creek's confluence with the Klamath River).

Fall Creek Hatchery operations and effluent discharge would potentially alter water temperature downstream of the hatchery discharge points, but the change in water temperature would be minimal. Water temperature data from 11 hatcheries and concurrent water temperature measurements upstream and downstream of the hatchery discharge indicate the average change in water temperature downstream of the hatchery discharge ranged from -0.5°F to 2.2°F, with a 0.1°F or less change in water temperature downstream of more than half of the hatcheries (ICF 2010). While the water temperature impacts of most hatcheries were limited, there were three instances (i.e., 1 percent of all available data) where the water temperature downstream of a hatchery was 5°F greater than the water temperature upstream, including one occasion at Iron Gate Hatchery in June 2008. In all three instances, hatchery discharge was warmer than the upstream water temperature, but it was less than the downstream water temperature, suggesting that factors in addition to hatchery operations may have influenced water temperature in the stream (ICF 2010). Fall Creek Hatchery is generally shady and therefore unlikely to have the same solar radiation impacts as Iron Gate Hatchery. However, there is the potential for the hatchery to elevate temperatures

Overall, Fall Creek Hatchery discharges potentially would alter water temperature between -0.5°F to 2.2°F, and there is significant potential that Fall Creek Hatchery discharges would result in exceedances of water quality standards for water temperature. Fall Creek is an interstate water originating in Oregon, so potential water temperature increases in the stream from hatchery discharges would result in an exceedance of the Thermal Plan water temperature water quality standard for interstate waters that prohibit the discharge of elevated temperature waters into **COLD** interstate waters (Table 3.2-4) and there would be a significant and unavoidable impact without mitigation to water temperature in Fall Creek due to Fall Creek Hatchery under the Proposed Project. While water temperature data in the Klamath River upstream and downstream of the confluence of Fall Creek is unavailable to determine the influence of Fall Creek water temperature on Klamath River water temperatures, the average monthly water temperature in Fall Creek is typically colder than the average monthly water temperature of the Klamath River upstream of Copco No. 1 during April through September (FERC 2007). Thus, Fall Creek would potentially be a source of cold water to the Klamath River during portions of the year and an increase in Fall Creek water temperature due to Fall Creek Hatchery discharges potentially would result in an increase in Klamath River water temperature. While the increase in Fall Creek water temperature and subsequent potential increase in Klamath River water temperature due to hatchery discharges would be small, any increase in water temperature would exceed Thermal Plan water temperature water quality standard for **COLD** interstate waters and there potentially would be a significant and unavoidable impact without mitigation on

water temperature in the Hydroelectric Reach of the Klamath River due to Fall Creek Hatchery under the Proposed Project. Although the water temperature of Fall Creek Hatchery discharges would potentially elevate Fall Creek and Klamath River water temperatures, the increase likely would occur at most for several hours per day during the summer and fall when discharge water temperatures would peak and the increase in water temperatures would not continuously occur throughout the 8-year period of operation.

Fall Creek Hatchery discharges potentially would increase suspended material in Fall Creek by discharging water containing organic solids from uneaten commercial pelletized feed and fish waste, but those increases remain less than the suspended sediment thresholds of significance. The measured maximum net TSS resulting from the discharge of 19 existing CDFW hatcheries ranged from less than 5.0 mg/L to 25.6 mg/L, with TSS equal to or greater than 5 mg/L in hatchery discharges occurring at 12 of the 19 hatcheries (ICF 2010). At those 12 hatcheries, TSS was equal to or greater than 5 mg/L less than once a year (1 out of 57 measurements at Iron Gate Hatchery) to approximately twice per year (13 out of 120 measurements at Hot Creek Hatchery). Additionally, the TSS was measured directly in the hatchery discharge, so the TSS within the receiving waterbody (i.e., just downstream of the hatchery discharge point) would be less due to dilution (ICF 2010). The range of potential suspended material in Fall Creek Hatchery discharges would likely be similar to existing CDFW hatcheries, so the potential for hatchery discharges to cause nuisance or adversely affect beneficial uses by introducing suspended material, settleable material, or sediments in excess is based on data regarding existing hatcheries. In line with data from existing CDFW hatcheries and expected dilution in the receiving waterbodies, suspended material in hatchery discharges would remain below the numeric SSC[58] threshold of significance for suspended sediments. Thus, Fall Creek Hatchery discharges under the Proposed Project would have a less than significant impact on suspended sediments in the short term and long term in Fall Creek and in the Klamath River downstream of its confluence with Fall Creek.

Nutrient concentrations in hatchery discharges likely would increase nutrients in Fall Creek downstream of the settling ponds and to a lesser extent downstream of the adult fish ladder, based on nutrient data from existing CDFW hatcheries. In the six existing CDFW hatcheries with nutrient data, the measured nutrients ranged from 0.07 to 5.6 mg/L TN, 0.008 to 5.2 mg/L nitrate, 0.02 to 0.25 mg/L TP, and less than 0.01 to 0.28 mg/L orthophosphate (ICF 2010). The range of measured nitrate concentrations indicates that there is no potential for hatchery discharges to exceed nitrate primary drinking water standards in streams. The existing CDFW hatchery data also documents that nutrient concentrations in hatchery discharges usually vary little from nutrient concentrations in the hatchery source water (i.e., upstream water not influenced by the hatchery), with

[58] For the purposes of this report, SSC is considered equivalent to TSS (see Section 3.2.3.1 *Thresholds of Significance* for additional details).

higher nutrient concentrations in hatchery discharges occurring infrequently. Visual observations from 10 hatcheries that record potential nuisance growth conditions in receiving waters (i.e., streams) did not note nuisance biostimulatory responses, such as discoloration, bottom deposits, visible films/sheens, or objectionable growth (i.e., fungi or slimes) downstream of hatchery discharges (ICF 2010). Fall Creek Hatchery discharges likely would increase nutrient concentrations in Fall Creek[59] and in the Klamath River downstream of its confluence with Fall Creek, but those increases would not be expected to result in exceedances of North Coast Regional Board Basin Plan water quality objectives for biostimulatory substances.

Fall Creek Hatchery discharges may also alter dissolved oxygen in streams by discharging water with dissolved oxygen concentrations different than the receiving waters due to fish respiration or biochemical oxygen demand (BOD) from organic solids, discharging water with organic solids that contribute BOD to streams and reduces dissolved oxygen downstream of the hatchery, and biological growth (e.g., algae and bacteria) in the hatchery and settling ponds. The analysis of dissolved oxygen data from existing CDFW hatcheries, including Iron Gate Hatchery, does not present dissolved oxygen percent saturation in the hatchery discharges, so it is not possible to evaluate hatchery discharges relative to Basin Plan dissolved oxygen water quality objectives. Dissolved oxygen in existing CDFW hatchery discharges usually were greater than 7.0 mg/L, but eight hatcheries had at least one occurrence of dissolved oxygen less than 7.0 mg/L (ICF 2010). In two out of nine measurements, Iron Gate Hatchery discharge dissolved oxygen was less than 7.0 mg/L, with the minimum dissolved oxygen reaching 6.3 mg/L (ICF 2010). While hatcheries manage dissolved oxygen concentrations for fish using flow control, passive aeration devices, and mechanical aeration, there is a low potential for dissolved oxygen below 7.0 mg/L (ICF 2010) that may correspond to dissolved oxygen percent saturation being less than Basin Plan dissolved oxygen water quality objectives. Dissolved oxygen percent saturation varies with water temperature, so dissolved oxygen can be below 7.0 mg/L during peak summer water temperature conditions, yet still meet the Basin Plan dissolved oxygen water quality objectives of 85 percent saturation. Thus, Fall Creek Hatchery discharges would have a low potential for causing dissolved oxygen percent saturation to be less than Basin Plan dissolved oxygen water quality objectives in Fall Creek downstream of the hatchery or in the Klamath River downstream of the confluence with Fall Creek.

[59] One data point exists for nutrient concentrations in Fall Creek measured in October 1999 when the Fall Creek Hatchery was still in operation. However, due to the difference in production goals and proposed new facilities (i.e., settling ponds), it is likely this data would overestimate background nutrient conditions in Fall Creek and potentially overestimate nutrient conditions in Fall Creek upon the resuming of Fall Creek Hatchery operations.

While Fall Creek Hatchery discharges would have a low potential for causing dissolved oxygen percent saturation to become less than Basin Plan dissolved oxygen water quality objectives, dissolved oxygen percent saturation in Fall Creek may infrequently decrease below Basin Plan dissolved oxygen water quality objectives and thus there would be significant impact without mitigation on dissolved oxygen in the short term and long term from hatchery discharges under the Proposed Project.

Fall Creek Hatchery discharges are unlikely to alter pH in streams based on pH monitoring data from existing CDFW hatcheries. The incremental change in pH between upstream and downstream monitoring data was less than 0.5 s.u. downstream of all hatcheries where downstream pH data was available (ICF 2010). Hatchery discharges had pH greater than 8.5 s.u. or less than 6.5 s.u. in only four out of the 12 CDFW hatcheries, with no exceedances occurring at Iron Gate Hatchery (ICF 2010). Thus, Fall Creek Hatchery discharges under the Proposed Project would be unlikely to alter pH in Fall Creek or the Klamath River downstream of its confluence with Fall Creek by 0.5 s.u. or more or result in pH less than 6.5 units or greater than 8.5 units and there would be a less than significant impact without mitigation on pH in Fall Creek and the Klamath River due to Fall Creek Hatchery operations and discharges under the Proposed Project.

Fall Creek Hatchery discharges would potentially increase the concentration of inorganic and organic contaminants in Fall Creek downstream of the settling ponds due to the use of water treatment chemicals, drugs, and vaccines to treat illnesses within hatchery fish (i.e., therapeutics) or prevent detrimental fungal or bacterial conditions. Chemical use in hatcheries typically occurs for several hours using immersion bath or flushing water through one or more components of the hatchery facilities for general treatments, while therapeutics are usually applied in small water volumes or fish feed for a short duration of several minutes up to one hour (ICF 2010). All water from the rearing ponds after cleaning, feeding, or therapeutic use along with all water from the incubation and spawning operations would be discharged from the hatchery settling pond (Figure 2.7-15), so potential increases in inorganic and organic contaminants would be limited to downstream of the settling pond (maximum of approximately 0.35 miles upstream of Fall Creek's confluence with the Klamath River).

Potential chemicals used in CDFW hatcheries in general, the reason for their use, and the regulatory status of the chemicals are summarized in Table 3.2-15. Copper sulfate had been historically used in hatcheries for general treatments, but its use has been discontinued in all CDFW hatcheries (ICF 2010). All the chemicals currently used are Food and Drug Administration (FDA) Center Veterinary Medicine (CVM) approved, investigational new animal drugs (INAD), low regulatory priority (LRP) compounds, or deferred decision (DD) chemicals (Table 3.2-15). FDA approved drugs have been determined to be safe for the treated fish, humans who might consume the treated fish, and the environment

when used in accordance with label instructions for proper usage. FDA INAD are used under exemption only, with annual renewals and numerous FDA requirements for their use. FDA LRP compounds are considered comparatively little risk to aquatic organisms, human consumers, or the environment, such that regulatory action is unlikely to occur as long as an appropriate grade of the compound is used for listed indications at the prescribed levels according to good management practices and local environmental requirements are met. FDA DD chemicals are those already approved by the USEPA in aquaculture settings (Bowker et al. 2014). Since proposed production at Fall Creek Hatchery would involve two of the three fish species/ life stages currently raised at Iron Gate Hatchery (i.e., coho and Chinook yearlings), this analysis assumes that chemicals that would potentially be used at Fall Creek Hatchery are similar to chemicals that are currently used, or can be used, at Iron Gate Hatchery (North Coast Regional Board 2017) (Table 3.2-17).

Table 3.2-15. Potential Treatment and Therapeutic Chemicals Used at California Department of Fish and Wildlife Hatcheries in General, Iron Gate Hatchery, and Potentially at Fall Creek Hatchery.

Chemical Name	Use at CDFW Hatcheries[1]	Use at Iron Gate Hatchery and Potential Use at Fall Creek Hatchery[2]	Regulatory Status[1]
Acetic acid	Control of external parasites		FDA LRP compound
Carbon dioxide (gas)	Anesthetic	X	FDA LRP compound
Sodium bicarbonate (baking soda)	Anesthetic		FDA LRP compound
Formalin (formaldehyde)	Fungus and parasite treatment	X	FDA approved
Povidone-iodine (PVP iodine)	Disinfectant for eggs	X	FDA LRP compound
Potassium permanganate	Control of external parasites and bacteria	X	FDA DD chemical; USEPA registered pesticide with approved use in aquaculture
Hydrogen peroxide	Control of fungal and bacterial infection	X	FDA approved
Chloramine-T (*N*-chloro tosylamide)	Control of external gill bacteria		FDA INAD
Terramycin (oxytetracycline)	Antibiotic	X	FDA approved
Aquaflor (florfenicol)	Antibiotic	X	FDA approved

Chemical Name	Use at CDFW Hatcheries[1]	Use at Iron Gate Hatchery and Potential Use at Fall Creek Hatchery[2]	Regulatory Status[1]
Penicillin G	Control and prevention bacterial infections		FDA approved
Romet-30 (sulfadimethoxine-ormetoprim)	Antibiotic		FDA approved
MS-222 (tricane mesylate)	Anesthetic		FDA approved

1 ICF 2010.

2 Source for Iron Gate Hatchery information is North Coast Regional Board (2017). For Fall Creek Hatchery, the list of chemicals is assumed to be the same since two of the three fish species/life stages currently raised at Iron Gate Hatchery (i.e., Chinook smolts) would be raised at Fall Creek Hatchery under the Proposed Project.

Notes:
FDA = Food and Drug Administration
INAD = investigational new animal drugs
LRP = low regulatory priority
DD = deferred decision
USEPA = U.S. Environmental Protection Agency

The potential for chemical concentrations in hatchery discharges to exceed the Basin Plan narrative toxicity water quality objective (Table 3.2-4), drinking water criteria, including California Department of Public Health (DPH) maximum contaminant levels (MCLs), or otherwise degrade water quality in streams was evaluated for existing CDFW hatcheries by comparing chemical use concentrations and measurements of chemicals in undiluted hatchery discharge water with CDFW Pesticide Unit guidance aquatic toxicity values and a CDFW Pesticide Investigation Unit toxicity assessment that determined short-term acute test methods (i.e., lethality end point) and chronic test methods (i.e., growth and reproduction end point) (ICF 2010). The CDFW Pesticide Investigation Unit toxicity assessment has been used previously by Regional Water Quality Control Boards to develop NPDES permit numerical effluent limits considered protective of applicable narrative toxicity objectives. Based on the frequency and duration of use in hatcheries, the expected rate of dilution and degradation in the environment, and reported hatchery discharge concentrations, the ICF (2010) analysis concludes acetic acid, carbon dioxide, sodium bicarbonate, PVP iodine, oxytetracycline, florfenicol, penicillin G, Romet-30, and MS-222 all pose a low risk of exceeding CDFW guidance values that are protective of aquatic life, thus the potential for substantial adverse effects on human health or environmental

receptors is very low. Available data indicates formalin, potassium permanganate, hydrogen peroxide, and Chloramine-T may exceed CDFW guidance values in undiluted hatchery water, but the analysis concludes the potential for substantial adverse effects from these chemicals on aquatic life-related beneficial uses and other less sensitive designated beneficial uses is very low since potentially elevated concentrations of the chemicals in undiluted hatchery discharges would be expected to rapidly degrade in the aquatic environment, or be diluted within the zone of complete mixing in the receiving waters (ICF 2010). As the discharge will be downstream of the City of Yreka's Fall Creek diversion for drinking water, the discharge should pose no risk to that water supply.

Chemicals that would potentially be used at Fall Creek Hatchery are likely to be similar to chemicals that are currently used, or can be used, at Iron Gate Hatchery, given that proposed production at Fall Creek Hatchery would involve two of the three fish species/ life stages currently raised at Iron Gate Hatchery (i.e., coho and Chinook yearlings). Installation of an ultraviolet light (UV) treatment system for water used in egg incubation at Fall Creek Hatchery, as specified for the Proposed Project, would likely reduce chemical use relative to other CDFW hatcheries without UV treatment systems. Additionally, potential influences of hatchery discharges on Fall Creek and the Klamath River downstream of its confluence with Fall Creek would occur for eight years (i.e., dam removal year 2 and the subsequent seven years post-dam removal) since Fall Creek Hatchery is assumed to operate for only this duration under the Proposed Project. Thus, potential increases in inorganic and organic contaminants in Fall Creek and in the Klamath River downstream of its confluence with Fall Creek due to general treatment or therapeutic chemicals in Fall Creek Hatchery discharges also would have a low risk of substantially adversely impacting aquatic life or other designated beneficial uses in the short term and long term and there is a less than significant impact without mitigation on inorganic and organic contaminants in the short term and long term under the Proposed Project from Fall Creek Hatchery discharges.

In summary, the combined impact of Fall Creek and Iron Gate hatchery operations under the Proposed Project would have no significant impact below Iron Gate Hatchery's discharges, since production would be reduced, decreasing impacts on Klamath River water quality from hatchery operations relative to existing conditions. Fall Creek Hatchery would have a significant impact without mitigation on water temperature in Fall Creek and potentially the Klamath River as it would potentially alter water temperature by -0.5 to 2.2^{o}F and any increase in water temperature would exceed the Thermal Plan water temperature water quality standard for **COLD** interstate waters. Dissolved oxygen percent saturation in Fall Creek may infrequently occur at levels below Basin Plan dissolved oxygen water quality objectives due to Fall Creek Hatchery discharges and thus there would be significant impact without mitigation on dissolved oxygen in the short term and long term from hatchery discharges under the Proposed

Project. While Fall Creek Hatchery operations and discharges would alter suspended materials, and inorganic and organic contaminant concentrations downstream of hatchery discharges, there would be no significant impact on suspended sediments, pH, chlorophyll-a and algal toxins, or inorganic or inorganic and organic contaminants in Fall Creek or the Klamath River downstream of Fall Creek in the short term or long-term under the Proposed Project.

In order to comply with Sections 301, 302, 303, 306, and 307 of the Clean Water Act (CWA), and with applicable requirements of California law, the Proposed Project would implement the conditions specified by the State Water Board in the Section 401 water quality certification. In addition to the Proposed Project Fish Hatchery Plan (see also Section 2.7.6; Appendix B: *Definite Plan – Section 7.8.3 Proposed Fish Hatchery Plan*), the draft water quality certification issued by the State Water Board specifies that, prior to operation of the Iron Gate and Fall Creek hatcheries, the Licensee shall, for each hatchery, obtain coverage under and comply with the *Cold Water Concentrated Aquatic Animal Production Facility Discharges to Surface Waters, National Pollutant Discharge Elimination System* permit (NPDES No. 135001) or subsequent NPDES permits issued by the North Coast Regional Board.

Several measures were considered to remediate water temperature increases in Fall Creek to avoid a significant impact. Fall Creek Hatchery settling pond and adult fish ladder discharges directly from Fall Creek diversion point could discharge to the Klamath River rather than Fall Creek. Fall Creek is typically cooler than the Klamath River, so Fall Creek Hatchery settling pond discharges would likely still be cooler than the Klamath River even with small amounts of warming of Fall Creek water through the hatchery. Thus, redirecting Fall Creek Hatchery settling pond discharges from Fall Creek to the Klamath River likely would not increase the temperature of interstate waters. Adult fish ladder discharges under the Proposed Project would have gone through the rearing ponds, so they may experience some warming and they may also increase the temperature of interstate waters. Thus, the adult fish ladder discharges would also need to be re-plumbed such that adult fish ladder discharges would be directly taken from the Fall Creek Hatchery diversion point on the Fall Creek powerhouse canal return flow to prevent warming. It is unclear given the available information about the plumbing of the Fall Creek Hatchery whether diverting flows from the Fall Creek Hatchery diversion point directly to the adult fish ladder and having all flows for the rearing tanks go to the settling pond for eventual discharge directly to the Klamath River is even generally feasible or cost-effective (i.e., this distance of pipe is unlikely to be cost effective for temporary hatchery modifications. Additionally, due to prolific tribal cultural resources in the vicinity of Fall Creek Hatchery this measure is likely infeasible. Furthermore, diverting flows from Fall Creek would reduce high-quality habitat for anadromous fish spawning for a longer stretch of the creek. Thus, this measure was not pursued as a feasible mitigation measure.

Chillers may also reduce water temperatures in Fall Creek Hatchery discharges so that water temperature in discharges is always less than the water temperature of receiving waters (in this case, Fall Creek). However, the temporary operations of the hatchery combined with the electricity cost of a chiller(s) was, like the distance for additional piping, found not to be feasible, and this mitigation measure was likewise not pursued.

Significance

No significant impact in the short term and long term for water quality in the Middle Klamath River downstream of Iron Gate Hatchery

Significant and unavoidable in the short term for water temperature and dissolved oxygen in Fall Creek downstream of Fall Creek Hatchery

No significant impact in the long term for water quality (except water temperature and dissolved oxygen) in Fall Creek downstream of Fall Creek Hatchery

Potential Impact 3.2-18 Impacts on water quality from construction activities on Parcel B lands.

As discussed in Section 2.7-10 *Land Disposition and Transfer*, as part of the Proposed Project, Parcel B lands would be transferred to the states (i.e., California and Oregon), as applicable, or to a designated third-party transferee, following dam removal. The outcome of the future Parcel B land transfer is speculative with regard to land use; while the lands would be managed for the public interest, this could include open space, active wetland and riverine restoration, river-based recreation, grazing, and potentially other uses.

It is likely that there would be at least some construction for recreation facilities, active restoration, fencing, trail-building, or other land management activities. To the extent there are construction activities, these could involve the same types of potential short-term impacts to water quality as described in Potential Impact 3.2-4, which would be a significant impact. Use of construction best management practices are feasible and implementation of these can reduce the erosion and sediment issues associated with construction to less than significant.

Therefore, the impact of minor construction on suspended sediments in the future associated the transfer of Parcel B lands and future land use on them would be less than significant with mitigation measures WQ-1, TER-1, and HZ-1, which include BMPs for the area. These measures represent protection under a broad range of construction projects, both in-water and in the dry, and are likely to cover the range of construction activities that would support the various public land uses anticipated under the KHSA. If implemented as part of construction activities under future land uses, these measures would avoid potential violations of water quality standards or other water quality degradation in affected portions

of wetlands and other waterbodies and would reduce impacts to less than significant.

In the long term, if managed grazing activities were to occur beyond the level occurring under existing conditions, this could result in erosion-related significant impacts on water quality. However, managed grazing activities would incorporate project-specific measures to reduce potential water quality impacts, including storm water management, streambank setbacks, or exclusionary livestock fencing. Managed grazing activities are required to meet the requirements of the non-point source discharge policy, the prohibition against unpermitted discharges, and the North Coast Regional Water Quality Control Board's Agricultural Lands Discharge Program. These require compliance with BMPs designed to meet state water quality requirements (North Coast Regional Board 2018a). Managed grazing activities that implement such project-specific measures would be expected to have a less than significant impact on water quality in the long term. Future land use activities that involve active wetland and riverine restoration would be likely to result in long-term benefits to water quality.

Significance
No significant impact with mitigation in the short term or long term

3.2.6 References

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3.3 Aquatic Resources

This section describes existing conditions of aquatic resources in the Klamath Basin; analyzes potential impacts that the Proposed Project would have on these aquatic resources and the recovery of listed fish species; and includes measures to avoid or mitigate any significant adverse impacts to fish, aquatic mammals, freshwater mussels, and aquatic macroinvertebrates. Commercial fisheries are discussed in Section 5.3.1 *Regional Economic Impacts*, and potential impacts to recreational fisheries opportunities are in discussed Section 3.20 *Recreation*. The tribal significance of fisheries and potential impacts are discussed in Section 3.12 *Historical Resources and Tribal Cultural Resources*. Floating and attached algae are addressed in Section 3.4 *Phytoplankton and Periphyton*, and wetlands and riparian vegetation and wildlife species (including amphibians and reptiles) are addressed in Section 3.5 *Terrestrial Resources*.

The objectives of the Proposed Project include advancing the long-term restoration of the natural fish populations in the Klamath Basin through water quality improvements, habitat expansion, and a reduction in existing disease rates among salmonids (Section 2.1 *Project Objectives*). Many comments were received by the State Water Board during the public scoping process relating to aquatic resources (see Appendix A), and several of the comment topics were controversial. Some commenters expressed concern that the Proposed Project will not, or is not likely to, meet the stated objectives, or that the costs of implementation (financial and otherwise) are too great to justify the potential for gain. Numerous commenters asserted that hundreds of miles of habitat would become available to salmonids should the dams be removed, and many commenters asserted evidence of historical salmon migrations to Upper Klamath Lake. In contrast, a number of comments identified potential fish passage obstructions located within the portion of the mainstem Klamath River that is currently inundated by the Lower Klamath Project reservoirs. Many comments further stated the belief that coho salmon were not historically found in the Klamath Basin, while others stated that coho salmon were not found in the mid- or upper Klamath Basin due to natural passage barriers. Numerous comments described the fishery benefits that could result from dam removal, including increased habitat access and reduced fish disease, while other comments described the fishery benefits that could result from leaving the dams in place and using fish ladders to support passage and hatchery operations to offset habitat losses. Many public comments contended that the Lower Klamath Project dams are responsible for the reduction in salmon populations in the Klamath Basin, while a roughly equal number of comments indicated that other factors are responsible for the observed population declines, including predation by sea lions, tribal harvest, and fishing pressure from foreign fishing fleets. Comments were also received regarding the relationship between marine

mammals, such as Southern Resident Killer Whales and sea lions, and the Chinook salmon fishery in the Klamath watershed, including comments that dam removal could benefit the mammals by increasing abundance of their prey. Additional summary of the aquatic resource comments received during the public scoping process, as well as the individual comments, are presented in Volume II Appendix A.

After circulation of the Draft EIR, numerous additional comments were received regarding aquatic resources (see Volume III), and changes to the section in response to those comments are flagged in the comment responses and then printed in this Final EIR section. None of the changes result in significant new information in the EIR under the meaning of CEQA Guidelines, section 15088.5, subdivision (a):

> New information added to an EIR is not 'significant' unless the EIR is changed in a way that deprives the public of a meaningful opportunity to comment upon a substantial adverse environmental effect of the project or a feasible way to mitigate or avoid such an effect (including a feasible project alternative) that the project's proponents have declined to implement.

However, the changes were numerous enough that reprinting the section rather than simply including a list of revisions was warranted to improve clarity and readability of the document.

3.3.1 Area of Analysis

The Area of Analysis for aquatic resources considers the range of environments that could be affected by the Proposed Project. The Area of Analysis includes most portions of the Klamath Basin, excluding the Lost River watershed, and most of the Trinity River. Although the Area of Analysis for aquatic resources includes much of the Upper Klamath Basin in Oregon, these areas are included only to the extent to which they affect California aquatic resources. As the lower 1/4 to 1/2 mile of the Trinity River could be used as a refuge by Klamath River fish attempting to avoid exposure to sediment pulses associated with dam removal, this portion of the Trinity River is also considered in the analysis as part of the Klamath Basin, the Area of Analysis includes the Klamath River Estuary and the nearshore portions of the Pacific Ocean.

This aquatic resources analysis includes an assessment of potential impacts within and across five study reaches of the Klamath River separated by changes in basin physiography (e.g., Upper and Lower Klamath basins), the presence of Lower Klamath Project facilities, and the degree of marine influence (Figure 3.3-1). The five study reaches within the Area of Analysis for aquatic resources are as follows:

1. Upper Klamath River and Connected Waterbodies

a. Tributaries to Upper Klamath Lake (Sprague, Wood, and Williamson rivers)
b. Upper Klamath Lake and Agency Lake
c. Keno Impoundment/Lake Ewauna
d. Upper Klamath River upstream of the influence of J.C. Boyle Reservoir to Keno Dam
e. Tule Lake and Lost River between Anderson Rose Dam and Tule Lake

2. Upper Klamath River − Hydroelectric Reach
    a. J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate reservoirs
    b. J.C. Boyle Bypass and Peaking reaches
    c. Copco No. 2 Bypass Channel
    d. Tributaries to the Upper Klamath River (e.g., Jenny, Spencer, Shovel, and Fall creeks)
3. Middle and Lower Klamath River
    a. Middle Klamath River from Iron Gate Dam downstream to the confluence with Trinity River
    b. Major tributaries to the Middle Klamath River (e.g., Shasta, Scott, and Salmon Rivers)
    c. Minor tributaries to the Middle Klamath River (e.g., Bogus, Beaver, Humbug, and Cottonwood creeks)
    d. Lower Klamath River from the confluence with the Trinity River to the estuary
    e. Lower portion of the Trinity River
4. Klamath River Estuary
5. Pacific Ocean Nearshore Environment
    a. California portion of the Klamath River Management Zone (KMZ, Oregon-California state line south to Horse Mountain [40° 05’ 00” N. latitude])

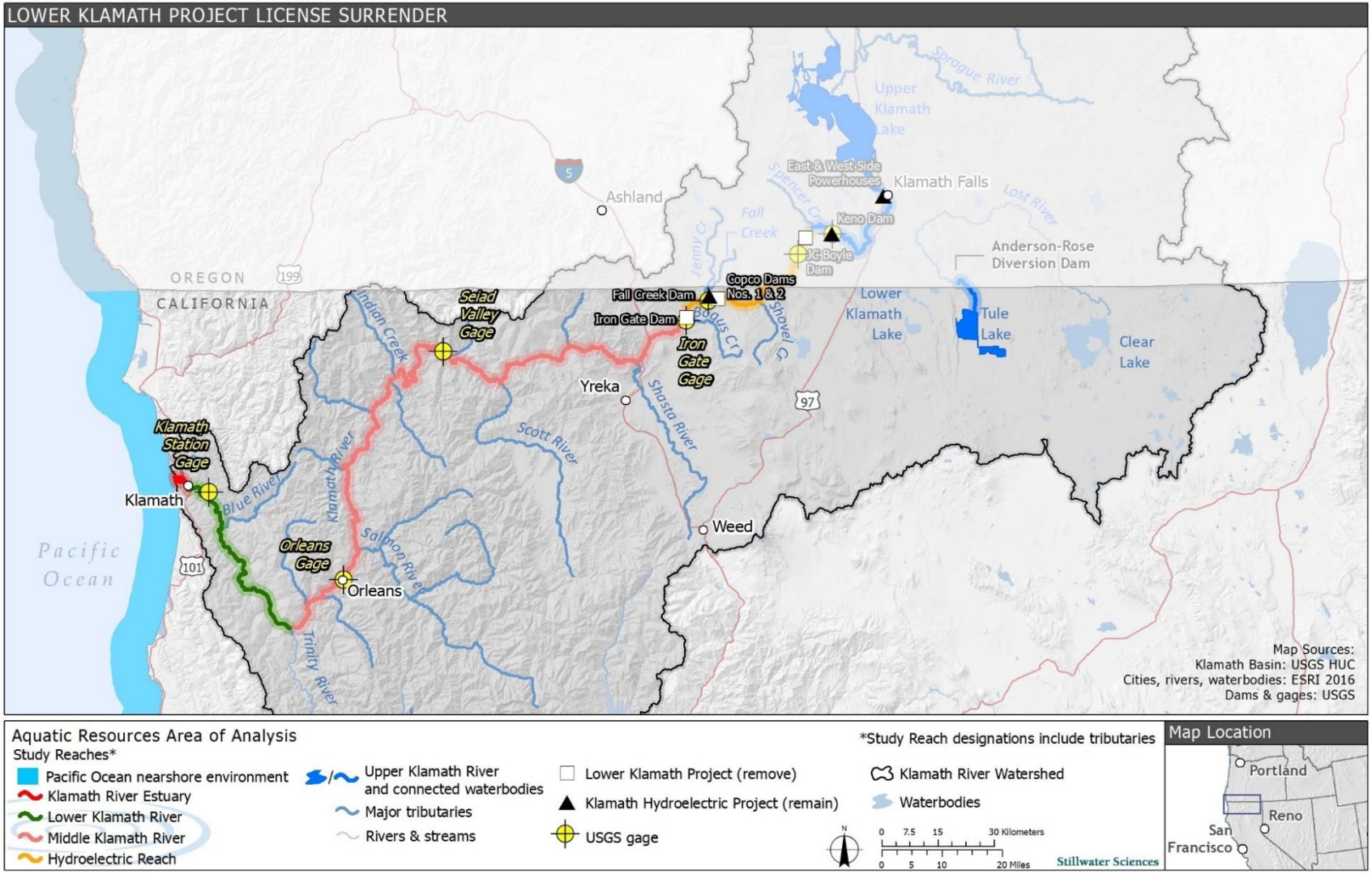

Figure 3.3-1. Study Reaches within the Area of Analysis for Aquatic Resources.

3.3.2 Environmental Setting

This section describes existing conditions in the Area of Analysis for aquatic resources, including discussion of aquatic species (Section 3.3.2.1 *Aquatic Species*); physical habitat in the waterbodies (Section 3.3.2.2 *Physical Habitat Descriptions*); and important factors affecting aquatic resources that the Proposed Project would influence, if implemented (Section 3.3.2.3 *Habitat Attributes Expected to be Affected by the Proposed Project*).

Each aquatic species description includes a brief summary of the current and historical distribution, life-history patterns, and habitat requirements. The narrative is subdivided into anadromous fish, resident riverine fish, non-native fish species, estuarine species, freshwater mollusks, benthic macroinvertebrates, and marine mammals.

The description of physical habitat contains a summary of water quality and other factors that may limit aquatic resource production in the waterbodies in the Area of Analysis, and it describes the species that occur in the California portion of these waterbodies. This section also describes designated critical habitat for species listed under the federal ESA and Essential Fish Habitat (EFH) managed under the Magnuson-Stevens Fishery Conservation and Management Act occurring within the California portion of the aquatic resources Area of Analysis.

Section 3.3.2.3 *Habitat Attributes Expected to be Affected by the Proposed Project* provides a more detailed description of existing conditions for factors that potentially could have a major influence on aquatic resources. These factors form the basis for Section 3.3.5 *[Aquatic Resources] Potential Impacts and Mitigation*.

3.3.2.1 Aquatic Species

Numerous aquatic species use the California portion of the Klamath Basin during some or all of their lives. The large number of species prohibits an individual evaluation of each species. Instead, the assessment of potential impacts and/or benefits of the Proposed Project within California on aquatic species is based on an analysis of target species that possess a legal status or importance for tribal, commercial, or recreational fisheries, and for which there are sufficient data to support the analysis. Appendix J: *Special-status Plant, Fish, and Wildlife Scoping Lists* Table J-1 includes a summary of all special-status aquatic fish documented in the Project vicinity. Special status species included in the analysis are summarized in Table 3.3-1, and all the target species (including others without special status) selected for analysis are discussed below.

Table 3.3-1. Special-status Aquatic Species Documented in the Vicinity of the Proposed Project and Included in Aquatic Resources Analysis.

Common Name ***Scientific Name***	**Status[a] Federal/ State/Forest Service, Bureau of Land Management**	**Query Sources**	**Distribution**	**Habitat Association**
Fish				
Shortnose sucker *Chasmistes brevirostris*	FE/SE, SFP/-- Designated critical habitat	CNDDB USFWS	Resident fish observed in the Upper Klamath Basin. In California, they are found in the Klamath River downstream to Copco No. 1 Reservoir and Iron Gate Reservoir.	Warm slow-moving waters or lakes. Spawning occurs along shorelines of lakes or tributaries.
Lost River sucker *Deltistes luxatus*	FE/SE, SFP Designated critical habitat within Area of Analysis	CNDDB USFWS	Resident fish observed in the Upper Klamath Basin. In California, they are found in the Klamath River downstream to Copco No. 1 Reservoir and Iron Gate Reservoir.	Warm slow-moving waters or lakes. Spawning occurs along shorelines of lakes or tributaries.
Coho salmon, southern Oregon/northern California coasts ESU *Oncorhynchus kisutch*	FT/ST/-- Designated critical habitat within Area of Analysis	USFWS	Within the Area of Analysis anadromous fish occurring downstream in the mainstem Klamath River and tributaries downstream of Iron Gate Dam	Streams; spawns in gravel riffles

Common Name ***Scientific Name***	**Status[a] Federal/ State/Forest Service, Bureau of Land Management**	**Query Sources**	**Distribution**	**Habitat Association**
Chinook salmon - upper Klamath and Trinity Rivers ESU *Oncorhynchus tshawytscha*	--/SSC/FSS	CNDDB	Within the Area of Analysis anadromous fish occurring downstream in the mainstem Klamath River and tributaries downstream of Iron Gate Dam	Streams; spawns in gravel riffles
Upper Klamath-Trinity River Spring Chinook *Oncorhynchus tshawytscha*	--/SCE/--		Within the Area of Analysis anadromous fish occurring downstream in the mainstem Klamath River and tributaries downstream of Iron Gate Dam	Streams; spawns in gravel riffles
Coastal cutthroat trout *Oncorhynchus clarki*	--/SSC/FSS	CNDDB	Within the Area of Analysis coastal cutthroat trout are distributed primarily within smaller tributaries to the lower 22 miles of the Klamath River mainstem above the estuary, but also within tributaries to the Trinity River.	Shaded streams with water temperatures below 64.4˚F and small gravel for spawning
Summer-run steelhead trout *Oncorhynchus mykiss irideus*	--/SSC/--	CNDDB	Within the Area of Analysis anadromous fish distributed throughout the Klamath River and in its tributaries, downstream from Iron Gate Dam	Streams; spawns in gravel riffles

Common Name ***Scientific Name***	**Status[a] Federal/ State/Forest Service, Bureau of Land Management**	**Query Sources**	**Distribution**	**Habitat Association**
Longfin smelt *Spirinchus thaleichthys*	FC/ST, SSC/--	CNDDB	Within the Area of Analysis anadromous fish found in Klamath River Estuary	Adults in large bays, estuaries, and nearshore coastal areas; migrate into freshwater rivers to spawn; salinities of 15–30 ppt
Eulachon *Thaleichthys pacificus*	FT/--/-- Designated critical habitat within Area of Analysis	CNDDB	Within the Area of Analysis anadromous fish found in Klamath River Estuary	Adults in large bays, estuaries, and nearshore coastal areas; migrate into freshwater rivers to spawn.
Aquatic Mollusks				
Montane peaclam *Pisidium ultramontanum*	–/–/FSS	CNDDB	Within the Area of Analysis, they have been found in Upper and Lower Klamath Basin	Mollusk found in spring-influenced streams, lakes, and pools and strongly associated with sands or small clean gravels

Common Name ***Scientific Name***	**Status[a] Federal/ State/Forest Service, Bureau of Land Management**	**Query Sources**	**Distribution**	**Habitat Association**
Mammals				
Killer whale *Orcinus orca* Southern Resident DPS	FE/– Critical habitat (Designated)	NMFS	Pacific Ocean	Coastal habitats of temperate waters, including bays

[a] Status codes:

Federal
- FE = Listed as endangered under the federal Endangered Species Act
- FT = Listed as threatened under the federal Endangered Species Act
- FPE = Federally proposed as endangered
- FPT = Federally proposed as threatened
- FC = Federal candidate species
- FD = Federally delisted
- PD = Federally proposed for delisting
- BGEPA = Federally protected under the Bald and Golden Eagle Protection Act
- FSS = Forest Service Sensitive species
- BLMS = Bureau of Land Management Sensitive Species

State
- SE = Listed as Endangered under the California Endangered Species Act
- ST = Listed as Threatened under the California Endangered Species Act
- SCE = State Candidate Endangered
- SD = State Delisted
- SSC = CDFW Species of Special Concern
- SFP = CDFW Fully Protected species
- BOFS = Considered a sensitive species by the California Board of Forestry under the California Forest Practice Rules (14 CCR §895.1)

Fish

Numerous fish species use the California portion of the Klamath Basin during some portion or all of their lives. Native fishes found in riverine environments, some of which are listed under the federal or state ESAs, include salmonids, lamprey, sturgeon, suckers, minnows, dace, sculpin; and in the estuary, anchovy, gunnel, pipefish, eulachon, smelt, stickleback, and gobies occur. Species that have been introduced into the Klamath Basin include non-native yellow perch (*Perca flavescens*), largemouth bass (*Micropterus salmoides*), spotted bass (*Micropterus punctulatus*), sunfish (*Lepomis spp*), and catfish (*Siluriformes spp*).

Anadromous Fish Species

The Klamath Basin provides habitat for many species of anadromous fish – fish that migrate between salt and fresh water. Many Klamath River anadromous fish are salmonids, but there are also green sturgeon (*Acipenser medirostris*), Pacific lamprey (*Entosphenus tridentatus*), American shad (*Alosa sapidissima*) (discussed under *Non-native Fish Species* below), and eulachon (*Thaleichthys pacificus*) (discussed under *Estuarine Species* below). Additionally, CDFW operates the Iron Gate Hatchery directly downstream of Iron Gate Dam for salmonid production, as described in more detail in Section 3.3.2.3 *Habitat Attributes Expected to be Affected by the Proposed Project – Fish Hatcheries*.

Anadromous fish species within the Klamath Basin have nearly all declined compared to their historical abundance (Table 3.3-2). Although historical data are not available for green sturgeon, the population appears to be more stable than other fish species. Based on reports of green sturgeon captures in the Yurok Tribal Chinook salmon gill-net fishery, Van Eenennaam et al. (2006) conditionally suggests that the Klamath River green sturgeon population appears strong and stable but cautions against conclusions based on short time frames relative to the green sturgeon's long-life span.

Table 3.3-2. Historical and Recent Status of Adult Klamath River Anadromous Fish.

Species/Location	Historical Run Estimate[1]	Recent Run Size Estimate	Source
Pacific Lamprey			
Basin Wide	N/A	4,750–13,000[2]	Goodman and Reid 2012
Shasta River	N/A	250–1,000[2]	Goodman and Reid 2012
Scott River	N/A	250–1,000[2]	Goodman and Reid 2012
Salmon River	N/A	1,000–2,500[2]	Goodman and Reid 2012
Trinity River	N/A	2,000–5,000[2]	Goodman and Reid 2012
Steelhead			
Basin Wide	400,000[3]	Spring-, Summer-, and Fall-Run – 110,000[4] Winter-Run – 20,000[4]	Historical (Leidy and Leidy 1984) Recent (Busby et al. 1994)
Scott River	N/A	146–419[5]	CDFW 2013
Trinity River Fall-Run (Naturally Produced)[6]	N/A	2,454–9,205[7]	CDFW 2016a
Trinity River Fall-Run (Hatchery Produced)[6]	N/A	4,460–46,379[7]	CDFW 2016a
Iron Gate Hatchery	N/A	<10–400[7]	CDFW 2018c and Moyle et al. 2017
Coho Salmon			
Basin Wide	15,400–20,000	2,796–41,270[8]	Historial (Moyle et al. 1995) Recent (Ackerman et al. 2006)
Iron Gate Hatchery	N/A	70–1,296[9]	Giudice and Knechtle 2018
Bogus Creek	N/A	6–446[9]	Knechtle and Chesney 2016a, Dennis et al. 2017, 2018
Shasta River	N/A	9–255[10]	CDFW 2015a, Chesney and Knechtle 2016, 2017
Scott River	N/A	63–2,752[11]	Knechtle and Chesney 2016b
Mid-Klamath Tributaries[12]	N/A	169–307[13]	PacifiCorp 2018a
Trinity River (Naturally Produced)[6]	N/A	65–4,457[9]	Kier et al. 2018
Trinity River (Hatchery Produced) [6]	N/A	590–17,448[9]	Kier et al. 2018

Species/Location	Historical Run Estimate[1]	Recent Run Size Estimate	Source
Fall-Run Chinook Salmon			
Basin Wide	500,000	27,369–316,754[14]	Historical (Moyle 2002) Recent (CDFW 2019)
Bogus Creek	N/A	868–12,930[14]	CDFW 2019
Salmon River	N/A	1,058–5,493[14]	CDFW 2019
Scott River	N/A	1,279–12,470[14]	CDFW 2019
Shasta River	20,000–80,000	1,348–29,544[14]	Historical (Moyle 2002) Recent (CDFW 2019)
Trinity River	N/A	4,901–65,893[14]	CDFW 2019
Trinity River Hatchery[15]	N/A	1,543–17,553[14]	CDFW 2019
Iron Gate Hatchery[15]	N/A	2,587–40,015[14]	CDFW 2019
Spring-Run Chinook Salmon			
Basin Wide	100,000	6,438–35,244[9]	Historical (Moyle 2002) Recent (CDFW 2018d)
Salmon River	N/A	166–1,593[9]	CDFW 2018d
Trinity River[16]	N/A	2,599–22,733[9]	CDFW 2018d
Trinity River Hatchery[16]	N/A	1,380–6,821[9]	CDFW 2018d
Green Sturgeon			
Basin-wide	Unknown	127–453[17]	Adams et al. 2007
Coastal cutthroat			
Basin-wide	Unknown	Unknown, but likely stable[18]	Moyle et al. 2017

Species/Location	Historical Run Estimate[1]	Recent Run Size Estimate	Source
Eulachon			
Basin-wide	650,000[19]	0–1000[20]	NMFS 2017a

N/A: Not available.

1 "Historical" is considered pre-1900's, unless otherwise noted.
2 Based on data from 2009–2012
3 Estimate from 1960. Anadromous fish numbers were already in decline in the early 1900s (Snyder 1931)
4 Based on data from 1977–1991
5 Based on data from 2007–2012
6 "Naturally produced" refers to progeny of fish that spawned in the river; "hatchery produced" refers to hatchery releases
7 Based on data from 2006–2015
8 Basin wide run size is estimated based on expanded harvest data from 1999–2005 and is naturally produced coho salmon and does not account for hatchery produced fish.
9 Based on data from 2008–2017
10 Based on data from 2007–2016
11 Based on data from 2007–2015
12 Mid-Klamath Tributaries include Cottonwood, Horse, Middle, and Seiad creeks
13 Based on data from 2015–2017
14 Based on data from 2009–2018
15 CDFW (2019) does not identify natural and hatchery produced fall-run Chinook salmon, values reported for Trinity River Hatchery and Iron Gate Hatchery are based on fish that spawned at the hatchery
16 CDFW (2018d) does not distinguish wild and hatchery origin spring-run Chinook spawning naturally, values reported for Trinity River Hatchery are based on fish that returned to the hatchery.
17 Values for green sturgeon are based on harvest data from 1985–2003
18 Coastal cutthroat are reported to be widely distributed in medium to high densities in nearly all lower Klamath tributaries downstream of Mettah Creek but no population numbers are available.
19 The only reliable landings data for Eulachon in the Klamath River is from 1963, when a total of 650,000 fish were reported to have been landed. Based on the limited nature of the data we cannot estimate the fraction of the harvest relative to the total run (escapement).
20 Eulachon were thought to be extinct from the Klamath River after 1998; however, a small run was reported in 2004 and more recent sampling efforts from 2011–2014 have reported increasing numbers.

Anadromous Salmonids

Anadromous salmonids in the Klamath River include fall-run[60] and spring-run Chinook salmon (*Oncorhynchus tshawytscha*); coho salmon (*Oncorhynchus kisutch*); fall-, winter-, and summer-run steelhead (*Oncorhynchus mykiss*); and coastal cutthroat trout (*Oncorhynchus clarki clarki)*. Anadromous salmonids share similar life-history traits, but the timing of their upstream migrations, timing of outmigration[61], habitat preferences, and distributions differ. All anadromous salmonids spawn in gravel or cobble substrates that are relatively free of fine sediment with suitable surface and subsurface flow to carry oxygen to the eggs and carry metabolic waste away from the eggs. Once suitable spawning habitat is found, the adult female digs one or more nests (called redds) and deposits eggs. The number of eggs deposited by female anadromous salmonids generally increases with fish size where larger females deposit more eggs. Depending on the species, age, and size of the fish the number of eggs deposited can range from 200–17,000 (Moyle 2002, Moyle et al. 2017). After depositing eggs, her mate, or mates, will simultaneously fertilize the eggs and fend off other males and egg-eating predators. The female continues digging upstream of the nest, which forms a distinctive pit just upstream from and a protective mound of gravel and cobble over the eggs. The female will continue the mound-building process and defend her nest location. Most anadromous male and female salmonids die after completing spawning, although steelhead and coastal cutthroat may survive spawning, re-enter the ocean, and return to spawn the following year(s).

The salmonid eggs hatch several weeks or months after spawning, depending on species and water temperature. The resulting yolk-sac fry, also referred to as alevins, reside in the gravel for several more weeks and feed off their yolk sac until it is depleted. Egg-to-emergence survival is related to fine sediment infiltration, water temperature, and the fitness of the eggs. The fry that survive to emerge from the redds seek slow shallow areas near shoreline or vegetative cover, feed on benthic macroinvertebrates, gradually moving into deeper and faster water as they grow. Anadromous salmonids are generally considered "juveniles" when they have grown to a fork length of approximately 55 millimeters (about 2.2 inches)[62].

Juveniles feed opportunistically on macroinvertebrates, crustaceans, and smaller fish, and grow on their way downstream. Downstream migration is increased during spring rain events. As discussed in detail in subsequent sections, survival of fry and juvenile life stages is related to disease, parasites, food availability, predation risk, water temperature, and habitat availability (e.g., refuge from high

[60] Run is a migration of salmon up a river from the sea.
[61] Outmigration is the migration of juvenile salmonids from rivers downstream to the estuary and ocean.
[62] Fork length is the length of a fish measured from the tip of the snout to the end of the middle caudal fin rays.

flows). Within the Klamath River juvenile salmonids seek refuge from high flows and turbidity during winter in off-channel features such as side-channels and ponds, and during summer locate thermal refuge within cool water at the confluence with tributaries (in addition to thermal relief during nighttime cooling). Juvenile salmonids may also rear for some time in the estuary feeding prior to entering the ocean. Before entering brackish or saltwater, juveniles must undergo a physiological process called smoltification, which is the series of physiological changes allowing juveniles to adapt from living in fresh water to living in seawater. After entering the ocean, smolts range up and down the coast as they grow to adulthood.

Most adult salmonids return to spawn in the stream where they were born, although some straying to nearby waterbodies does occur. Different salmon species and populations (and even the same populations from year to year) have highly variable straying rates, with hatchery origin spawners straying at a higher rate (Lasko et al. 2014). Straying may be the result of a multitude of factors, including as a response to environmental conditions or disturbance events, or exploration of new habitats for suitability. Survival of adults in the marine environment is related to fishing pressure, food availability, and predation risk (e.g., marine mammals). When adults return to natal streams upstream migration success is related to availability of adequate instream flows, turbidity, water temperature (for spring- and summer-runs), disease and parasites, fishing pressure, and passage obstacles (both natural and man-made). Between 1998 and 2008, smolt-to-adult-return-ratios (SAR) for coho salmon at Iron Gate Hatchery ranged from 0.04 percent to 2.66 percent with an average of 0.99 percent (CDFW and PacifiCorp 2014). Fall-run Chinook salmon smolts from Iron Gate Hatchery implanted with coded wire tags had return rates ranging from 0.006 to 0.914 percent with an average return rate of 0.178 percent during the period of 1990 through 2015, while Chinook salmon yearlings during the same period had return rates ranging from 0.009 to 1.058 percent with an average return rate of 0.352 percent (Giudice and Knechtle 2018). From 1988 to 2003, the SAR for fall Chinook released from the Trinity River hatchery ranged from 0.12 percent to 3.19 percent with an average of 1.61 percent (California HSRG 2012). For Trinity River spring-run Chinook salmon, yearling releases have averaged just over twice the survival of smolt releases (0.54 percent vs. 1.11 percent). The range of SARs for smolts was from 0.004 percent in 1989 to 2.27 percent in 1999. The SAR range for yearlings was from 0.08 percent in 1990 to 3.30 percent in 1999.

Specific details of life history and distribution are described in the following sections for each anadromous salmonid species.

Chinook Salmon

Two Chinook salmon Evolutionarily Significant Units (ESUs) currently occur in the Klamath Basin downstream of Iron Gate Dam—the Southern Oregon and Northern California Coastal ESU, which includes all naturally spawned Chinook

salmon in the Lower Klamath River downstream from its confluence with the Trinity River, and the Upper Klamath and Trinity Rivers ESU, which includes all naturally spawned populations of Chinook salmon in the Klamath and Trinity rivers upstream of the confluence of the two rivers. A status review in 1999 determined that neither ESU warranted listing under the federal ESA (NMFS 1999a). The Upper Klamath and Trinity Rivers ESU is listed as a CDFW Species of Special Concern and a USDA Forest Service Sensitive Species.

Another petition to list Chinook salmon in the Upper Klamath and Trinity Rivers ESU under the ESA was submitted to NMFS in January 2011 (CBD et al. 2011). In the petition, NMFS was asked to consider one of three alternatives for the listing of Chinook salmon in the Upper Klamath and Trinity River ESU: (1) list spring-run only as a separate ESU, (2) list spring-run as a distinct population segment (DPS) within the Upper Klamath and Trinity River Chinook Salmon ESU, or (3) list the entire Chinook salmon Upper Klamath and Trinity River ESU including both spring-run and fall-run populations. In April 2011, NMFS announced that the petition contained substantial scientific information warranting federal review as to whether Chinook salmon within the Upper Klamath and Trinity River ESU should be listed as threatened or endangered. As a result, NMFS formed a Biological Review Team (BRT) to assess the biological status of the species and determine if listing under the ESA is necessary. The BRT (Williams et al. 2011) found that recent spawner abundance estimates of both fall-run and spring-run Chinook salmon returning to spawn in natural areas are generally low compared to historical estimates of abundance; however, the majority of populations have not declined in spawner abundance over the past 30 years (i.e., from the late 1970s and early 1980s to 2010) except for the Scott and Shasta rivers where there have been modest declines (Williams et al. 2011). In addition, Williams et al. (2011) found that hatchery returns did not track escapement[63] to natural spawning areas and they concluded that there has been little change in the abundance levels, trends in abundance, or population growth rates since the review conducted by Myers et al. (1998). The BRT also noted that recent abundance levels of some populations are low, especially in the context of historical abundance estimates. This was most evident with two of the three spring-run population units that were evaluated (Salmon River and South Fork Trinity River). The BRT concluded that although current levels of abundance are low when compared to historical estimates of abundance, the current abundance levels did not constitute a major risk in terms of ESU extinction.

The BRT also concluded that spring-run Chinook salmon did not warrant designation as a separate ESU or DPS within the Upper Klamath and Trinity River ESU. This finding was based in part on genetic evidence that indicates

[63] Escapement is the portion of a salmon population that does not get caught by commercial or recreational fisheries and returns to their freshwater spawning habitat or hatchery of origin.

that spring-run and fall-run life histories have evolved on multiple occasions across different coastal watersheds located north and south of the Klamath River. Kinziger et al. (2008) found that there are four genetically distinct and geographically separated groups of Chinook salmon populations in the Upper Klamath and Trinity River basins; and that spring-run and fall-run Chinook salmon life histories have evolved independently, but in parallel, within both the Salmon and Trinity rivers. In addition, spring-run and fall-run populations in the Salmon River were nearly genetically indistinguishable and spring-run and fall-run populations in the South Fork Trinity River were extremely similar to each other and to Trinity River hatchery stocks. Williams et al. (2011) concluded that spring-run and fall-run Chinook salmon within the Upper Klamath and Trinity River basins are genetically similar to each other and that the two runs are not substantially reproductively isolated from each other. In addition, ocean type (ocean entry in early spring within a few months of emergence) and stream type (ocean entry during spring of their second year of life) life history strategies are exhibited by both run types, further suggesting that spring-run Chinook salmon in the Upper Klamath and Trinity River basins do not represent an important component in the evolutionary legacy of the species.

However, recently published research by Prince et al. (2017) questions the basis of treating the fall-run and spring-run Chinook salmon in the Upper Klamath and Trinity River ESU as a single ESU, which was based on overall genetic structure that is primarily defined by geography. The genomic results of Prince et al. indicate that premature migration observed in spring-run Chinook salmon is defined by a single genetic variation, questioning the basis of conventional ESU designations which assume that genetic structure is primarily defined by geography.

In response to new information from Prince et al. (2017), and the overall decline of spring-run Chinook salmon, in November 2017, the Karuk Tribe and the Salmon River Restoration Council submitted a petition to NMFS to list as threatened or endangered the Upper Klamath and Trinity Rivers ESU or, alternatively, create a new ESU to describe Klamath spring-run Chinook salmon and list the new ESU as threatened or endangered under the ESA. In February 2018, NMFS announced a 90-day finding on this petition (NMFS 2018a). NMFS found that the petition presents substantial scientific information indicating the petitioned actions may be warranted. NMFS will conduct a status review of the Chinook salmon in the Upper Klamath and Trinity rivers to determine if the petitioned actions are warranted. No final decision has been published to date.

In July 2018, the Karuk Tribe and Salmon River Restoration Council submitted a petition to the California Fish and Game Commission to list the Upper Klamath Trinity River Spring Chinook as an endangered species under the California Endangered Species Act (CESA). In February 2019, the California Fish and Game Commission designated the Upper Klamath Trinity River Spring Chinook a candidate for listing while the petition undergoes review.

Regardless of the status of a determination on whether spring-run and fall-run Chinook salmon comprise a single ESU, these two runs have different life history strategies (NRC 2004), and therefore are considered distinct in this analysis. A more detailed discussion of the two run types is described below.

Fall-Run Chinook Salmon

Fall-run Chinook salmon are currently distributed throughout the Klamath River downstream from Iron Gate Dam. Upstream adult migration through the estuary and Lower Klamath River peaks in early September and continues through late October (Moyle 2002, FERC 2007, Strange 2008) (Table 3.3-3). Spawning peaks in late October and early November, and fry begin emerging from early February through early April (Stillwater Sciences 2009a), although timing may vary somewhat depending on temperatures in different years and tributaries. Table 3.3-3 provides a generalized life history periodicity for fall-run Chinook salmon life stages, with additional timing provided in Appendix E.3.1.1.

Table 3.3-3. Life-history Timing of Fall-run Chinook Salmon in the Klamath River Basin Downstream of Iron Gate Dam. Peak activity is indicated in black.

Life Stage	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec	
All Types																								
Incubation																								
Emergence																								
Adult migration																								
Spawning																								
Type I																								
Rearing																								
Juvenile outmigration																								
Type II																								
Rearing																								
Juvenile outmigration																								
Type III																								
Rearing																								
Juvenile outmigration																								

Fall-run Chinook salmon in the Klamath Basin exhibit three juvenile life-history types: Type I (ocean entry at age 0[64] in early spring within a few months of emergence), Type II (ocean entry at age 0 in fall or early winter), and Type III (ocean entry at age 1 in spring) (Sullivan 1989) (Table 3.3-3). Based on outmigrant trapping at Big Bar on the Klamath River from 1997 to 2000, 63 percent of natural Chinook salmon outmigrants are Type I, 37 percent are Type II, and less than 1 percent are Type III (Scheiff et al. 2001). Although trapping efforts are not equal among seasons, the results are consistent with scale analysis of adult returns by Sullivan (1989).

Critical stressors on fall-run Chinook salmon in the basin include water quality and quantity in the mainstem and within spawning tributaries. Downstream from Iron Gate Dam, the mainstem Klamath River undergoes seasonal changes in flows, water temperature, dissolved oxygen, and nutrients, as well occasional blooms of *Microcystis aeruginosa* (a blue-green algae species that is potentially toxic to fish, as discussed in detail below and in Section 3.4 *Phytoplankton and Periphyton*). During outmigration, juvenile Chinook salmon are vulnerable to contracting disease from pathogens, including the bacterium *Flavobacterium columnare*, and myxozoan parasites *Parvicapsula minibicornis* and *Ceratomyxa shasta*.

Spring-Run Chinook Salmon

Spring-run Chinook salmon in the Klamath Basin are distributed mostly in the Salmon and Trinity rivers and in the mainstem Klamath River downstream from these tributaries during migratory periods, although a few fish are occasionally observed in other areas (Stillwater Sciences 2009a). Based on data from 2005 to 2014 (CDFW 2015b), the Salmon River contributions to the overall escapement of spring-run Chinook salmon ranged from 1 to 12 percent of the total escapement, and from 1 to 20 percent of the natural escapement. To date, no spring-run Chinook salmon spawning has been observed in the mainstem Klamath River (Shaw et al. 1997). As described above, the BRT (Williams et al. 2011) concluded that while current abundance is low compared with historical abundance (Table 3.3-2), the Chinook salmon population (which includes hatchery fish) appears to have been fairly stable for the past 30 years. However, the BRT noted, as did Myers et al. (1998), that the recent spawner abundance levels of two of the three spring-run population components (Salmon River and South Fork Trinity River) are very low compared to historical abundance (less than 2,000 fish and 1,000 fish, respectively). The BRT was concerned about the relatively few populations of spring-run Chinook salmon and the low numbers of spawners within those populations (Williams et al. 2011).

[64] A fish emerging in spring is designated as age 0 until January 1st of the following year, when it is designated as age 1 until January 1st of the next year, when it is designated age 2.

The BRT (Williams et al. 2011) found the decline in spring-run salmon especially troubling given that historically the spring-run population may have been equal to, if not larger than the fall-run (Barnhart 1994). Huntington (2006) reasoned that spring-run Chinook salmon likely accounted for the majority of the Upper Klamath Basin's actual salmon production under historical conditions. Spring-run Chinook salmon spawned in the tributaries of the Upper Klamath Basin (Moyle 2002, Hamilton et al. 2005, Hamilton et al. 2016) with large numbers of spring-run Chinook salmon spawning in the basin upstream of Klamath Lake in the Williamson, Sprague, and Wood rivers (Snyder 1931). Genetic studies of Chinook in the Klamath-Trinity basin, including analysis of archeological samples from the upper Klamath Basin, support the historical prevalence of spring-run Chinook salmon in tributaries upstream of Klamath Lake and identify genetic differences between spring-run and fall-run phenotypes (Prince et al. 2017, Thompson et al. 2018). Large runs of spring-run Chinook salmon also historically returned to the Shasta, Scott, and Salmon rivers (Moyle et al. 1995). The runs in the Upper Klamath Basin are thought to have been in substantial decline by the early 1900s and were eliminated by the completion of Copco No. 1 Dam in 1917 (Snyder 1931). The cause of the decline of the Klamath River spring-run Chinook salmon prior to Copco No. 1 Dam has been attributed to dams, overfishing, irrigation, and largely to commercial hydraulic mining operations (Coots 1962, Snyder 1931). These large-scale mining operations occurred primarily in the late 1800's, and along with overfishing, left spring-run Chinook salmon little chance to recover prior to dam construction in the early 1900's. Dams (e.g., Iron Gate Dam and Lewiston Dam) have eliminated access to much of the historical spring-run spawning and rearing habitat and are partly responsible for the extirpation of at least seven spring-run populations from the Klamath-Trinity River system (Myers et al. 1998). For example, the construction of Dwinnell Dam on the Shasta River in 1926 was soon followed by the disappearance of the spring-run Chinook salmon run in that tributary (Moyle et al. 1995).

Wild spring-run Chinook salmon from the Salmon River appear to primarily express a Type II life history, based on scale analyses of adults returning from 1990 to 1994 in the Salmon River (Olson 1996), as well as otolith analyses of Salmon River fry and adults (Sartori 2006). A small number of fish employ the Type III life history, although it does not appear to be nearly as prevalent as the Type II.

Spring-run Chinook salmon upstream migration is observed during two-time periods—spring (April through June) and summer (July through August) (Strange 2008) (Table 3.3-4). Snyder (1931) also describes a run of Chinook salmon occurring in the Klamath River during July and August under historical water quality and temperature conditions. Adults spawn from mid-September to late-October in the Salmon River and from September through early November in the South Fork Trinity River (Stillwater Sciences 2009a). Emergence begins in March and continues until early June (West et al. 1990). Age-0 juveniles rearing

in the Salmon River emigrate at various times of the year, with one of the peaks of outmigration occurring in April through May (Olson 1996), which would be considered Type I life history. Based on outmigrant trapping from April to November in 1991 at three locations in the South Fork Salmon River, Olson (1996) reported that the greatest peak in outmigration of age-0 juveniles (69 percent) was in mid-October, which would be considered Type II life history. Sullivan (1989) reported that outmigration of Type II age-0 juveniles can occur as late in the year as early-winter. On the South Fork Trinity River outmigration occurs in late-April and May with a peak in May (Dean 1994, 1995), although it is not possible to differentiate between spring- and fall-run juveniles and so the spring-run may have different run timing. Age-1 juveniles (Type III) have been found to outmigrate from the South Fork Trinity River during the following spring (Dean 1994, 1995). Table 3.3-4 provides a generalized life history periodicity for spring-run Chinook salmon life stages, with additional timing provided in Appendix E.3.1.2.

Table 3.3-4. Life-history Timing of Spring-run Chinook Salmon in the Klamath River Basin Downstream of Iron Gate Dam. Peak Activity is Indicated in Black.

Life Stage	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec	
All Types																								
Incubation																								
Emergence																								
Adult migration in mainstem																								
Adult entrance into tributaries																								
Spawning																								
Type I																								
Rearing																								
Juvenile outmigration																								
Type II																								
Rearing																								
Juvenile outmigration																								
Type III																								
Rearing																								
Juvenile outmigration																								

It is unclear how much time outmigrating age-0 juveniles spend in the Klamath River mainstem and estuary before entering the ocean. Sartori (2006) did identify a period of increased growth (an estimated mean of 24 days) just prior to reaching an estuarine environment based on otolith analyses of returning adults to the Salmon River, but this period was never clearly linked to mainstem residence. From March to May, there were fair numbers of age-1 juvenile outmigrants captured in the Klamath River Estuary (Wallace 2004). Approximately half were identified to be hatchery age-1 juvenile fall-run Chinook salmon, and the rest were identified to be of natural origin, based on tag expansions.

Stressors on spring-run Chinook salmon related to water quality and quantity are similar to those for fall-run Chinook salmon in the mainstem Klamath River. Although water quality tends to improve in the mainstem downstream from the confluence with the Salmon River (the upstream-most spawning tributary), degradation of water quality (especially temperature and dissolved oxygen) can create critically stressful conditions for spring-run Chinook salmon adults and juveniles for much of the summer (June through September). Production in the Salmon River is primarily controlled by high water temperatures that reduce adult holding and summer rearing habitat in the mainstem Salmon River, while increased fine sediment input within the watershed reduces spawning and rearing habitat quality in some locations (Elder et al. 2002).

Coho Salmon

Coho salmon within the Klamath Basin are included within the Southern Oregon/Northern California Coast (SONCC) coho salmon ESU, which is listed as federally threatened (NMFS 1997a). SONCC coho salmon designated critical habitat includes the Klamath River downstream of Iron Gate Dam, including the estuary (NMFS 1999b). This ESU includes all naturally spawning populations between Punta Gorda, California and Cape Blanco, Oregon, which encompasses the Trinity and Klamath basins (NMFS 1997a). In addition, coho salmon in the Klamath Basin have been listed by the California Fish and Game Commission as threatened under the California Endangered Species Act (CESA) (CDFG 2002a). The Pacific Fishery Management Council (PFMC) considers potential impacts from fishing when setting retention limits each year. The annual coho salmon exploitation rate (proportion of a population that is caught during a year) averaged approximately 5 percent from 2000 to 2013. California waters were open to coho salmon fishing prior to 1998, but currently, coho salmon fishing in California is restricted to tribal harvest under federal reserved fishing rights in the Klamath River. California's statewide prohibition of coho salmon fishing maintains consistently low impacts from freshwater recreational fisheries on SONCC coho salmon (NMFS 2014).

Coho salmon are native to the Klamath Basin. Williams et al. (2006) described nine historical coho salmon populations within the Klamath Basin: the Upper Klamath River, Shasta River, Scott River, Salmon River, Middle Klamath River,

Lower Klamath River, and three population units within the Trinity River watershed (Upper Trinity River, Lower Trinity River, and South Fork Trinity River). Note that the designation of these population units varies from the Area of Analysis study reach designations used in this EIR.

Although coho salmon are native to the Klamath River, documentation of coho salmon in the Klamath River is scarce prior to the early 1900's due, in part, to the apparent difficulty of those providing written records in recognizing that there were different species of salmon inhabiting the rivers of the area (Snyder 1931). Snyder (1931) reported that coho salmon were said to migrate to the headwaters of the Klamath River to spawn, but that most people did not distinguish them from other salmon species. Available data suggests that coho salmon were in both mainstem and tributary reaches of the Klamath River upstream to and including Spencer Creek at RM 232.6 (NRC 2004, as cited in NMFS 2007a, Hamilton et al. 2005). While noting that the evidence of historic presence between Fall and Spencer creeks was not conclusive, the 2006 Administrative Law Judge trial-type hearing under Section 241 of the Energy Policy Act of 2005 (NMFS 2006a) determined that coho salmon were abundant at Fall Creek, and that suitable habitat in the Hydroelectric Reach included Spencer, Fall, Beaver, Deer, Shovel, Scotch and Jenny creeks, as well as the main stem of the Klamath River itself.

The final SONCC Coho Salmon Recovery Plan was published on September 9, 2014 (NMFS 2014). Estimated extinction risk is designated as high for the Lower and Upper Klamath River populations, and moderate for the Middle Klamath River population. Estimated extinction risks of the Shasta, Scott, and Salmon river populations are designated as high, moderate, and high, respectively. Extinction risks for the Lower and Upper Trinity River populations are designated as high and moderate, respectively, while the South Fork Trinity River population is designated as high. Williams et al. (2006) describes population units to support recovery planning for the listed SONCC ESU. Analysis of coho salmon in this EIR considers impacts and benefits for each of the nine population units in the Klamath Basin separately but makes a significance determination for all population units combined within the Klamath Basin to be consistent with the approach to assessing other aquatic species populations, and to be consistent with the NMFS 2014 Southern Oregon/Northern California Coast (SONCC) Recovery Plan, which assesses all of the coho salmon in the Klamath River Basin as part of the same ESU.

The 2016 five-year status review of SONCC coho salmon (NMFS 2016a) indicated that the ESU's extinction risk has increased since the last status review in 2011. Drought conditions had persisted in four of the prior five years and were ongoing. These conditions are unprecedented in the time since SONCC coho salmon have been listed and were found likely to have resulted in reduced juvenile survival and stressful rearing conditions in nearly all parts of the ESU's range. Those juveniles that survived the freshwater conditions were also found

likely to have faced poor ocean conditions, the results of which would only be apparent after these year classes return as adults.

Coho salmon are currently widely distributed in the Klamath River downstream from Iron Gate Dam (RM 193.1) (NRC 2004, Dennis et al. 2017, 2018), which blocks the upstream migration of coho salmon to historically available habitat in the upper watershed. To minimize and mitigate for adverse effects to coho salmon, PacifiCorp prepared a Habitat Conservation Plan (HCP) for its interim operations of the Klamath Hydroelectric Project (PacifiCorp 2012). This HCP underlines the conservation strategy and measures that PacifiCorp will undertake to address anticipated effects on SONCC coho salmon and their habitat in the Klamath Basin. Per the HCP, PacifiCorp provides funding for the California Klamath Restoration Fund/Coho Enhancement Fund (CEF) as an Interim Measure (IM2). As of January 2018, PacifiCorp has provided funding of over $4,900,000 into the CEF. Between 2009 and 2017, NMFS and CDFW selected 42 projects (with a value of approximately $4.3 million) to benefit coho salmon (PacifiCorp 2018). These projects have been conducted at the mouths of 72 tributaries as well as in Seiad Creek, Scott River, Denny Ditch, Shasta River, Huseman Ditch, McBravey Creek, Fort Goff Creek Stanshaw Creek and Lower Hoopaw Creek. Over 2,000 feet of channel has been restored, over 163,000 ft^2 of off-channel ponds have been created, three fish screens have been installed, 73 passage barriers have been removed, access has been improved to over 71 miles of coho salmon habitat, 7 miles of riparian fencing have been installed, 29 water leases have been implemented to improve flows to nearly 36 miles of stream, and 71,000 ft^2 of other habitat enhancement projects have been implemented. PacifiCorp has developed a partnership with the National Fish and Wildlife Foundation (NFWF) to administer the fund, and this allows grant recipients to apply for additional funding from other grant programs. Using this process, grantees have leveraged an additional $7.7 million matching funds for coho salmon restoration projects as of 2017. A Technical Review Team was formed in 2012 and meets annually to review existing projects funded under the Coho Enhancement Fund and to recommend possible adaptive management changes.

Coho salmon use the mainstem Klamath River for some or all of their life history stages (spawning, rearing and migration). However, the majority of returning adult coho salmon spawn in the tributaries to the mainstem (Magneson and Gough 2006, NMFS 2010a).

Adult coho salmon in the Klamath Basin migrate upstream from September through late December, with migration peaking in October and November (Table 3.3-5). Spawning occurs mainly in November and December, with fry emerging from the gravel in the spring, three to four months after spawning, depending on water temperature (Trihey and Associates 1996, NRC 2004) (Table 3.3.-5). Table 3.3-5 provides a generalized life history periodicity for coho salmon life stages, with additional timing provided in Appendix E.3.1.3.

Table 3.3-5. Life-history Timing of Coho Salmon in the Klamath River Basin Downstream of Iron Gate Dam. Peak Activity is Indicated in Black.

Life Stage	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec	
Incubation																								
Emergence																								
Rearing																								
Juvenile redistribution																								
Juvenile outmigration																								
Adult migration																								
Spawning																								

Some fry and age-0 juveniles enter the mainstem in the spring and summer following emergence (Chesney et al. 2009). Large numbers of age-0 juveniles from tributaries in the mid-Klamath River move into the mainstem in the fall (October through November) (Soto et al. 2008, Hillemeier et al. 2009). Juvenile coho salmon have been observed to move into off-channel ponds, non-natal tributaries to the Klamath River, downstream portions of the Lower Klamath River, and the estuary for overwintering (Soto et al. 2008, Hillemeier et al. 2009). Some proportion of juveniles generally remain in their natal tributaries to rear.

Age-1 coho salmon migrate downstream from tributaries into the mainstem Klamath River as smolts from February through mid-June with a peak in April and May, which often coincides with the descending limb of the spring hydrograph (NRC 2004, Chesney and Yokel 2003, Scheiff et al. 2001). Once in the mainstem, smolts appear to move downstream rather quickly; Wallace (2004) reported that numbers of coho salmon smolts in the Klamath River Estuary peaked in May, the same month as peak outmigration from the tributaries.

The major activities identified as responsible for the decline of SONCC coho salmon and degradation of their habitat include logging, road building, grazing, mining, urbanization, stream channelization, dams, wetland loss, beaver trapping, artificial propagation, overfishing, water withdrawals, and unscreened diversions for irrigation (NMFS 1997a). In 2007, NMFS published a Klamath River Coho Salmon Recovery Plan to comply with the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006. This level of recovery planning is not as intensive or thorough as the recovery planning process required under the ESA (which to date had not been completed). The 2007 plan includes the following actions identified as high priority for recovery:

- Restore access for coho salmon to the Upper Klamath Basin by providing passage upstream of existing mainstem dams.
- Fully implement the Trinity River Restoration Program.
- Provide incentives for private landowners and water users to cooperate in (1) restoring access to tributary streams that are important for coho spawning and rearing, and (2) enhancing mainstem and tributary flows to improve instream habitat conditions.
- Continue to improve the protective measures already in place to address forestry practices and road building/maintenance activities that compromise the quality of coho salmon habitat.
- Implement restorative measures identified through fish disease research results to improve the health of Klamath River coho salmon populations.

Many of the actions identified in the 2007 plan have been, or are in the process of being, addressed: the Proposed Project in this EIR would address restoration of access for coho salmon; the Trinity River Restoration Program is currently being implemented; and, many private landowners and water users are restoring coho access and habitat to stream reaches and they are addressing forestry

practices that could harm fish. Fish disease issues are being researched and addressed, most recently in 2013 when the NMFS and USFWS issued a joint Biological Opinion (2013 BiOp; NMFS, and USFWS 2013) for the USBR's Klamath Irrigation Project operations, as described in detail in Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*. While the 2013 BiOp is for operations upstream of the Lower Klamath Project, the conditions of the 2013 BiOp form an important part of the existing condition for coho salmon downstream of Iron Gate Dam, and, as discussed below, are intended to reduce coho disease rates. In this joint BiOp, NMFS consulted on coho salmon, while USFWS consulted on listed suckers (discussed below under *Lost River and Shortnose Suckers*).

In the 2013 BiOp, NMFS concluded that the effect of proposed USBR Klamath Irrigation Project operations on flows would result in habitat reductions for coho salmon juveniles in the mainstem Klamath River. To offset these negative effects, the 2013 BiOp includes flow release requirements to reduce disease incidence for coho salmon in the Klamath River downstream of Iron Gate Dam. The formulaic approach to flow releases designed to benefit coho salmon, as described in the 2013 BiOp, prioritizes a volume of water set-aside in an Environmental Water Account (EWA) for releases in the spring, and minimum daily flow targets in April through June to meet Hardy et al. (2006) recommended ecological base flows (discussed further in Section 3.3.2.3 *Habitat Attributes Expected to be Affected by the Proposed Project*). The 2013 BiOp found that Klamath Irrigation Project operations were not likely to diminish habitat for coho salmon fry and juveniles in the Upper Klamath, Middle Klamath, Shasta, and Scott river populations to an extent that would reduce life history diversity.

In their 2013 BiOp analysis of the Klamath Irrigation Project operations, NMFS concluded that the proposed flow releases would result in coho salmon disease risks that are lower than observed period of record conditions, yet higher than under natural flow conditions (NMFS and USFWS 2013). Of all the adverse effects of the proposed Klamath Irrigation Project operations, NMFS concluded that risk of fish disease due to the myxozoan parasite *Ceratomyxa shasta* (*C. shasta*) is the most significant for coho salmon, since *C. shasta* is a key factor limiting salmon recovery in the Klamath River (e.g., Foott et al. 2009). The adaptive management element of the USBR's Klamath Irrigation Project proposed operations was intended to minimize disease risks to coho salmon during average to below average water years if EWA surplus volume is available. Lastly, NMFS concluded that the proposed minimum daily flows below Iron Gate Dam in April to June would limit the increase in disease risks posed to coho salmon from Klamath Irrigation Project operations. The Klamath Irrigation Project directs flow requirements in the Klamath River below Iron Gate Dam by releases from the Lower Klamath Project's Iron Gate Dam consistent with the 2013 BiOp issued on the Klamath Irrigation Project. By lowering the disease risk, NMFS asserted that coho salmon abundance would likely improve over the next ten years for the Upper Klamath, Middle Klamath, Shasta, and Scott river populations.

However, the first years of 2013 BiOp implementation included severe drought conditions, and although the USBR was operating the Klamath Irrigation Project in accordance with the 2013 BiOp, the infection rate for *C. shasta* in the Klamath River downstream of Iron Gate Dam greatly exceeded the incidental take maximum (U.S. District Court 2017a). As described in Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*, this led to a court order requiring USBR to implement three specific flows in the Klamath River, as measured immediately downstream of Iron Gate Dam: annual winter-spring surface flushing flows, biennial winter-spring deep flushing flows, and spring-summer emergency dilution flows (U.S. District Court 2017a–c). The court also required that USBR re-initiate consultation with NMFS and the USFWS regarding the effects of the Klamath Irrigation Project operations on coho salmon in the Klamath River and Lost River and shortnose suckers in the Upper Klamath Basin (U.S. District Court 2017a–c). The flow-related analyses in this EIR acknowledge the re-initiation of consultation on the 2013 BiOp Flows by considering the 2017 court-ordered flushing and emergency dilution flow requirements downstream of Iron Gate Dam as interim flow requirements until completion of formal consultation. The court-ordered flushing flows and emergency dilution flows are not part of existing conditions for the Proposed Project, because they went into effect after the Notice of Preparation was filed by the State Water Board in December 2016, and because the data evaluating the effectiveness of the flows and their potential impacts were not sufficiently robust to support analyses in the Draft EIR. The court-ordered flushing and emergency dilution flows are detailed in Section 4.2.1.1 *[Alternative Description] Summary of Available Hydrology Information for the No Project Alternative* as part of the No Project Alternative because they would likely only apply if Iron Gate Dam were to remain in place or the disease nidus remains. These flows are also discussed in Section 4.4 *Continued Operations with Fish Passage Alternative*.

After the issuance of the Lower Klamath Project Draft EIR on December 27, 2018, the applicable biological opinion and the operational flow requirements for the Klamath River changed again in March 2019, when the new biological opinions were issued by NMFS (2019) and USFWS (2019a). The 2019 BiOp Flows are now the current operational flow requirement for the Klamath River. The 2019 BiOp Flows are analyzed in the Lower Klamath Project Final EIR as a second CEQA baseline, representing flows under conditions defined and implemented during final EIR development. Inclusion of two baseline hydrology regimes in the Lower Klamath Project Final EIR is consistent with CEQA Guidelines section 15125 (a). The 2019 BiOp flow requirements include annual surface flushing flows of at least 6,030 cubic feet per second (cfs) for 72 hours at Iron Gate Dam between March 1 and April 15, and the potential for dilution flows and/or enhanced spring flows should conditions allow.

Steelhead

Steelhead are highly adaptive salmonids, with multiple life histories (Hodge et al. 2016). Klamath Basin summer steelhead and winter steelhead populations both belong to the Klamath Mountain Province ESU, which is not listed under the ESA. The NMFS (2001) status review found that this ESU was not in danger of extinction or likely to become so in the foreseeable future, based on estimated populations for the ESU and lower estimates of genetic risk from naturally spawning hatchery fish than estimated in previous reviews, and consideration of existing conservation efforts that are benefiting steelhead in the ESU.

Summer Steelhead

The Klamath Mountain Province ESU of summer steelhead is a CDFW Species of Special Concern and is distributed throughout the Klamath River downstream from Iron Gate Dam and in its tributaries. This species historically used habitat upstream of Upper Klamath Lake prior to the construction of Copco No. 1 Dam (Hamilton et al. 2005). However, some populations such as the Salmon River summer steelhead have declined significantly in the past several decades (Quiñones et al. 2013), and in general summer steelhead populations in the ESU are currently in low abundance (Moyle et al. 2017). Based on available escapement data from summer direct observation surveys, approximately 55 percent of summer steelhead spawn in the Trinity River and other lower-elevation tributaries (CDFW and USDA Forest Service 2002, unpubl. data). Most remaining summer steelhead are believed to spawn in tributaries between the Trinity River (RM 43.3) and Seiad Creek (RM 132.7), with high water temperatures limiting their use of tributaries to the Klamath River farther upstream (NRC 2004). Adult summer steelhead use the mainstem Klamath River primarily as a migration corridor to access holding and spawning habitat in tributaries.

Summer steelhead adults enter and migrate up the Klamath River from March through June while sexually immature (Hopelain 1998), then hold in cooler tributary habitat until spawning begins in December (USFWS 1998) (Table 3.3-6). Forty to 64 percent of summer steelhead in the Klamath River exhibit repeat spawning, with adults observed to migrate downstream to the ocean after spawning (also known as “runbacks”) (Hopelain 1998). Summer steelhead in the basin also have a “half-pounder” life-history pattern, in which an immature fish emigrates to the ocean in the spring, returns to the river in the fall, spends the winter in the river, then emigrates to the ocean again the following spring (Busby et al. 1994, Moyle 2002). Table 3.3-6 provides a generalized life history periodicity for summer steelhead life stages, with additional timing provided in Appendix E.3.1.4.

Table 3.3-6. Life-history Timing of Summer Steelhead in the Klamath River Basin Downstream of Iron Gate Dam. Peak Life-history Periods are Shown in Black.

Life Stage	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec	
Incubation																								
Emergence																								
Rearing																								
Juvenile outmigration																								
Half-pounder residence																								
Adult migration in mainstem																								
Adult holding in tributaries																								
Spawning																								
Run-backs																								

Juvenile summer steelhead in the Klamath Basin may rear in freshwater for up to three years before outmigrating. Although many juveniles migrate downstream at age-1 (Scheiff et al. 2001), those that outmigrate to the ocean at age 2 appear to have the highest survival (Hopelain 1998). Juveniles outmigrating from tributaries at age-0 and age-1 may rear in the mainstem or in non-natal[65] tributaries (particularly during periods of poor water quality) for one or more years before reaching an appropriate size for smolting. Age-0 juvenile steelhead have been observed migrating upstream into tributaries, off-channel ponds, and other winter refuge habitat in the Lower Klamath River (Stillwater Sciences 2010). Juvenile outmigration occurs primarily during spring. Smolts are captured in the mainstem and estuary throughout the fall and winter (Wallace 2004), but peak smolt outmigration normally occurs from April through June, based on estuary captures (Wallace 2004). Temperatures in the mainstem are generally suitable for juvenile steelhead, except during periods of the summer, especially upstream of Seiad Valley (for more species information see USFWS 1998, Moyle 2002, NRC 2004, and Stillwater Sciences 2009a). Critical limiting factors for summer steelhead include degraded habitats, passage impediments, predation, and competition (Moyle et al. 2008).

Winter Steelhead

Moyle (2002) describes steelhead in the Klamath Basin as having a summer- and winter-run. Some divide the winter-run into fall and winter-runs (Barnhart 1994, Hopelain 1998, USFWS 1998, Papa et al. 2007). In this section, "winter steelhead" refers to both fall- and winter-runs except in cases when the distinction is pertinent to the discussion, and wherever data was sufficient to analyze them separately.

Winter steelhead are widely distributed throughout the Klamath River and its tributaries downstream from Iron Gate Dam, and historically used habitat upstream of Upper Klamath Lake (Hamilton et al. 2005). Butler et al. (2010) found that 93 percent of the 41 *Oncorhynchus mykiss* specimens excavated from archeological sites above Upper Klamath Lake were anadromous (indicating occurrence of steelhead historically upstream of Upper Klamath Lake). Winter steelhead adults generally enter the Klamath River from July through October (fall-run) and from November through March (winter-run) (USFWS 1998, Stillwater Sciences 2010). They spawn mainly in tributaries throughout the Klamath River Basin downstream of Iron Gate Dam, and occasionally within the mainstem (NRC 2004). Winter steelhead migrate upstream primarily from January through April (USFWS 1998), with peak spawn timing in February and March (ranging from January to April) (NRC 2004) (Table 3.3-7). Adults may repeat spawning in subsequent years after returning to the ocean in the spring following spawning. Immature "half-pounders" return after a short (<1 year) ocean residence each year in September through March and typically use the mainstem Klamath River to feed until returning to the ocean (NRC 2004),

[65] Tributary other than the one in which it was born.

although they also use larger tributaries such as the Trinity River (Dean 1994, 1995). Table 3.3-7 provides a generalized life history periodicity for spring-run Chinook salmon life stages, with additional timing provided in Appendix E.3.1.4.

Table 3.3-7. Life-history Timing of Fall-and Winter-run Steelhead and Rainbow Trout in the Klamath River Basin Downstream of Iron Gate Dam. Peak Life-history Periods are Shown in Black.

Life Stage	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec	
Incubation																								
Emergence																								
Rearing																								
Juvenile outmigration																								
Half-pounder residence																								
Fall-run adult migration																								
Winter-run adult migration																								
Spawning																								
Run-backs																								

Fry emerge in spring (NRC 2004), with fry observed in outmigrant traps in Bogus Creek and Shasta River from March through mid-June (Dean 1994). Age-0 and age-1 juveniles have been captured in outmigrant traps in spring and summer in tributaries to the Klamath River upstream of Seiad Creek (CDFG 1990a, b). These fish are likely rearing in the mainstem or non-natal tributaries before outmigrating to the ocean as age-2 outmigrants.

Juvenile outmigration appears to primarily occur between May and September with peaks between April and June, although smolts are captured in the estuary as early as March and as late as October (Wallace 2004). Most adult returns originate from fish that smolt at age-2, representing 86 percent of adult returns; in comparison with only 10 percent for age-1 juveniles and 4 percent for age 3+ juveniles (Hopelain 1998).

Similar limiting factors listed for summer steelhead also affect winter steelhead populations, including degraded habitats, decreased habitat access, fish passage, predation, and competition (for more species information see USFWS 1998, NRC 2004, Wallace 2004, and Stillwater Sciences 2009a).

Coastal Cutthroat Trout

Klamath River coastal cutthroat trout belong to the Southern Oregon/California Coasts ESU. Coastal cutthroat trout within the Area of Analysis for aquatic resources is listed as a CDFW Species of Special Concern and a USDA Forest Service Sensitive Species. In a 1999 status review, NMFS determined that the Southern Oregon/California Coasts ESU did not warrant ESA listing (Johnson et al. 1999). Coastal cutthroat trout are distributed primarily within smaller tributaries to the 22 miles of the Klamath River mainstem upstream of the estuary (NRC 2004), but also within tributaries to the Trinity River (Moyle et al. 1995).

Coastal cutthroat trout have not been extensively studied in the Klamath Basin, but it has been noted that their life history is similar to fall- and winter-run steelhead in the Klamath River (NRC 2004). Both resident and anadromous life histories are observed in coastal cutthroat trout in the Klamath Basin. Anadromous adults enter the river to spawn in the fall. Moyle (2002) noted that upstream migration in northern California spawning streams tends to occur from August to October after the first substantial rain. Generally, spawning of anadromous and resident coastal cutthroat trout may occur from September to April (Moyle 2002). “Sea-run” adults spend some time in the ocean without fully adopting a fixed anadromous life history may either return to rivers in summer to feed or return in September or October to spawn and/or possibly overwinter (NRC 2004). Cutthroat with a resident life history remain in freshwater for their entire lives and may use mainstem and/or tributary habitats.

Juvenile coastal cutthroat trout may spend anywhere from one to three years in freshwater to rear. Anadromous or sea-run juveniles outmigrate during April through June, at the same time as Chinook salmon juvenile downstream

migration (Moyle 2002, NRC 2004). These juveniles also appear to spend at least some time rearing in the estuary. Wallace (2004) found that estuary residence time ranged from 5 to 89 days, with a mean of 27 days, based on a mark-recapture study.

Pacific Lamprey

Pacific lamprey are the only anadromous lamprey species in the Klamath Basin. Pacific lamprey, along with three other lamprey species found in California, Oregon, Washington and Idaho, were petitioned for ESA listing in 2003 (Nawa 2003). Although the USFWS halted species status review in December 2004 due to inadequate information (USFWS 2004), efforts to resume the review Pacific lamprey are anticipated as more information is obtained. Although no historical abundance data are available, recent estimates are that there are annual runs of over 4,000 Pacific lamprey in the Klamath Basin (Goodman and Reid 2012, Table 3.3-2).

Pacific lamprey are found in Pacific Ocean coast streams from Alaska to Baja California. They occur throughout the mainstem Klamath River downstream from Iron Gate Dam and its major tributaries including: Trinity, Salmon, Shasta, and Scott River basins (Stillwater Sciences 2009a). Although the evidence is inconclusive as to whether Pacific lamprey were historically present upstream of Iron Gate Dam, the record of evidence shows that access to habitat would benefit Pacific lamprey by providing additional spawning and rearing grounds (NMFS 2006a). Pacific lamprey are capable of migrating long distances and show similar distributions to anadromous salmon and steelhead (Hamilton et al. 2005).

Pacific lamprey are anadromous nest builders that die shortly after spawning. They enter the Klamath River on their own volition during all months of the year, with peak upstream migration occurring from December through June (Stillwater Sciences 2009a) (Table 3.3-8, life history timing detailed in Appendix E.3.1.5). As adults, Pacific lamprey do not feed in freshwater. Spawning occurs at the upstream edge of riffles in sandy gravel from mid-March through mid-June (Stillwater Sciences 2009a). After lamprey eggs hatch, the larvae (ammocoetes) drift downstream to backwater areas and burrow into the substrate, feeding on algae and detritus (FERC 2007). Based on observations and available habitat, most ammocoete rearing likely occurs in the Salmon, Scott, and Trinity rivers, as well as throughout the mainstem Klamath River from Iron Gate downstream to the estuary (FERC 2007). The Klamath River upstream of the Shasta River appears to have less available spawning and rearing habitat, and Pacific lamprey are not regularly observed there (FERC 2007). Ammocoetes remain in freshwater for five to seven years (with slower growing individuals leaving at older ages) before emerging from the substrate and beginning their “transformer” life stage. During the transformer life stage, metamorphosis begins, and Pacific lamprey begin to develop eyes and sharp teeth (Clemens 2019). Once metamorphosis is complete, juveniles migrate downstream to the ocean where

they will spend one to three years in the marine environment (with no documented cause of variability in marine residency), where they parasitize a wide variety of ocean fishes, including Pacific salmon, flatfish, rockfish, and pollock (Close et al. 2010). For more species information see Close et al. (2010), Stillwater Sciences (2009a), and PacifiCorp (2004a).

Table 3.3-8. Life-history Timing of Pacific Lamprey in the Klamath River Basin Downstream of Iron Gate Dam. Peak Activity is Indicated in Black.

Life Stage	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec	
Incubation																								
Rearing																								
Juvenile outmigration																								
Adult migration																								
Spawning																								

Major factors believed to be affecting their populations include barriers to upstream migration at dams, dewatering of larval habitat through flow regulation, stranding due to rapid downramping, reduced larval habitat by increasing water velocity and/or reducing sediment deposition areas when sediment is trapped at dams, and mortality due to exposure to contaminants in the larval stage (Close et al. 2002, as cited in Hamilton et al. 2011).

Green Sturgeon

Green sturgeon are an anadromous species that occurs in coastal marine waters from Mexico to the Bering Sea. NMFS has identified two DPSs: (1) the Northern Green Sturgeon DPS, which is not listed as threatened or endangered but is on NMFS' Species of Concern list and which includes populations spawning in coastal watersheds from the Eel River north, and (2) the Southern Green Sturgeon DPS, listed as threatened under the federal ESA and encompassing coastal or Central Valley populations spawning in watersheds south of the Eel River (NMFS 2006b). Although the Southern Green Sturgeon DPS is considered a separate population from the Northern Green Sturgeon DPS based on genetic data and spawning locations, their ranges outside of the spawning season tend to overlap (CDFG 2002b, Israel et al. 2004, Moser and Lindley 2007). The Klamath Basin may support most of the spawning population of Northern Green Sturgeon DPS (Adams et al. 2002). Although Southern Green Sturgeon DPS may enter other west coast estuaries to feed in the summer and fall, there has been no documentation of them entering the Klamath River or its estuary (USBR 2010). No Northern Green Sturgeon DPS tagged by the Yurok Tribe within the Klamath River have ever been detected in the range of Southern Green Sturgeon DPS (primarily San Francisco Bay) despite the presence of numerous receivers that would have detected tagged Klamath River fish if they had ventured there (McCovey 2011a). No Southern Green Sturgeon DPS tagged in the Sacramento/San Joaquin and/or San Francisco Bay region have ever been detected in the Klamath River. Southern Green Sturgeon DPS have been detected immediately offshore of the Klamath River, but have not been detected in the Klamath River Estuary or mainstem despite the presence of functioning acoustic receivers in the Klamath River Estuary (McCovey 2011a). Based on the available evidence it appears unlikely that sturgeon from the Southern Green Sturgeon DPS currently occur within the Klamath River or nearshore environment. Therefore, the rest of this section pertains only to the Northern Green Sturgeon DPS.

Northern Green Sturgeon DPS in the Klamath River sampled during their spawning migration ranged in age from 16 to 40 years (Van Eenennaam et al. 2006). It is believed that in general green sturgeon have a life span of at least 50 years, and spawn every four years on average after around age-16, for approximately eight spawning efforts in a lifetime (Klimley et al 2007). Green sturgeon enter the Klamath River to spawn from March through July (Table 3.3-9). Green sturgeon spawn primarily in the lower 67 miles of the mainstem Klamath River (downstream from Ishi Pishi Falls, directly upstream of the

confluence with the Salmon River), in the Trinity River, and occasionally in the lower Salmon River (KRBFTF 1991, Adams et al. 2002, Benson et al. 2007). Most green sturgeon spawning occurs from the middle of April to the middle of June (NRC 2004). After spawning, approximately 25 percent of green sturgeon migrate directly back to the ocean (Benson et al. 2007), and the remainder hold in mainstem pools in the Klamath River between RM 13 and RM 66.3 through November prior to migrating downstream to the ocean. Table 3.3-9 illustrates the periodicity of green sturgeon in the Klamath River. Additional timing detail is provided in Appendix E.3.1.6.

Table 3.3-9. Life-history Timing of Green Sturgeon in the Klamath River Basin Downstream of Iron Gate Dam. Peak Activity is Indicated in Black.

Life Stage	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec	
Incubation/emergence																								
Rearing																								
Juvenile outmigration																								
Adult migration																								
Spawning																								
Post-spawning adult holding																								

During the onset of fall rainstorms and increased river flow, adult sturgeon move downstream and leave the river system (Benson et al. 2007). Juvenile green sturgeon may rear for one to three years in the Klamath River Basin before they migrate to the estuary and ocean (NRC 2004, FERC 2007, CALFED 2007), usually during summer and fall (Emmett et al. 1991, as cited in CALFED 2007, CH2M Hill 1985, Hardy and Addley 2001).

Adult green sturgeon that have held over the summer in the Klamath River after spawning appear to migrate downstream to the ocean in conjunction with increases in discharge in the fall. Attenuation of high flows downstream from Iron Gate Dam as a result of USBR Klamath Irrigation Project operations may affect a key environmental cue used to stimulate the fall outmigration of adult green sturgeon that have remained in holding pools over the summer (Benson et al. 2007). Historically Klamath River below Iron Gate Dam was relatively responsive to discharge increases related to rainfall events, and the timing of peak flows changed significantly following implementation of USBR Klamath Irrigation Project operations on the Klamath River (Balance Hydrologics, Inc. 1996). When compared to pre- Klamath Irrigation Project operations, existing flows in October are higher and flows in late spring and summer are lower (Balance Hydrologics, Inc. 1996).

Resident Riverine Fish Species

Rainbow and Redband Trout

Rainbow trout exhibit a wide range of life-history strategies, including anadromous forms (steelhead, described above) and resident forms, described here. The Klamath Basin has two subspecies of rainbow trout. Behnke (1992) identifies the inland form as the Upper Klamath redband trout, *Oncorhynchus mykiss newberrii*, but considers steelhead and resident rainbow trout downstream from Upper Klamath Lake to be primarily coastal rainbow trout, *Oncorhynchus mykiss irideus*. Since construction of Copco No. 1 Dam and Iron Gate Dam, resident trout upstream of Iron Gate Dam are considered redband trout, and resident trout downstream from Iron Gate Dam are considered coastal rainbow trout (FERC 2007). Coastal rainbow trout are widely distributed downstream of Iron Gate Dam, including occasionally within the mainstem Klamath River, and predominately within every major tributary and most smaller tributaries with perennial flow as well. Their habitat requirements, sensitivities to disease and water quality are the same as those described above for steelhead. Rainbow trout are distinguished from steelhead by a life history that is limited to freshwater. Juveniles rear in mainstem and tributary habitat from two to three years before reaching sexual maturity (with faster growing individuals maturing sooner), and adults spawn in tributaries.

Behnke (2002) indicates that two distinct groups of redband trout may be in the Upper Klamath Basin: one that is adapted to lakes and another that is adapted to streams. These fish are a popular recreational fishery. The Upper Klamath

Basin supports the largest and most functional adfluvial[66] redband trout population of Oregon's interior basins (Hamilton et al. 2011). In the Hydroelectric Reach, most redband trout spawning is thought to occur in Spencer and Shovel creeks. Redband trout migrate among habitats, mainstem, tributaries, and reservoirs to meet their life-history requirements. Redband trout are considered resistant to *C. shasta* or other diseases potentially brought upstream by anadromous fishes (Hamilton et al. 2011).

Redband trout in the upper Klamath River currently risk potential entrainment at Project facilities. A study addressing the potential for entrainment at Project facilities found that several tens of thousands of resident fish are estimated to be entrained annually at each of the Project facilities (CH2M Hill 2003). The majority of these fish are likely nonnative species; however, redband trout also have the potential to be entrained. Furthermore, records from canal salvage operations at the J.C. Boyle power canal show resident trout are entrained and possibly killed each year in Project canals (DOI 2007).

For more information on rainbow and redband trout, see USFWS (1998); USFWS (2000); Behnke (2002); Moyle (2002); NRC (2004); PacifiCorp (2004a); Starcevich et al. (2006); and Messmer and Smith (2007).

Resident Lampreys

In addition to the anadromous Pacific lamprey, described above, at least three resident species are present in the California portion of the Klamath Basin (PacifiCorp 2006, Hamilton et al. 2011):

- Northern California brook lamprey (*Entosphenus folletti*);
- Western brook lamprey (*Lampetra richardsoni*); and
- Klamath River lamprey (*Lampetra similis*).

No lamprey species are listed as threatened or endangered on either the California or Federal ESA lists (CDFW 2018a). However, all three resident species are listed in California as Species of Special Concern (Moyle et al. 2015). All resident lamprey species have a similar early life history where ammocoetes drift downstream to areas of low velocity with silt or sand substrate and proceed to burrow into the stream bottom and live as filter feeders for two to seven years (USFWS 2004). After they transform into adults, the non-parasitic species (Northern California brook lamprey, western brook lamprey) do not feed, while the parasitic Klamath River lamprey feed on a variety of fish species (FERC 2007).

Klamath River lamprey are found both upstream and downstream from Iron Gate Dam, from Spencer Creek downstream, and are common in the Lower Klamath River and the low-gradient tributaries there (NRC 2004). They are also found in

[66] Life history strategy in which adult fish spawn and juveniles subsequently rear in streams but migrate to lakes for feeding as subadults and adults.

the Trinity River, and in the Link River of the Upper Klamath Basin (Lorion et al. 2000, as cited in Close et al. 2010).

In the Klamath River Basin, Western brook lamprey are known to occur only in Hunter and McGarvey creeks, near the mouth of the Klamath River (Close et al. 2010). Early studies of Western brook lamprey were conducted outside of California (Moyle et al. 2015), and therefore there is no information on the life history, distribution, or abundance of this species in the Klamath River Basin prior to the construction of the Lower Klamath Project. Because they are known to occur only in streams near the mouth of the Klamath River, the effects from the existing dams would be confined to flow alteration in the mainstem, to the extent that Western brook lamprey use the mainstem for dispersal or other life history events.

Northern California brook lamprey (also known as the Modoc brook lamprey) are found upstream of Iron Gate Dam (Close et al. 2010). They have been reported from a tributary to the Lost River in the Clear Lake Basin and are potentially also found in Fall Creek (Close et al. 2010). Moyle et al. (2015) report that Northern California brook lamprey are known to occur in Willow and Boles creeks above Clear Lake Reservoir. Northern California brook lamprey was not described as a separate species until 1976 (based on museum specimens) and was not recognized as a species by the American Fisheries Society until 2013 (Moyle et al. 2015). Therefore, there is no information on the life history, distribution, or abundance of this species prior to the construction of the Lower Klamath Project. Moyle et al. (2015) states that the only known populations are above large reservoirs, which suggests that they are isolated from other populations. Moyle et al. (2015) reports that dams and diversions on the upper Klamath River and Lost River alter downstream flows and habitats, potentially negatively affecting the downstream populations.

<u>Cyprinids</u>

The native blue chub (*Gila coerulea)* and tui chub (*Gila bicolor*) are both found in the Klamath Basin, including Lost River, Lower Klamath Lake, Tule Lake, and Iron Gate and Copco No. 1 reservoirs (CH2M Hill 2003). These species prefer habitat with quiet water, well-developed beds of aquatic plants, and fine sediment or sand bottoms. Although blue and tui chubs can withstand a variety of conditions including cold, clear lake water, and can also tolerate low dissolved oxygen levels, they are most often found in habitats with summer water temperatures higher than 68°F. These fish are omnivores, they feed on sediment detritus, and can play an important role in nutrient cycling through the excretion of nutrients into the water column in forms available to primary producers (e.g., phytoplankton). Both species of chub found in the Klamath Basin spawn from April through July, in shallow rocky areas in temperatures of 59 to 64.4°F (Moyle 2002). Presumably dams and diversions have benefitted both of these species by increasing the availability of its preferred warmer, low-velocity habitat.

Sculpin

Several sculpin species are found in coastal streams and rivers from Alaska to southern California. Several species of sculpin are known to occur in the California portion of Klamath River and its estuary, including Pacific staghorn (*Leptocottus armatus*), prickly (*Cottus asper*), slender (*Cottus tenuis*), sharpnose (*Clinocottus acuticeps*), coastrange (*Cottus aleuticus*), and marbled (*Cottus klamathensis*). Of these, only the marbled and slender sculpins are known to occur upstream of Iron Gate Dam (Carter and Kirk 2008). Mainstem Klamath River habitat may be important to sculpin populations as it can provide an important migration corridor from the estuary to upstream riverine reaches (White and Harvey 1999). Pacific staghorn sculpin are found predominantly in brackish waters of the estuary. Coastal populations of prickly and coastrange sculpin are generally assumed to be dependent on the estuary for part of their early life history (White and Harvey 1999). The marbled sculpin is a relatively wide-ranging species found in a variety of habitats in northern California and southern Oregon (Daniels and Moyle 1984). Marbled sculpin are found mainly in low gradient, spring-fed streams and rivers where the water temperature is less than 68°F in the summer and in habitat with fine substrate that can support beds of aquatic plants. They are typically found in 60 to 70 centimeters of water and in velocities around 23 centimeters per second (approximately 0.36 gallons per minute) (Moyle 2002). Slender sculpin were likely historically common in the Williamson, Sprague, Sycan, and Lost rivers and in Upper Klamath Lake (Bentivoglio 1998, cited in NRC 2004). Bentivoglio (1998) collected sculpins throughout the upper basin in 1995–1996 and found slender sculpins only in the lower Williamson River and a few in Upper Klamath Lake. Little is known about the species' biological requirements (NRC 2004). Sharpnose sculpin are primarily found in marine and brackish conditions, although they can tolerate freshwater (Love 2011). As such, they are likely restricted to the Klamath River Estuary and possibly the lower mainstem Klamath River.

Lost River and Shortnose Suckers

The Lost River sucker (*Deltistes luxatus*) and shortnose sucker (*Chasmistes brevirostris*) are endemic to the Upper Klamath Basin of southern Oregon and northern California (Moyle 2002). These species share similar distribution and habitat requirements, and thus are typically managed together. The Lost River sucker and the shortnose sucker are listed as endangered under the ESA (USFWS 1988) and are endangered under CESA. A Revised Recovery Plan for the Lost River sucker and Shortnose sucker (revised recovery plan) was published in 2013 (USFWS 2012b). The final designation of critical habitat for both species was published by the USFWS on December 11, 2012 (USFWS 2012a). Both species are also fully protected species under California Fish and Game Code Section 5515(a)(3)(b)(4) and (6), respectively. Assembly Bill Number 2640 (Wood 2018) added Section 2081.11 to the Fish and Game Code to allow the take of both sucker species resulting from impacts attributable to the decommissioning and removal of the Lower Klamath Project facilities, so long as

the take will not result in jeopardy for the species, is minimized, and mitigation incorporates information from sampling efforts.

The 2013 revised recovery plan (USFWS 2012b) identifies a recovery unit for both of these species within the California portion of the Area of Analysis: the reservoirs along the Klamath River downstream of Keno Dam (including Iron Gate and Copco reservoirs), known as the Klamath River Management Unit. Populations in the Klamath River Management Unit are comprised mostly of adults (USFWS 2012b). The USFWS (2012b) recovery plan considers these populations as "sink populations", as they are not likely self-sustaining because of low recruitment due to the lack of access to spawning habitats, citing Moyle (2002), and NRC (2004). Extensive sampling was conducted by Oregon State University (Desjardins and Markle 2000) in J.C. Boyle, Copco No. 1 and Iron Gate reservoirs during 1998 and 1999 using multiple gear types (trammel nets, beach seines, cast nets, trap nets, backpack electrofishing, and otter trawls). Sampling gears, seasons and locations were selected to maximize the collection of suckers and different sucker life stages, and thus the results may not be representative of the larger fish community. Adult suckers were sampled for in 1997, 1998 and 1999 (with trammel nets), while larval and juvenile suckers were only sampled in 1998 and 1999. Over three years of study, a total of 50 shortnose sucker adults were collected in J.C. Boyle Reservoir, 165 in Copco No. 1 Reservoir and 22 in Iron Gate Reservoir. Lost River suckers were present in J.C. Boyle Reservoir and Copco No. 1 Reservoir, but at much lower numbers, with just one collected in Copco No.1 Reservoir and two in J.C. Boyle Reservoir. Larval suckers (species unknown) were more abundant with 275 collected over two years in J.C. Boyle Reservoir, 8,729 in Copco No. 1 Reservoir, and 1,177 in Iron Gate Reservoir. A total of 23 juveniles were collected in J.C. Boyle Reservoir and 3 in Copco No.1 Reservoir. In all, shortnose sucker represented 1 percent (1998) and 2 percent (1999) of the trammel net catch in J.C. Boyle Reservoir, 12 percent (1998) and 14 percent (1999) in Copco No.1 Reservoir and 0.3 percent (1998) and 2 percent (1999) in Iron Gate Reservoir. Juveniles were only a significant portion of the seine net catch in J.C Boyle Reservoir, representing 17 percent of the catch in 1998 and 9 percent in 1999. In larval trawls, sucker larvae represented only 0.2 to 5 percent of the catch in all reservoirs in 1998, but those percentages increase to 27 percent (J.C. Boyle Reservoir), 44 percent (Copco No.1 Reservoir) and 30 percent (Iron Gate Reservoir) in 1999.

To minimize and mitigate for adverse effects to both sucker species, PacifiCorp prepared an HCP for its interim operations of the Klamath Hydroelectric Project (i.e., prior to dam removal) (PacifiCorp 2013). This HCP includes the conservation strategy and measures that PacifiCorp would undertake to address anticipated effects on suckers and their habitat in the Klamath Basin. The conservation measures outlined follow a two-pronged approach: (1) manage the shutdown of East- and West-side powerhouses (which are part of the Klamath Hydroelectric Project in Oregon, see Figure 3.3-1) in such a way as to minimize

effects on listed suckers, resulting in additional benefits by reducing possible entrainment, ramping events, and false attraction to powerhouse tailraces; and (2) improve habitat conditions for listed suckers by facilitating/funding specific enhancement projects, a sucker conservation fund, and the Nature Conservancy's (TNC) Williamson River Delta Restoration Project.

In the 2013 BiOp (NMFS and USFWS 2013), USFWS consulted on both sucker species. USFWS concluded that the proposed USBR Klamath Irrigation Project operations affects both Lost River and shortnose suckers. In the Klamath River Management Unit, USFWS concluded that effects of the proposed operations on both species are likely small in comparison to other effects because there are fewer suckers present in the reservoirs, so effects are primarily limited to changes in water quality (USFWS 2007).

Existing threats to the sucker populations include: the damming of rivers, instream flow diversions, hybridization (e.g., between shortnose sucker and Klamath largescale suckers [*Catostomus snyderi*]), competition and predation by exotic species, dredging and draining of marshes, water quality problems associated with timber harvest, the removal of riparian vegetation, livestock grazing, agricultural practices, and low lake elevations, particularly in drought years (USFWS 1993). Reduction and degradation of lake and stream habitats in the Upper Klamath Basin is considered by USFWS to be the most important factor in the decline of both species (USFWS 1993).

Miller and Smith (1981) claimed that sucker hybridization was most pronounced in the Lower Klamath Project reservoirs, and Markle et al. (2005) reported hybridization between small scale sucker and both Lost River and shortnose suckers in the Hydroelectric Reach. Hybridization prompted Buettner et al. (2006) and others to caution against supporting migration of individuals from Iron Gate and Copco reservoirs into the Upper Klamath Lake population.

The Lost River sucker historically occurred in Upper Klamath Lake (Williams et al. 1985) and its tributaries and the Lost River watershed, Tule Lake, Lower Klamath Lake, and Sheepy Lake (Moyle 1976). Shortnose suckers historically occurred throughout Upper Klamath Lake and its tributaries (Williams et al. 1985, Miller and Smith 1981). The present distribution of both species includes Upper Klamath Lake and its tributaries (Buettner and Scoppettone 1990), Clear Lake Reservoir and its tributaries (USFWS 1993), Tule Lake and Lost River up to Anderson-Rose Dam (USFWS 1993), and the Klamath River downstream of Iron Gate Reservoir (USFWS 1993). Shortnose suckers occur in Gerber Reservoir and its tributaries, but Lost River suckers do not.

Lost River and shortnose suckers are lake-dwelling, but spawn in tributary streams or springs (USFWS 1988). They spawn from February through May, depending on water depth and stream temperature (Buettner and Scoppettone 1990, Andreasen 1975, USFWS 2008). Spawning locations appear to be both

substrate and flow dependent (although specific preferred flow velocities are unknown), with an apparent preference for gravel substrates (where eggs incubate in the interstices). When spawning occurs over cobble and armored substrate, eggs fall between crevices or are swept downstream and lost (Buettner and Scoppettone 1990). Larval Lost River and shortnose suckers spend relatively little time in tributary streams, migrating to lake habitat shortly after emergence, typically in May and early June (Buettner and Scoppettone 1990). Adults return to Upper Klamath Lake soon after spawning. Lake fringe emergent vegetation is the primary habitat used by larval suckers (Cooperman and Markle 2004). Juvenile suckers use a wide variety of habitat including near-shore areas with or without emergent vegetation and off-shore habitat (Hamilton et al. 2011).

Smallscale Sucker

The Klamath smallscale sucker (*Catostomus rimiculus*) is common and widely distributed in the Klamath River and its tributaries downstream from the city of Klamath Falls, Oregon, and in the Rogue River (Moyle 2002). They tend to inhabit deep, quiet pools in mainstem rivers and slower-moving reaches in tributaries; however, they can be found in faster-flowing habitats when feeding or breeding (Moyle 2002). McGinnis (1984) reported that this species spawns in small tributaries to the Klamath and Trinity rivers. Spawning in tributaries to Copco Reservoir has been observed from mid-March to late April (Moyle 2002). Juveniles are most commonly found in the streams that are used for spawning. The larger adults observed approach lengths of 20 inches and fish measuring 18 inches have been aged through scale analysis as being approximately 15 years old (Scoppetone 1988, as cited in Moyle (2002). Moyle (2002) speculated that dams and diversions have benefitted this species by increasing the availability of its preferred warmer, low-velocity habitat.

Electrofishing conducted by PacifiCorp and ODFW in the J.C. Boyle Peaking Reach revealed the existence of a population of smallscale suckers in moderate velocity habitat, and they were the most prevalent species in the majority of the collected samples (W. Tinniswood, pers. comm., June 2011). J.C. Boyle Dam blocks the migration of smallscale suckers to potential spawning habitat in Spencer Creek. Currently, spawning occurs in the mainstem of the Klamath River where smallscale suckers are subject to flow fluctuations that can strand and dry the eggs during power peaking[67] operations (Dunsmoor 2006). Electrofishing in Jenny Creek revealed adult smallscale suckers occupying deep, moderate-velocity habitat among boulders (W. Tinniswood, pers. comm., June 2011).

[67] Power peaking is rapid changes in flow associated with hydropower generation.

Non-native Fish Species

Introduced non-native fish species threaten the diversity and abundance of native fish species through competition for resources, predation, interbreeding with native populations, and causing potential physical changes to the invaded habitat (Moyle 2002). Non-native fish species occurring within the Area of Analysis are described below, including descriptions of interactions with native fish species.

Yellow Perch

Yellow perch (*Perca flavescens*) prefer weedy rivers and shallow lakes. They are found in reservoirs and ponds along the Klamath River, and are a popular recreational fishery. Optimal temperature for growth is between 71.6 and 80.6°F but yellow perch can survive in temperatures up to 86 to 89.6°F. They can also survive low levels of dissolved oxygen (less than one milligram per liter [mg/L]) but are most abundant in areas with low turbidity, as they are visual feeders. Larval and juvenile yellow perch feed on zooplankton; adults are opportunistic predators that may feed on larger invertebrates and small fish, including younger yellow perch, white bass, and smelt (Knight et al. 1984); and may also prey on larval suckers (USFWS 1993). The preferred habitat of the yellow perch includes large beds of aquatic plants for spawning and foraging; habitat that is common in Lower Klamath Project reservoirs. Their spawning takes place in 44.6 to 66.2°F water in April and May and usually occurs in their second year (Moyle 2002).

Bass and Sunfish

Several species of bass (*Micropterus* spp.) and sunfish (*Lepomis* spp.) have been introduced into the Klamath Basin, including largemouth bass, white and black crappie, bluegill, pumpkinseed, and green sunfish. All are a popular recreational fishery, especially the bass species. Largemouth bass and sunfish prefer lakes, ponds, or low-velocity habitat in rivers, and are mostly found in Lower Klamath Project reservoirs upstream of Iron Gate Dam. They prefer habitats with aquatic vegetation and will spawn in a variety of substrates. They prefer water temperatures above 80.6ºF. Juvenile and adult largemouth bass tend to feed on larger invertebrates and fish (Moyle 2002), potentially including suckers (USFWS 1993). Smaller members of the family, such as sunfish, are opportunistic feeders and eat a variety of aquatic insects, fish eggs, and planktonic crustaceans (Moyle 2002).

Catfish

Several species of catfish have been introduced into the Klamath Basin, including channel catfish (*Ictalurus punctatus*), black bullhead (*Ameiurus melas*), brown bullhead (*Ameiurus nebulosus*), and yellow bullhead (*Ameiurus natalis*) (NRC 2004). Catfish prefer slow moving, warm water habitat. Brown bullhead (*Ameiurus nebulosus*) can tolerate a wide range of salinities and live at temperatures of 32 to 98.6°F, but their optimum temperature range is 68 to 91.4°F. Brown bullhead are most active at night and form feeding aggregations. Catfish are opportunistic omnivores and scavenge off the bottom of their habitat (Moyle 2002).

Trout

Brook trout (*Salvelinus fontinalis)* is an introduced species in the Upper Klamath Basin within the California portion of the Area of Analysis (FERC 2007) found in clear, cold lake and stream habitats. They prefer temperatures between 57.2 and 66.2°F but can survive in temperatures ranging from 33.8 to 78.8°F. Brook trout feed predominantly on terrestrial insects and aquatic insect larvae, though they may also opportunistically feed on other types of prey such as crustaceans, mollusks, and other small fish. Brook trout spawn in the fall and prefer habitats with small-sized gravel and nearby cover (Moyle 2002).

Brown trout (*Salmo trutta*) have also been introduced to the Klamath River and are found in both the Upper and Lower Klamath Basin. Brown trout prefer clear, cold water and can utilize both lake and stream habitats. Like brook trout, they spawn in the fall in streams with areas of clean gravel. Brown trout become piscivorous (fish eaters) once they reach a size where their gape can accommodate small fish available as prey.

American Shad

American shad are an introduced, anadromous fish species found in the Klamath River downstream of Ishi Pishi Falls, and are a popular sport fish. They feed primarily on plankton, mostly mysids and copepods, and occasionally on small fishes such as smelt. Adult American shad spend three to six years in the ocean before returning to spawn in the Klamath River (Pearcy and Fisher 2011). The preferred spawning habitat of the American shad includes sandy or pebbly substrate, water temperatures between 59 and 64.4°F, and where water velocities are less than 0.7 m/s (approximately 2.3 feet per second) (Moyle 2002).

Estuarine Species

The estuary is the mixing zone for freshwater and saltwater from the ocean. The balance of freshwater to saltwater changes over the course of the day with tides and is also strongly influenced by river flows. Due to this, both marine and freshwater species can often be found in different portions of the estuary at various times. All anadromous fish pass through the estuary during their migrations from freshwater to the ocean and back again, and salmonid smolts may rear in the estuary for varying periods of time, prior to moving into the ocean. Surveys in the freshwater portion of the estuary commonly find Klamath speckled dace (*Rhinichthys osculus klamathensis*), Klamath smallscale sucker (*Catostomus rimiculus*), prickly sculpin, and Pacific staghorn sculpin. Other fairly common species include northern anchovy (*Engraulis mordax*), saddleback gunnel (*Pholis ornate*), and bay pipefish (*Syngnathus leptorhyncus*). Other species in the estuary include federally-listed eulachon, state-listed longfin smelt (*Spirinchus thaleichthys*) (described below), non-native Mississippi silversides (*Menidia beryllina*), surf smelt (*Hypomesus pretiosus*), three-spined stickleback (*Gasterosteus aculeatus*), and several species of gobies. Impacts to the

estuarine species were assessed based on effects on specific sensitive species such as eulachon and EFH for groundfish and pelagic fish, as described in the Essential Fish Habitat subsection of Section 3.3.2.3 *Habitat Attributes Expected to be Affected by the Proposed Project*.

Eulachon

Eulachon is an anadromous fish that occurs in the lower portions of certain rivers draining into the northeastern Pacific Ocean, ranging from northern California to the southeastern Bering Sea in Bristol Bay, Alaska (McAllister 1963, Scott and Crossman 1973, Willson et al. 2006, as cited in NMFS 2010b). The Yurok Tribe consider eulachon a "Tribal Trust Species," and the fish has major cultural significance (Larson and Belchik 1998). The southern population of Pacific eulachon consists of populations spawning in rivers south of the Nass River in British Columbia, Canada, to and including the Mad River in California (NMFS 2009a). On March 18, 2010, NMFS listed the southern DPS of eulachon as threatened under the ESA (NMFS 2010b). Final critical habitat was designated in October of 2011 and includes the Klamath River Estuary (NMFS 2011). NMFS has issued a draft recovery plan (NMFS 2016b) and has formed a Eulachon Recovery Team to support recovery planning.

Historically, the Klamath River was described as the southern limit of the range of eulachon (Gustafson et al. 2010). Other accounts have described large spawning aggregations of eulachon occurring regularly in the Klamath River (Fry 1979, Moyle et al. 1995, Larson and Belchik 1998, Moyle 2002, Hamilton et al. 2005), and occasionally in the Mad River (Moyle et al. 1995, Moyle 2002) and Redwood Creek in Humboldt County (Moyle et al. 1995). In addition, small numbers of eulachon have been reported from the Smith River (Moyle 2002). The only reported commercial catch of eulachon in northern California occurred in 1963 when a combined total of 25 metric tons (56,000 lbs) was caught from the Klamath River, the Mad River, and Redwood Creek (Odemar 1964). Since 1963, the run size has declined to the point that only a few individual fish have been caught in recent years. Moyle (2002) indicates that eulachon have been scarce in the Klamath River since the 1970s, with the exception of three years: they were plentiful in 1988, 1989, and 1998. After 1998, eulachon were thought to be extinct in the Klamath Basin until a small run was observed in the estuary in 2004. According to accounts of Yurok Tribal elders, the last noticeable runs of eulachon were observed in the Klamath River in 1988 and 1989 by Tribal fishermen (Larson and Belchik 1998).

Larson and Belchik (1998) reported that eulachon have not been of commercial importance in the Klamath since the 1980's. However, in January 2007, six eulachon were reportedly caught by tribal fishermen on the Klamath River. Another seven were captured between January and April of 2011 at the mouth of the Klamath River (McCovey 2011b). More recently, 40 adult eulachon were captured in spring 2012 (McCovey 2012), and 112 in spring 2012 (McCovey and

Walker 2013) by Yurok Indian tribal biologists in presence/absence surveys, using seines and dip nets in the Klamath River.

According to the 2016 status review update of southern DPS eulachon (Gustafson et al. 2016), adult spawning abundance of the southern DPS of eulachon has increased since the listing occurred in 2010. A number of data sources indicate that eulachon abundance in some subpopulations within the southern DPS was substantially higher in 2011 through 2015 compared to indications of very low abundance in 2005 through 2010. The improvement in estimated abundance in the Columbia, Naselle, Chehalis, Elwha, and Klamath rivers, relative to the time of listing, reflects both changes in biological status and improved monitoring (Gustafson et al. 2016).

Historically, eulachon runs in northern California were said to start as early as December and January and peak in abundance during March and April. Large numbers of eulachon migrated upstream in March and April to spawn, but they rarely moved more than eight miles inland (NRC 2004). Eulachon spawn at an age of three to five years, and usually die after spawning (Larson and Belchik 1998). Spawning occurs in gravel riffles, with hatching about a month later. The larvae generally move downstream to the estuary following hatching (Larson and Belchik 1998).

Longfin Smelt

Longfin smelt are a state-listed threatened species and a CDFW Species of Special Concern throughout their range in California. The USFWS denied the petition for federal listing because the population in California (and specifically San Francisco Bay) was not believed to be sufficiently genetically isolated from other populations (USFWS 2009). This species generally has a two-year lifespan, although three-year-old fish have been observed (Moyle 2002). They typically live in bays and estuaries and have sometimes been observed in the nearshore ocean from San Francisco Bay to Prince William Sound, Alaska, including the Klamath River. Longfin smelt prefer salinities of 15 to 30 parts per thousand (ppt), although they can tolerate salinities from freshwater to full seawater. They prefer temperatures of 60.8 to 64.4°F and generally avoid temperatures higher than 68°F. Longfin smelt may occur in the Klamath River throughout the year. They would only be expected to use the estuary, the lowest reaches of the river, and infrequently in the Pacific Ocean nearshore. Longfin smelt spawning occurs primarily from January to March, but may extend from November into June, in fresh or slightly brackish water over sandy or gravel substrates. Temperatures during spawning in the San Francisco estuary are 44.6 to 58.1°F. Embryos hatch in approximately 40 days in 44.6°F water temperature (approximately 25 days in 51°F water) and are quickly swept downstream by the current to more brackish areas. The importance of ocean rearing is unknown. Longfin smelt were common in the Klamath River Estuary during 1978–1989, but the population has significantly declined since. In 1992,

two were found in the Klamath River Estuary, and in 2001 only one adult longfin smelt was collected (CDFG 2009).

Freshwater Mollusks

While life history traits of individual species of freshwater mussels have not been fully studied, the general life cycle is as follows. Eggs within female freshwater mussels are fertilized by sperm that is brought into the body cavity. From April through July thousands of tiny larvae, called glochidia, are released into the water where they must encounter a host fish for attachment within hours, otherwise they perish (Haley et al. 2007). Most juvenile freshwater mussels from these species drop off the fish hosts to settle from June to early August. The juvenile freshwater mussels spend an undetermined amount of time buried in the sediment where they grow to the point where they can maintain themselves at or below the substrate surface in conditions that are optimal for filter feeding (Nedeau et al. 2009). Freshwater mussels are fed upon by muskrats, river otters, and sturgeon (Nedeau et al. 2009). They are also a food of cultural significance for the Karuk Tribe (Westover 2010) and The Klamath Tribes. Adult freshwater mussels are generally found wedged into gravel rock substrate or partially buried in finer substrates, using a muscular foot to maintain position. Freshwater mussels filter feed on plankton and other organic material suspended in the water column.

Four species of native freshwater mussels have been observed within the Klamath Basin (FERC 2007, Westover 2010). PacifiCorp surveys conducted in 2002 and 2003 found Oregon floater (*Anodonta oregonensis*), California floater (*Anodonta californiensis*) and western ridged mussel (*Gonidia angulata*) along Klamath River reaches from the Keno Impoundment/Lake Ewauna to the confluence of the Klamath and Shasta rivers. Westover (2010) also found western pearlshell mussel (*Margaritifera falcata*) in addition to these species along the Klamath River from Iron Gate Dam to the confluence of the Klamath and Trinity rivers. Byron and Tupen (2017) surveys also conducted during in 2002 and 2003 upstream of Iron Gate Dam documented Oregon floater and western ridged mussel in the Keno Reach, Oregon floater in the J.C. Boyle Peaking Reach, and both species in the mainstem Klamath River between Copco No. 2 Reservoir and J.C. Boyle Dam.

Downstream of Iron Gate Dam, Davis et al. (2013) found that *Anodonta sp.* occurred only in the farthest upstream survey sites; western ridged mussel was present in most reaches and often at high densities, and western pearlshell mussel was present in high numbers downstream of the confluence with the Salmon River. All surveyed mussel populations declined in abundance with increasing distance downstream of Iron Gate Dam, due to more mobile substrate. The Shasta River was the only tributary to the Klamath River with Oregon floater, California floater, and western ridged mussel all detected. Western ridged mussel and western pearlshell mussel were more common in

reaches farther downstream in the Klamath River from Iron Gate Dam, probably due to thicker shells which allow them to withstand scouring in high flow events.

A full understanding of western ridged mussels former and current distribution is difficult to assemble due to the lack of data, but it is believed to have been extirpated in central and southern California and has probably declined in many other watersheds, including the Columbia and Snake River basins (Jepsen et al. 2010). The Klamath River appears unusual in that western ridged mussels dominates its mussel community, unlike other rivers in the Pacific Northwest (Westover 2010).

Western pearlshell mussels have also been observed within the Klamath Basin downstream from Iron Gate Dam, though in lesser abundance than other mussel species (Westover 2010). Western pearlshell mussels occupies habitats with low water velocity (e.g., pools and near banks) and pockets within bedrock and cobble (Howard and Cuffey 2003).

Anodonta spp. (commonly referred to as "floaters") are more tolerant of lake conditions than other native mussel species (Nedeau et al. 2005) and have been observed in Lower Klamath Project reservoirs. Floaters are also more tolerant of siltier substrates, as their thin shells allow individuals to "float," or rest on top of silt-dominated streambeds. Byron and Tupen (2017) found that low-energy areas where finer sediments accumulate and where hydrology is consistent were most suitable for *Anodonta spp.*

Western ridged mussels are the largest and most common type of freshwater mussel found within the Klamath Basin (Nedeau et al. 2005). They are known to prefer cold, clean water, but can tolerate seasonal turbidity, and can be found in aggrading, or depositional areas as it can partially bury itself within bed sediments without affecting filter feeding (Vannote and Minshall 1982, Westover 2010). Byron and Tupen (2017) found that they appeared to prefer faster waters and, consequently, coarser substrates such as medium- and coarse sands. Even areas with boulder and bedrock substrates had pockets of finer materials in which *G. angulata* were aggregated. Commonly, *G. angulata* were found buried to depths of 15 centimeters and often stacked atop one another. In general, *G. angulata* were always buried at least 80 percent, with only the tops of shells visible (Byron and Tupen 2017). Known fish hosts of juvenile *G angulata* include hardhead (*Mylopharodon conocephalus*), Pit sculpin (*Cottus pitensis*), and tule perch (*Hysterocarpus traski*), but a full list of host fish species for western ridged mussels are unknown (Jepsen et al. 2010). However, Mageroy (2016) found that *G. angulata* hosts in Canada included primarily sculpin species (*Cottus* spp.) but that northern pikeminnow (*Ptychocheilus oregonensis*), leopard dace (*Rhinichthys falcatus*), and longnose dace (*Rhinichthys cataractae*) are potential hosts as well. Therefore, it appears that the species has significant range of hosts.

Seven to eight species of fingernail clams and peaclams (Family: Sphaeriidae) were also found in the Hydroelectric Reach and from Iron Gate Dam to Shasta River during re-licensing surveys (FERC 2007). One of the clam species, the montane peaclam (*Pisidium ultramontanum)*, has special status as a federal species of concern and a USDA Forest Service Sensitive Species. The montane peaclam is generally found on sand-gravel substrates in spring-influenced streams and lakes, and occasionally in large spring pools. The historic range included the Klamath and Pit rivers in Oregon and California, as well as some of the larger lakes (Upper Klamath, Tule, Eagle, and possibly, Lower Klamath lakes) (FERC 2007). On USDA Forest Service lands they are currently present or suspected in streams and lakes of Lassen and Shasta-Trinity National Forests. Fingernail clams and peaclams are relatively short-lived (one to three years) compared to freshwater mussels (typically 10 to 15 years although in some cases 100 or more years for some species). These small clams live on the surface or buried in the substrate in lakes, ponds or streams. They bear small numbers of live young several times throughout the spring and summer (Thorp and Covich 2001).

There are also many species of freshwater snails, some of which are endemic to the Klamath Basin and have restricted ranges, often associated with cold-water springs. Several of these have recently been petitioned for listing. Based on their restricted distribution to areas outside of Klamath River reaches that could be affected by the Proposed Project, no further analysis was undertaken for freshwater snails for this EIR.

Benthic Macroinvertebrates

Benthic macroinvertebrates (BMI) are small aquatic animals and the aquatic larval stages of insects. They lack a backbone, are visible with the naked eye and are found in and around water bodies during some period of their lives. BMI include immature, aquatic stages of insects such as midges, mayflies, caddisflies, stoneflies, dragonflies, and damselflies. They also include immature and adult stages of aquatic beetles; crustaceans such as crayfish, amphipods and isopods; clams and snails; aquatic worms; and other major invertebrate groups. Many BMI are the primary consumers in riverine food webs, feeding on primary producers—algae, aquatic plants, phytoplankton, bacteria, as well as leaves and other organic materials from terrestrial plants, and detritus. By converting organic material into biomass available to a wide variety of consumers, these organisms form an important component of the aquatic food web. Some BMI are secondary consumers, feeding on the primary consumers. BMI are the primary food source for most freshwater fish species, and therefore, changes in abundance, distribution, or community structure can affect fish populations. BMI are also used as general indicators of water quality. This is assessed based upon the relative abundance or diversity of each group (taxa) and their tolerance of water quality impairment or habitat degradation. BMI are also particularly sensitive to changes in fine and coarse sediment, which would occur during the Proposed Project. A diminished food supply can limit growth of

salmonids, and this is especially true at higher temperatures because as water warms, a fish's metabolic rate increases and it needs more food to sustain growth (Brett 1971, McCullough 1999). Growth is critical to juvenile salmonids because a larger size fish often has a survival advantage during the overwintering period, smolt outmigration, and ocean residence. If fish are chronically exposed to warm water temperatures and food availability is low, growth rates are reduced and fish experience physiological stress, often resulting in increased mortality from disease, parasites, and predation. However, in a productive system with high densities of BMI or forage fish, a high rate of growth can be sustained at temperatures higher than would be considered optimal under conditions where food is limiting.

Relicensing studies for PacifiCorp's Klamath Hydroelectric Project evaluated BMI populations in the Klamath River from Link River Dam to the Shasta River and within Fall Creek in 2002 and 2003 (FERC 2007). These studies show that BMI are abundant, with typical densities of 4,000 to 8,000 individuals per square meter. BMI densities in the fall of 2002 ranged from approximately 2,200 per square meter in the Copco No. 2 Bypass Reach of the Klamath River to approximately 21,600 per square meter below Keno Dam (FERC 2007). Abundance of BMI in both the J.C. Boyle Peaking Reach of the Hydroelectric Reach and the Middle Klamath River downstream of Iron Gate Dam was as low as approximately 500 per square meter in the spring of 2003. The Lower Klamath Project reservoirs had high abundance of BMI, but low diversity, and were dominated by species tolerant of impaired water quality conditions.

The Yurok Tribe conducted studies in 2005 and 2008 (Burks and Cowan 2007) evaluating the biological community of the Klamath River within the Yurok Indian Reservation (RM 0 to RM 43.3) through BMI surveys. Data collected during these studies were used to calculate an Index of Biological Integrity (IBI)—composite scores generated by assigning values to variables, such as species richness, percent intolerant individuals, percent predator individuals, and others.

The Index of Biological Integrity values generated in 2005 indicated that two of the nine sites on the Klamath River within the Yurok Indian Reservation were in the "impaired" range (i.e., score of 52 or below), and the majority of the other sites were in "fair" condition (i.e., score of 53 to 60) (Burks and Cowan 2007). In 2008, the Index of Biological Integrity values suggested a slight improvement in stream health, with the majority of sites scoring in the "good" range (i.e., score of 61 to 80) (Sinnott and Hanington 2008).

Marine Mammals

Pinnipeds (seals and sea lions), and Southern Resident Killer Whales potentially occur within the Pacific Ocean nearshore environment, off Northern California. Redwood National Park lists harbor seals (*Phoca vitulina richardsi*), California sea lions (*Zalophus californianus*), Steller sea lions (*Eumetopias jubatus*), and Northern elephant seals (*Mirounga angustirostris*) as occurring at least

seasonally in the vicinity of the Klamath River Estuary. Elephant seal diets consist primarily of rays, sharks, pelagic squid, ratfish, and Pacific hake, and are not expected to consume salmonids, but other pinnipeds and Southern Resident Killer Whales may feed on adult salmon from the Area of Analysis. In particular, pinnipeds are a documented predator within the Klamath River Estuary and nearshore environment. During radio telemetry studies, Strange (2007a, 2007b, 2008) found that between 14 and 33 percent of tagged Chinook salmon were consumed by pinnipeds (primarily California sea lions). However, the Chinook salmon tagged in those studies were disoriented and potentially fatigued as a result of being captured, anesthetized, and handled, and were therefore more vulnerable to predation. In these studies, most of the observed predation occurred within minutes to hours of release.

In a study of pinniped predation in the Klamath River Estuary using visual observations in August through mid-November 1998 (Williamson and Hillemeir 2001), approximately 3,077 adult salmon were consumed (including fall-run Chinook salmon, spring-run Chinook salmon, coho salmon, and steelhead). Most predation was on fall-run Chinook salmon (2,559 consumed) and was equivalent to 2.6 percent of the estimated fall-run Chinook salmon run that year. An estimated 438 spring-run Chinook, 63 coho salmon, and 110 steelhead were also consumed. California sea lions were the primary predator, and Pacific harbor seals, and Steller sea lions were also observed feeding upon salmonids. Efforts such as “seal bombs” have been used to reduce pinniped predation on salmonids in the estuary but have not been observed to be effective (Strange 2008).

Southern Resident Killer Whale

The Southern Resident Killer Whale (*Orcinus orca*) DPS is listed as endangered under the ESA (NMFS 2005). This DPS primarily occurs in the inland waters of Washington State and southern Vancouver Island, although individuals from this population have been observed off coastal California in Monterey Bay, near the Farallon Islands, and off Point Reyes (Heimlich-Boran 1988, Felleman et al. 1991, Olson 1998, Osborne 1999, NMFS 2005). Survival and fecundity of Southern Resident Killer Whales are correlated with Chinook salmon abundance (Ward et al. 2009, Ford et al. 2009). Hanson et al. (2010) found that Southern Resident Killer Whale stomach contents included several different ESUs of salmon, including Central Valley fall-run Chinook salmon, but none from the Klamath River Basin. More recent studies have confirmed that salmon from the Klamath River are consumed, although in small numbers (Hanson 2015). During early spring, summer, and early fall months Southern Resident Killer Whale are present in Washington inland waters where their diet consists primarily of Chinook salmon. During late fall, winter, and early spring, Southern Resident Killer Whale move into the outer coast of Washington, Oregon, and California where their ranges and movements are less well known (NMFS 2006c). Limited observations indicate that they will make occasional and short-duration winter visits to the California Coast, where their diet is apparently primarily chum,

Chinook and coho salmon, augmented with smaller numbers of steelhead and sockeye based on limited data (Hanson 2015). No data are available to determine the contribution of salmon from the Klamath River Basin to their overall diet, but it is believed to be small (<1 percent) on an annual basis given the work of Hanson et al. (2010) and Hanson (2015).

3.3.2.2 Physical Habitat Descriptions

Upper Klamath River and Connected Waterbodies

Aquatic habitat in the Upper Klamath Basin includes both lacustrine (lake) and riverine (river) habitats and large thermally stable coldwater springs. The Upper Klamath River upstream of Iron Gate Dam once supported large populations of anadromous salmon and steelhead by providing spawning and rearing habitat (Hamilton et al. 2005, Butler et al. 2010, Hamilton et al. 2016), as discussed in detail in Section 3.3.5.8 *Aquatic Habitat*.

Upper Klamath Lake is the most prominent feature in this part of the basin, although other lakes and reservoirs are also present. Lake Ewauna, another lake on the Klamath River mainstem, is formed by Keno Dam, which regulates water surface elevations in the impoundment to facilitate agricultural diversions. Lake Ewauna connects to Upper Klamath Lake via the Link River.

Upper Klamath Lake and Lake Ewauna are affected by poor water quality conditions. During the summer months, these waterbodies exhibit episodic high pH, broad daily shifts in dissolved oxygen, and elevated ammonia concentrations (Hamilton et al. 2011). In Upper Klamath Lake several incidents of mass adult mortality of shortnose and Lost River sucker have been associated with low dissolved oxygen levels (Perkins et al. 2000, Banish et al. 2009). Instances of pH levels above 10 and extended periods of pH levels greater than nine lasting for several weeks are associated with large algal blooms occurring in the lake (Kann 2010). On a diel (i.e., 24-hour) basis, algal photosynthesis can elevate pH levels during the day, with changes exceeding two pH units over a 24-hour period. During November through April, pH levels in Upper Klamath Lake are near neutral (Aquatic Scientific Resources 2005).

Implementation of the Proposed Project would result in the reintroduction of anadromous fish into Upper Klamath Lake and Lake Ewauna and their tributary streams. Fish passage over Link Dam is provided by a ladder. This ladder is designed to modern standards to allow the passage of shortnose and Lost River suckers and other migratory fish, including resident and anadromous salmonids and Pacific lamprey, if present. Keno Dam is equipped with a 24-pool weir and orifice type fish ladder, which rises 19 feet over a distance of 350 feet, designed to pass trout and other resident fish species (FERC 2007). The fishway at Keno Dam currently complies with passage criteria for salmonid fish. Although Lost River and shortnose suckers (in addition to other sucker species), have been observed to use the Keno Dam fish ladder, the ladder was not designed for sucker passage and is considered generally inadequate for sucker passage

(USBR 2002). Plans are being developed to have the fishway rebuilt to criteria for suckers, lamprey, and for larger anadromous salmonid runs (T. Reaves Gilmore, USBR, pers. comm., October 2018).

The Williamson and Wood rivers are the largest and second largest tributaries to Upper Klamath Lake, respectively. The Sprague River is tributary to the Williamson River, and the Sycan River is tributary to the Sprague River (Hamilton et al. 2011). These tributaries currently provide habitat for redband trout, bull trout, shortnose sucker and Lost River sucker, as well as other species. Historically these tributaries provided substantial habitat for Chinook salmon and steelhead (Hamilton et al. 2005, 2016). Important flow contributions from springs into these tributaries provide cool summer baseflows with water temperatures and dissolved oxygen levels generally adequate to support coldwater fish habitat requirements (Hamilton et al. 2011).

Upper Klamath River − Hydroelectric Reach

The Hydroelectric Reach, from the upstream extent of J.C. Boyle Reservoir to Iron Gate Dam, includes four reservoirs (J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate) and two riverine reaches. Several coldwater tributaries enter the Klamath River and reservoirs in this reach. The reservoirs are productive and nutrient rich and tend to have warm surface waters during the summer months, with mean daily temperatures sometimes reaching 73ºF (FERC 2007). During the late spring/early summer, water quality in Copco No. 1 and Iron Gate reservoirs declines, becoming quite poor due to warm surface waters and annual blooms of the blue-green algae species *Aphanizomenon flow-aquae, Anabaena flos-aquae,* and *Microcystis aeruginosa* (see also Section 3.4 *Phytoplankton and Periphyton*). *Microcystis aeruginosa,* and to an unknown extent *Anabaena flos-aquae,* produce toxins that can be harmful to fish and other animals and humans. Routine sampling from areas frequented by recreational users of the reservoirs has documented cell counts up to 4,000 times greater than what the World Health Organization considers a moderate health risk (see Section 3.4 *Phytoplankton and Periphyton*). This has resulted in Copco No. 1 and Iron Gate reservoirs being posted with health advisory warnings against human and animal contact with the water by local health officials every summer since 2005.

The 21-mile long riverine reach between J.C. Boyle and Copco No. 1 reservoirs is divided into two reaches: the 4.6-mile long J.C. Boyle Bypass Reach, which receives bypass flows from J.C. Boyle Dam, and the 17-mile long Peaking Reach, which receives variable flow from hydroelectric operations (see also Section 2.3.1 *J.C. Boyle Dam and Associated Facilities*). The downstream 6.2 miles in California is designated by CDFW as a Wild Trout Area with the whole reach managed by CDFW for wild trout, including angling restrictions and reduced stocking, and habitat enhancements targeted for native trout (CDFG 2005). The reach from the J.C. Boyle Powerhouse to the Oregon-California state line is designated as a National Wild and Scenic River. Approximately 100 cubic feet per second (cfs) is released from J.C. Boyle Dam to the Bypass Reach

through a minimum flow outlet and the fish ladder. This is augmented by inflows from Big Springs of about 220 to 250 cfs (FERC 2007). In the Peaking Reach, this flow is added to flows from the powerhouse, which can range from zero to over 3,000 cfs, depending on operations (FERC 2007). Peaking operations can occur daily, or cycles may extend over several days, depending on water availability, power demands, and whitewater boating needs. The 1.4-mile Copco No. 2 Bypass Reach has flows of about 5 cfs provided by Copco No. 2 Dam. Both of these riverine reaches provide complex physical habitat suitable for salmonid spawning and rearing.

A number of tributary streams join the Klamath River in this reach, including Spencer, Shovel, Fall, Spring, and Camp creeks. These streams provide suitable coldwater spawning and rearing habitat for fish (including potentially salmon and steelhead).

As described in detail in Section 3.20.2.3 *Lower Klamath Project Reservoir-Based Recreation*, the reservoirs currently provide a recreational fishery for non-native fishes including largemouth bass, trout, catfish, crappie, and sunfish (Hamilton et al. 2011). Fishing is popular in Copco No. 1 and Iron Gate reservoirs, especially for yellow perch (Hamilton et al. 2011). These reservoirs also support small numbers of native shortnose and Lost River suckers that are believed to be individuals that have migrated down from the upstream reservoirs and that are thought to not be self-sustaining populations or to be contributing to populations in upstream areas (Hamilton et al. 2011). Riverine sections between reservoirs support populations of speckled dace, marbled sculpin, tui chub, and rainbow and redband trout. This area historically supported anadromous fish populations, including Chinook and coho salmon, steelhead, and Pacific lamprey. These fish can no longer access this area because of the lack of adequate facilities for fish passage at the dams (Hamilton et al. 2011).

Middle and Lower Klamath River

The Klamath River flows unobstructed for 190 river miles downstream from Iron Gate Dam before entering the Pacific Ocean. Downstream from Iron Gate Dam, the Klamath River has a gradient of approximately 0.25 percent and four major tributaries enter this reach: Shasta, Scott, Salmon, and Trinity rivers.

The Klamath Basin downstream from Iron Gate Dam provides hundreds of miles of suitable habitat for anadromous and resident fish. Recreational fishing within this area is popular for steelhead and Chinook salmon, and tribal fishing is common for Chinook salmon with gillnets, and Pacific lamprey with basket traps. Freshwater mussels are also common in this reach. Most of the anadromous salmonid species spawn primarily in the tributary streams, although fall-run Chinook salmon and coho salmon do spawn in the mainstem. The mainstem also serves as a migratory corridor and as rearing habitat for juveniles of many salmonid species (FERC 2007). The ability of the mainstem Klamath River to support the rearing and migration of anadromous species is reduced by periodic

high water temperatures during summer, poor water quality (low dissolved oxygen and high pH; see Sections 3.2.2.5 *Dissolved Oxygen* and 3.2.2.6 *pH*), and disease outbreaks during spring. Aquatic habitat quality in the tributaries is also affected by high temperatures. The Shasta and Scott Rivers also are impaired by low flows, high water temperatures, stream diversions, non-native species, and degraded spawning habitat (Hardy and Addley 2001, FERC 2007, North Coast Regional Board 2010). In the Salmon River, past and present high severity fires and logging roads in the watershed contribute to high sediment yields, and continued placer mining has disturbed spawning and holding habitat (NRC 2004).

Klamath River Estuary

Wallace (1998) surveyed the Klamath River Estuary and noted formation of a sand berm at the river mouth each year in the late summer or early fall, raising the water level in the estuary, reducing tidal fluctuation, and restricting saltwater inflow. The surveys found a brackish water layer along the bottom of the estuary may be extremely important to rearing juvenile salmonids, as they appeared to be more abundant near the freshwater/saltwater interface. Juvenile Chinook salmon may also use the cooler brackish water layer as a thermal refuge.

The Klamath River Estuary supports a wide array of fish species and also serves as breeding and foraging habitat for marine and estuarine species. These species include, but are not limited to Pacific herring (*Clupea pallasii*), surf smelt, longfin smelt, eulachon, top smelt, starry flounder (*Platichthys stellatus*) and other flatfish, Klamath speckled dace, Klamath smallscale sucker, prickly sculpin, Pacific staghorn sculpin, northern anchovy, saddleback gunnel, and bay pipefish. Recreational fishing for Chinook salmon is popular in the estuary, as well as tribal fishing for Chinook salmon with gillnets and Pacific lamprey with hooks.

Pacific Ocean Nearshore Environment

The Pacific Ocean nearshore environment includes the Klamath River Management Zone (KMZ), the California portion of which extends from the Oregon-California state line south to Horse Mountain (40° 05’ 00” N. latitude) and out three nautical miles from the coast. Physical habitat within this environment includes sandy beach, rocky intertidal, and a sand-dominated seafloor at depths less than 200 ft within one mile of the coast, ranging to depths greater than 500 ft on the continental shelf. During winter high flows fine sediment deposits on the seafloor shoreward of the 196-feet isobath along the coast, with greater quantities depositing in close proximity to the mouth of the Klamath River. After fine sediment loading onto the continental shelf during river floods, fluid-mud gravity flows typically transport fine sediment offshore. Summer coastal upwelling naturally resuspends some of the river sediments that are transported to the nearshore environment and deposited on the continental shelf, especially those deposited during the previous winter (Ryan et al. 2005, Chase et al. 2007; see Potential Impact 3.2-8).

The Pacific Ocean nearshore environment supports a wide array of fish species and serves mostly as foraging habitat for marine and anadromous species. These species include, but are not limited to all of the anadromous fish listed previously, as well as federally threatened Southern DPS green sturgeon, Pacific halibut (*Hippoglossus stenolepis*), Pacific herring, surf smelt, longfin smelt, eulachon, top smelt, starry flounder and other flatfish, northern anchovy, saddleback gunnel, lingcod (*Ophiodon elongates*), rockfish species (*Sebastes spp.)*. Within the Pacific Ocean nearshore, recreational and commercial fishing for Chinook salmon, halibut, lingcod, and rockfish species is common.

3.3.2.3 Habitat Attributes Expected to be Affected by the Proposed Project

The Proposed Project would affect the physical, chemical, and biological components of aquatic habitat within portions of the Klamath Basin. These effects would result from changes in suspended sediment, bedload sediment, water quality, water temperature, disease and parasites, habitat availability, and flow-related habitat. As described in the following sections, these changes would act in both beneficial and harmful ways on species, critical habitat, and EFH. Some of the changes would be short-term, and others permanent. The overarching long-term effect would be to bring the habitat closer to a more natural riverine system, from the current reservoir and reservoir-influenced baseline.

Appendices E and F provide more detailed technical descriptions of suspended sediment and bedload sediment under existing conditions. Anticipated changes in water quality under the Proposed Project are discussed in greater detail in Section 3.2 *Water Quality*, and a description of the effects of implementing the Proposed Project on algae is found in Section 3.4 *Phytoplankton and Periphyton*.

Suspended Sediment

Suspended sediment dynamics would be altered by the Proposed Project within the Hydroelectric Reach and reaches downstream of Iron Gate Dam. Existing conditions with respect to algal-derived (organic) suspended material and mineral (inorganic) suspended material in the Klamath River upstream and downstream from Iron Gate Dam are summarized in Section 3.2.2.3 *Suspended Sediments* and in Appendix C.

Hydroelectric Reach

Organic suspended material originating from Upper Klamath Lake (in Oregon) is the predominant form of suspended material entering the Hydroelectric Reach. Interception, decomposition, and retention of suspended materials in the Lower Klamath Project reservoirs, as well as dilution from coldwater springs downstream of J.C. Boyle Dam, can decrease organic suspended material concentrations in this reach; however, seasonal increases in organic suspended material also occur in Copco No. 1 and Iron Gate reservoirs due to large summertime phytoplankton blooms (see Section 3.2.2.3 *Suspended Sediments*

and Appendix C – *Section C.2.1* for more detail). In the winter months, suspended material in the Hydroelectric Reach is dominated by mineral sediment loads from several tributaries that join the river in this reach (primarily Shovel Creek, Spencer Creek, Jenny Creek, and Fall Creek), which are primarily transported during high flow events and generally settle out in the Lower Klamath Project reservoirs. On the scale of the entire Klamath Basin, the trapping of fine sediments and suspended materials does not appear to be a critical function of the Lower Klamath Project reservoirs with respect to the overall cumulative sediment delivery including downstream tributaries (see also Section 3.11.2.4 *Sediment Load*), since a relatively small percentage (3.4 percent) of total sediment supplied to the Klamath River on an annual basis originates from the Upper and Middle Klamath River (i.e., from J.C. Boyle Dam to the confluence with the Shasta River).

Middle and Lower Klamath River

In general, available data (existing conditions) (detailed in Appendix C.2.2.1) indicate that suspended sediment concentrations (SSCs) downstream from Iron Gate Dam range from less than 5 mg/L during summer low flows to greater than 5,000 mg/L during winter high flows. During large winter storms or following landslides in the Klamath Basin, extremely high SSCs have been observed in the Klamath River mainstem and tributaries (M. Belchik, Fisheries Biologist, Yurok Tribe, pers. comm., August 2008). Large rivers such as the Klamath River, Columbia River, and Sacramento River have large fluctuations in SSCs even under unimpaired conditions, and aquatic species have adapted to survive in this environment. Appendix E provides a detailed analysis of the effects of suspended sediment on aquatic species downstream from Iron Gate Dam under existing conditions.

During all water year types, SSCs of the magnitude and duration modeled under existing conditions (multiple months with concentrations over 50 mg/L) are expected to cause major stress to migrating adult and juvenile salmonids primarily during winter and early spring (Newcombe and Jenson 1996, see also Appendix E). Under existing conditions, Iron Gate Dam traps most suspended sediment from upstream sources, and downstream of Iron Gate Dam SSCs generally increase in a downstream direction from the contribution of tributaries (Appendix C.2).

Klamath River Estuary

Under existing conditions, SSCs within the Klamath River Estuary (modeled at Klamath Station at RM 5; Figure 3.3-1) are relatively high compared to SSCs observed farther upstream due to SSC contribution of major tributaries downstream of Iron Gate Dam (Appendix E). The Lower Klamath River downstream from the Trinity River confluence to the estuary is currently listed as sediment-impaired under Section 303(d) of the Clean Water Act (CWA) (North Coast Regional Board 2010). Modeling in the Klamath River (from Seiad Valley at approximately RM 132.7 downstream to the Klamath Station at RM 5)

indicates that under normal conditions SSCs are relatively high during winter and spring (typically 50 to 100 mg/L), and lower (less than 10 mg/L) during summer. Under existing extreme conditions (wet water year) SSCs are generally 10 to 100 mg/L in summer and fall, with peaks between 100 and 1,000 mg/L during winter and spring.

Pacific Ocean Nearshore Environment
Under existing conditions, a plume of Klamath River water extends into the Pacific Ocean nearshore environment in the Klamath River vicinity that is subject to strong land runoff effects following winter rainfall events. The plume can create areas of low-salinity, high levels of suspended particles, high sedimentation, and low light, and potential exposure to land-derived contaminants (Farnsworth and Warrick 2007). The extent and shape of the plume is variable, and influenced by wind patterns, upwelling effects, shoreline topography (especially Point Saint George), and longshore currents. High riverine SSC events contribute to the plume, especially during floods. In northern California, plume zones are primarily north of river mouths because longshore currents and prevailing winds are northward during periods of strong runoff (Geyer et al. 2000, Pullen and Allen 2000). River plumes and the associated habitat conditions they create support areas of high productivity for marine organisms (Grimes and Finucane 1991, Morgan et al. 2005), and create abrupt changes in marine water quality conditions (e.g., water temperature, salinity, sediment) that support salmonids (Schabetsberger et al. 2003, De Robertis et al. 2005).

Bed Elevation and Grain Size Distribution
Section 3.11.2.4 *Sediment Load* and Appendix F of this EIR describe sediment dynamics and channel conditions in the Area of Analysis and assess changes in channel bed elevation and sediment grain size in response to increased bedload supply and transport for existing conditions and under the Proposed Project. The sections below provide a brief summary of the analyses of bedload supply, transport, and channel change provided elsewhere. Bedload supply and transport are vital to the creation and maintenance of functional aquatic habitat. Natural river dynamics include transportation of coarse sediment (e.g., sand, gravel, cobble, and boulder) downstream. Natural sediment pulses that result from heavy rainfall and snowmelt events are incorporated by stream and river processes into spawning beds, gravel bars, side channels, pools, riffles, and floodplains that provide habitat and support food chains of aquatic species. These periodic inputs and movement of coarse sediment are necessary for the long-term maintenance of aquatic habitats. Salmonids evolved to depend on continued sediment delivery to provide substrate suitable for spawning and early rearing in streams and rivers. These natural processes have been disrupted in the Klamath River since the construction of dams.

Under existing conditions, dams have disrupted geomorphic and vegetative processes that can form channels and create spawning grounds downstream

from Iron Gate Dam, by trapping sediment and preventing its transport downstream (Buer 1981, PacifiCorp 2004a, KRBFTF 1991). Since the construction of the Lower Klamath Project, sediment and gravel have been intercepted by Lower Klamath Project reservoirs, with Iron Gate Dam cutting off sediment supply from the Upper Klamath Basin. The resultant reduction in spawning gravels downstream of Iron Gate Dam has been identified as one of the causes of the decline in salmonid fry production in this reach of the Klamath River (Buer 1981). In response to this recognized limiting factor, the California Department of Water Resources developed (but never implemented) gravel augmentation programs for spawning gravel downstream from Iron Gate Dam (Buer 1981). Per the Interim Operations Habitat Conservation Plan for Coho Salmon (PacifiCorp 2012), PacifiCorp developed and implemented a plan to augment gravel immediately downstream of Iron Gate Dam beginning in 2014 (PacifiCorp 2014). Gravel augmentation occurred immediately downstream of Iron Gate Dam in 2014, 2016, and 2017, with approximately 4,600 cubic yards total placed downstream of the dam as of December 2017 (PacifiCorp 2018b). The placed gravel has moved downstream by high flows (PacifiCorp 2018b), although additional details on the extent of downstream movement have not been reported (and were not required under the HCP).

Water Quality

Section 3.2.2 *[Water Quality] Environmental Setting* provides information regarding existing conditions for water quality from J.C. Boyle Reservoir to the Klamath River Estuary, including those parameters that can directly affect beneficial uses for aquatic species (i.e., water temperature, suspended sediments, dissolved oxygen, pH, and algal toxins such as microcystin). Multiple waterbodies in the Area of Analysis, including the mainstem of the Klamath River, are listed under section 303(d) of the CWA for a variety of water quality parameters such as water temperature, sediment, nutrients, dissolved oxygen, pH, ammonia, chlorophyll-*a*, and microcystin (North Coast Regional Board 2011). Existing conditions for water temperature and algal toxins are evaluated in greater detail below with respect to implications on fish health and survival in the Klamath Basin. Microcystin toxin concentrations are also addressed in Section 3.2 *Water Quality* and Section 3.4 *Phytoplankton and Periphyton*.

Water Temperature

The Klamath River, from Keno Dam to the Klamath River Estuary, has been listed as impaired for water temperature (North Coast Regional Board 2011; see Section 3.2 *Water Quality* and Appendix C.1 of this EIR for discussion of existing water temperature conditions). Water temperatures in the Klamath River are of special concern as they are unsuitable in the lower mainstem for anadromous salmonids at times during the summer (Bartholow 2005). Acute thermal effects for salmonids are expected to occur as mean daily water temperatures begin to exceed 68°F (Bartholow 2005). These elevated temperatures are especially detrimental to anadromous species during the warmer portions of the year (ODEQ 2002). Bartholow (2005) expressed concern that if observed increases

in water temperature over the last several decades in the mainstem Klamath River downstream from Iron Gate Dam, which may be related to the cyclic Pacific Decadal Oscillation, continue, some stocks may decline to levels insufficient to ensure survival of the population. Klamath River salmonids are generally more tolerant of high-water temperatures than salmonids from other basins (FERC 2007, Foott et al. 2012). Moreover, NMFS (2006a) concluded that available evidence indicates that juvenile steelhead can withstand incrementally higher temperatures exceeding 71.6°F provided food is abundant and by finding thermal refuge or by living in areas where nocturnal temperatures drop below the thermal threshold. Elevated temperatures can affect the timing of different life-history events, altering migration patterns, delaying and shortening the spawning season, impairing reproductive success, reducing growth, and resulting in a reduction of the diversity in the timing of migration (Hamilton et al. 2011). High water temperatures can contribute to low dissolved oxygen events by reducing dissolved oxygen solubility and accelerating oxygen-demanding processes and can facilitate the spread of disease (Wood et al. 2006). Stress associated with high water temperatures can make cold water species more vulnerable to disease and parasites (ODEQ 2002).

Upper Klamath River and Connected Waterbodies

Both Upper Klamath Lake and the Keno Impoundment/Lake Ewauna are relatively shallow and temperatures in both are generally warm during the late spring through early fall (FERC 2007). In the summer, instantaneous maximum water temperatures of 71.6 to 75.2°F are common in the upper three to six feet of Upper Klamath Lake, and temperatures can approach a maximum of 86°F near the surface (PacifiCorp 2004c). Although prolonged exposure to these high temperatures could be lethal for some species, the water temperature remains within tolerance criteria for migrating adult anadromous salmonids during migratory periods (i.e., not during summer) (Dunsmoor and Huntington 2006, Hamilton et al. 2011). Anadromous salmonids successfully navigated through Upper Klamath Lake to spawn in the Upper Klamath Basin prior to their access being blocked by the Lower Klamath Project. In addition, thermal refugia are available in this reach where fish can avoid high water temperatures. Upper Klamath Lake supports a population of redband trout that moves into cooler tributary habitats during the summer, but which have high growth rates while in the lake. Those in the lake over the summer can find thermal refuge in Pelican Bay, which is fed by springs and remains cool (Dunsmoor and Huntington 2006).

The Keno Impoundment/Lake Ewauna exhibits warm water temperatures in the summer, with instantaneous maximum water temperatures frequently exceeding 77°F (Sullivan et al. 2009, USGS 2010; both as cited in Hamilton et al. 2011). The USEPA (2003) mean weekly maximum temperature (MWMT) criteria for migrating adult salmonids is 68°F. Warm water temperatures are also present in the Klamath River downstream from Keno Dam. However, from November through mid-June, the reach from Link River Dam to Keno Dam is cooler (below 68°F) and meets criteria for migrating adult anadromous salmonids (Hamilton et

al. 2011). Temperatures in the Link River and the Keno Impoundment/Lake Ewauna tend to increase in the summer; however, maximum water temperatures (71.6 to 77°F) are still within the preferred range for warm- and some cold-water species found in the Upper Klamath Basin (yellow perch, catfish, sunfish, largemouth bass, and spotted bass).

Upper Klamath River − Hydroelectric Reach

Water temperatures in the Hydroelectric Reach are generally warm in the Lower Klamath Project reservoirs from late spring through early fall, but tributaries in this reach are generally cool. Additionally, there are several springs in the California portion of the Hydroelectric Reach, located along the edges of Copco No. 1 and Iron Gate reservoirs, that contribute an unquantified amount of flow to the reservoirs (FERC 2007). Average monthly water temperatures within reservoirs from 2001 to 2004 ranged from just over 41°F in November to more than 71.6°F in June through August (FERC 2007), with thermal stratification in Copco No. 1 and Iron Gate reservoirs resulting in relatively warm discharge waters during summer months. Water temperatures at the downstream end of the J.C. Boyle Bypass Reach and in the Klamath River upstream of Shovel Creek are consistently cooler than other sites sampled between Link Dam and the Shasta River (PacifiCorp 2004b). Temperatures in the J.C. Boyle Bypass Reach are cooled by the contribution of 200 to 250 cfs of groundwater at a relatively constant 51.8 to 53.6°F within the reach (PacifiCorp 2006, Kirk et al. 2010). The input from the Bypass Reach during the summer results in a relatively lower daily water temperature range in the Klamath River in the J.C. Boyle Peaking Reach (FERC 2007).

Further downstream in the Peaking Reach, near the confluence of the Klamath River and Shovel Creek (Figure 3.3-1), there are natural hot springs that contribute flows to the mainstem river. The natural hot springs were not found to result in consistent substantial warming of the Klamath River based on two sets of measurements made in November and December 2017 (KRRC 2018). Water temperature data collected upstream and downstream of the confluence of the Klamath River and Shovel Creek showed a 1.4°F increase in the downstream direction during the November 2017 measurement, but a 0.2°F decrease during the December 2017 measurement (KRRC 2018). Water temperatures in Shovel Creek itself are generally low year-round, with reported values consistently below 59°F in the summer (PacifiCorp 2004a). Water temperatures recorded in Shovel Creek in late fall/early winter 2017 were 46°F (on November 1) and 39.9°F (December 5) (KRRC 2018).

Temperature data for other tributaries entering the Hydroelectric Reach are based on a limited study period (between 2001 and 2003) (PacifiCorp 2004c). Fall Creek, which flows into Iron Gate Reservoir, is generally cold year-round and does not exceed 57.2°F during the summer (PacifiCorp 2004c). Temperatures in Jenny Creek, which also flows into Iron Gate Reservoir, vary seasonally, ranging from less than 50°F in the spring to more than 71.6°F in July and August

(PacifiCorp 2004c). As noted above, temperatures in Shovel Creek are generally low year-round and do not exceed 59°F in the summer (PacifiCorp 2004c). Spencer Creek temperatures are low during spring (<59°F) and are generally below 64.4°F but can exceed 68°F for short durations (PacifiCorp 2004c).

Iron Gate and Copco No. 1 reservoirs are the two deepest reservoirs in the Hydroelectric Reach. These reservoirs thermally stratify each year beginning in April/May and the warmer (64.4°F to 73.4°F) surface and colder (46.4°F to 62.6°F) bottom waters do not mix again until October/November (see also Section 3.2.2.2 *Water Temperature*). Surface waters in these reservoirs reach maximum temperatures exceeding 77°F during the summer (PacifiCorp 2004c). Colder water temperatures occur at depths greater than six to ten meters below the reservoir surfaces during periods when the reservoirs are stratified (see Appendix C, Section C.1.1.1 and Figure C-1) (PacifiCorp 2004c, Asarian and Kann 2011). The powerplant intakes in both reservoirs are relatively shallow, at approximately nine to ten meters below the surface, such most of the reservoirs' discharge waters are from the warmer surface waters. Consequently, discharges from Copco No. 1 and Iron Gate reservoirs increase late summer/fall water temperatures downstream of Iron Gate Dam by approximately 4°F to 18°F (approximately 2°C to 10°C) (see also *Middle and Lower Klamath River*). Further, even though Copco No. 1 and Iron Gate reservoirs retain large volumes (approximately 9,000 acre-feet and 23,000 acre-feet, respectively) of colder bottom waters during periods of stratification, these waters are typically hypoxic (dissolved oxygen less than 2 mg/L), particularly in Copco No. 1 Reservoir (Appendix C, Section C.4.1.1). Although summertime water temperatures documented in the Hydroelectric Reach are within the tolerance ranges of the species observed there (e.g., perch, bass), these temperatures regularly exceed the range of chronic effects temperature thresholds (approximately 55 to 68°F [13 to 20°C]) for full salmonid support in California (North Coast Regional Board 2010).

Middle and Lower Klamath River

The large thermal mass of the stored water in Copco No. 1 and Iron Gate reservoirs delays the natural warming and cooling of riverine water temperatures on a seasonal basis such that spring water temperatures in the Middle Klamath River immediately downstream of Iron Gate Dam are generally cooler than would be expected under natural conditions, and summer and fall water temperatures are generally warmer (Figure ; see also Section 3.2.2.2 *Water Temperature*). This "thermal lag" diminishes downstream from Iron Gate Dam, and there is no noticeable alteration in water temperatures by just upstream of the Salmon River confluence. Summer weather conditions can be very hot from June through September and rising ambient air temperatures can lead to increased water temperatures (Hamilton et al. 2011). Downstream from Iron Gate Dam, monthly mean temperatures in the river are 37.4 to 42.8°F in January and 68 to 72.5°F in July and August and the monthly average daily maximum temperature is commonly greater than 73.4 °F (Bartholow 2005). Substantial losses of juvenile

salmonids have occurred during their migration through the Lower Klamath River, and losses were especially severe during low-water years with periods of sustained high-water temperatures. Exposure to high water temperature reduces the resistance of these fish to disease and other stressors (Scheiff et al. 2001, Ray et al. 2014). Consequently, during periods of high-water temperature juvenile salmonids have been observed to crowd into areas with suitable water temperature such as at tributary confluences (thermal refugia). Summary statistics compiled by the United States Environmental Protection Agency (USEPA) indicate that water temperatures at locations between Iron Gate Dam and the Klamath River's confluence with the Scott River range from about 60.8 to 71.6°F in June, and from 60.8 to 78.8°F in July (FERC 2007). From May through September (peaking in June–August) summer water temperatures in the Lower Klamath Basin begin to warm to stressful levels for cold water species such as salmon, steelhead, and Pacific lamprey.

Klamath River Estuary and Pacific Ocean Nearshore Environment
Water temperatures in the estuary range from 41 to 53.6°F from December through April (Hiner 2006). Warmer air temperatures and lower flows in summer and fall months result in increased water temperatures ranging from 68 to 75.2°F (Wallace 1998) or greater than 75.2°F (Hiner 2006). When flows become low during some summer conditions, water temperatures in the Klamath River Estuary sometimes exceed criteria for optimal growth, and occasionally are warm enough to result in potential mortality for Chinook salmon, coho salmon, and steelhead (Stillwater Sciences 2009a). However, observed warm water conditions in the Klamath River Estuary are typically short in duration, due to input of cool ocean water and a high prevalence of coastal fog. Water temperatures in the Pacific Ocean nearshore environment are moderated by the Pacific Ocean currents and patterns that appear unrelated to the contribution of the Klamath River.

Disease and Parasites
Fish diseases, specifically the myxozoan parasites *Ceratomyxa shasta* (*C. shasta*) and *Parvicapsula minibicornis (P. minibicornis),* regularly result in substantial mortality of Klamath River salmon (Fujiwara et al. 2011, Bartholomew and Foott 2010); however, steelhead are generally resistant to *C. shasta*. Additional diseases that may affect fish in the Klamath Basin include *Ichthyophthirius multifis* (Ich) and *Flavobacterium columnare* (columnaris). These parasites and diseases occur throughout the watershed but appear to cause the most severe mortality in the mainstem Klamath River downstream from Iron Gate Dam where *C. shasta* has been observed to result in high rates of mortality in salmon (True et al. 2013). Ich and columnaris occasionally result in substantial mortality (e.g., the 2002 fish kill of primarily adult Chinook salmon, as discussed below).

Both *C. shasta* and *P. minibicornis* spend part of their life cycle in an invertebrate host and another part in a fish host (Figure 3.3-2). Transmission of these

parasites is limited to areas where the invertebrate host is present. In the Klamath River, their invertebrate host is the annelid polychaete worm *Manayunkia speciosa* (Bartholomew et al. 1997, 2007). Once the polychaetes are infected, they release *C. shasta* and *P. minibicornis* actinospores into the water column. Actinospores are generally released when temperatures rise above 50°F and remain viable from three to seven days at temperatures from 51.8 to 64.4°F, with temperatures outside that range resulting in a shorter period of viability (Foott et al. 2007). The longer the period of viability, the wider the distribution of the actinospores within the river, and thus the higher the risk of exposure for salmon (Bjork and Bartholomew 2010). Actinospore abundance, a primary determinant of infectious dose, is controlled by the number of polychaetes and the prevalence and severity of infection within their population. The river channel downstream from Iron Gate Dam has been atypically stable since dam construction and has provided favorable habitat for the polychaete worm host, likely increasing the parasite load to which the fish are exposed. High parasite loads are believed to lead to higher rates of mortality (Fujiwara et al. 2011). Ray et al. (2014) evaluated *in situ* juvenile salmonid exposure using sentinel cages. Studies found that increasing parasite concentrations and water temperatures were positively associated with the proportion of juvenile fish that experienced infection and mortality. Spore concentration and water temperature were more important determinants of exposure and mortality of juvenile Chinook and coho salmon, than was river flow. However, Ray and Bartholomew (2013) observed an inverse relationship between flow and actinospore transmission; higher flows (water velocities) appeared to result in lower transmission rates. The location of peak actinospore concentrations varies among years, and Som et al. (2016a) report that the most frequent location of the peak in concentrations occurs near the confluence of Beaver Creek.



Figure 3.3-2. Lifecycle of *Ceratomyxa Shasta*. Source: NMFS 2012.

Salmon become infected when the actinospores enter the gills, eventually reaching the intestines where the parasite replicates and matures to the myxospore stage. Myxospores are shed by the dying and dead salmon, and the cycle continues with infection of polychaete worms by the myxospores (Figure 3.3-2) (Bartholomew and Foott 2010). Som et al. (2016a) states that myxospores released from adult salmon carcasses contribute the bulk of myxospores to the system; mostly from carcasses upstream of the confluence with the Shasta River.

The polychaete host for the parasite is present in a variety of habitat types, including runs, pools, riffles, edge-water, and reservoir inflow zones, as well as sand, gravel, boulders, bedrock, aquatic vegetation, and it is frequently found among mats of filamentous periphytic algal species (e.g., Cladophora) that traps fine sediment and detritus (Bartholomew and Foott 2010).

The highest densities of polychaetes have been observed in slow-flowing and more stable, depositional habitats (e.g., pools with sand) (Bartholomew and Foott 2010), especially if instream flows remain constant. The mobilization of particles on the bed of the channel downstream from Iron Gate Dam depends directly upon the size of the substrate and magnitude of peak flows. The greater the flows, the larger the particles likely to be moved, and the smaller the particle, the

lower the flow required for mobilization. Polychaetes are more persistent if the substrate remains immobile for long periods (on the order of years). Malakauskas et al. (2013) performed flume experiments to evaluate flow requirements for dislodging polychaetes. Their results suggested resilience of polychaetes to flow-mediated disturbance and indicated that substrate size has a great influence on resilience of polychaetes to disruption (smaller particles, greater susceptibility). Malakauskas et al. (2013) found that sufficiently high sheer velocities (>140 cm/s) dislodge polychaetes from both rock substrate and fine sediment. Bartholomew et al. (2018) attributed the observed lowest polychaete densities and prevalence of *C. shasta* infection in 2017 (as compared to all previous years of monitoring) in part to the high magnitude and sustained duration of peak discharge in 2016 and 2017, and in part to low spring water temperatures. Under historical conditions, frequent flood events and natural sediment supply, combined with considerable intra-annual flow variability, ensured that the substrate was frequently mobilized. Under existing conditions with dams in place, sediment supply is reduced, flow variability is decreased, and conditions supporting the persistence of polychaetes are more prevalent (Shea et al. 2016).

Susceptibility to *C. shasta* is also influenced by the genetic type of *C. shasta* encountered by the fish (Som et al. 2016a). Atkinson and Bartholomew (2010) conducted an analysis of the genotypes of *C. shasta* and the association of these genotypes with different salmonid species, including Chinook and coho salmon, steelhead, rainbow trout, and redband trout. In a genetic analysis, the *C. shasta* genotypes were characterized as Type 0, Type I, Type II, and Type III (Table 3.3-10). In the Williamson River, although parasite densities had been found to be high, sentinel Chinook salmon were resistant to infection because the genotype specific to Chinook salmon was absent (Hurst et al. 2012).

Table 3.3-10. *Ceratomyxa Shasta* Genotypes in the Klamath Basin.

***C. shasta* Genotype**	**Distribution**	**Affected Species**	**Notes**
Type 0	Upper and Lower Klamath Basin	native steelhead, rainbow, and redband trout	Usually occurs in low densities, is not very virulent, and causes little or no mortality
Type I	Lower Klamath Basin	Chinook salmon	If the Type I genotype were carried into the Upper Klamath Basin, only Chinook salmon would be affected

***C. shasta* Genotype**	**Distribution**	**Affected Species**	**Notes**
Type II	Klamath Lake, Upper and Lower Klamath Basin	coho salmon in Lower Klamath Basin and non-native rainbow trout	The "biotype" found in the Upper Klamath Basin does not appear to affect coho salmon in sentinel studies
Type III	Assumed widespread in Klamath Basin based on presence in fish	all salmonid species	Prevalence of this genotype is low and it infects fish but does not appear to cause mortality

Native populations of salmonids in waters where *C. shasta* is endemic generally develop a high degree of resistance to the disease. Stocking et al. (2006) conducted studies of the seasonal and spatial distribution of *C. shasta* in the Klamath River. The study included the exposure of fall-run Chinook salmon (Iron Gate Hatchery strain). The study found the polychaete host, *M. speciosa*, from Upper Klamath Lake to the mouth of the river. Although infection rates were high in non-native, non-resistant rainbow trout, used as sentinel fish in the upper Klamath River upstream of Iron Gate Dam and downstream from the Williamson River, mortality rates were very low (Stocking et al. 2006). Chinook salmon at this location did not become infected. Minimal mortality in both was likely due to low levels of parasites in this area and a predominance of Type 0 genotype of *C. shasta*. Because the parasites are endemic to the watershed, the native salmonid populations have some level of resistance to the disease.

Upper Klamath River and Connected Waterbodies

Many of the diseases and parasites described above can occur in the Upper Klamath River. *C. shasta* and *P. minibicornis* are both known to occur in the Upper Klamath Basin (NMFS 2006a), and *C. shasta* densities have been reported to be as high in the Williamson River (Hurst et al. 2012) as in the area downstream from Iron Gate Dam (Hallett and Bartholomew 2006). Habitat in the lower Williamson River supporting high polychaete densities (and thus parasite densities) includes stable flows and large deposits of sand-silt and fine benthic organic matter (Stocking and Bartholomew 2007). However, in the section of the river upstream of J.C. Boyle Reservoir, *C. shasta* does not have the same serious effects as it does downstream from Iron Gate Dam, because of the genotype of the parasite (Type 0, II, and III) and the higher resistance of the redband trout to the disease. Historically *C. shasta* and *P. minibicornis* occurred in the Upper Klamath Basin and resident fish upstream of the dams evolved with these parasites (Hamilton et al. 2011). The current infectious zone and high parasite loads below Iron Gate Dam are the result of a synergistic effect of numerous factors (FERC 2007, Hamilton et al. 2011), including: (1) close

proximity of myxospore-shedding carcasses (concentration of carcasses); (2) abundant polychaete populations that are found in stable habitats; (3) suitable water temperatures (greater than 59°F) during periods when juvenile salmonids are present; and 4) low flow variability (Bartholomew and Foott 2010). This synergy would be unlikely in the Upper Klamath River (Hamilton et al. 2011), and the NMFS (2006a, USFWS/NMFS Issue 2(B)) concluded that the movement of anadromous fish upstream of Iron Gate Dam presents a relatively low risk of introducing pathogens to resident fish (e.g., redband trout, cutthroat trout).

Upper Klamath River − Hydroelectric Reach

As described above, Stocking et al. (2006) found the polychaete host for *C. shasta* and *P. minibicornis* throughout the mainstem Klamath River, including the reach from J.C. Boyle Reservoir to Iron Gate Dam (the Hydroelectric Reach), and within the Lower Klamath Project reservoirs. However, these polychaete populations are most abundant at reservoir inflow areas with densities decreasing with distance from reservoir/river interface, but not disappearing entirely (Stocking and Bartholomew 2007). In order for an area to develop as an infectious zone, several factors need to coincide, including microhabitats with low velocity, and stable flows, which are rare within this reach (Bartholomew and Foott 2010).

Middle and Lower Klamath River

In the Klamath River downstream of Iron Gate Dam, the polychaete host for *C. shasta* and *P. minibicornis* is aggregated into small, patchy populations. The reach of the Klamath River from the Shasta River to Seiad/Indian Creek is known to be a highly infectious zone with high actinospore exposure, particularly from May through August (Beeman et al. 2008, Bartholomew and Foott 2010). This portion of the river contains dense populations of polychaetes within low-velocity habitats with *Cladophora* (a filamentous green periphytic algae), sand-silt, and fine organic material in the substrate (Stocking and Bartholomew 2007). As described above, the reduced bedload mobility has increased the persistence of polychaetes under existing conditions (Som et al. 2016b). High parasite prevalence in the Lower Klamath River is considered to be a combined effect of high spore input from heavily infected, spawned adult salmon that congregate downstream from Iron Gate Dam and Iron Gate Hatchery, and the proximity to dense populations of polychaetes (Bartholomew et al. 2007). The highest rates of infection occur in the Lower Klamath River downstream from Iron Gate Dam, generally in the reach from Shasta River to Seiad (Stocking and Bartholomew 2007, Bartholomew and Foott 2010, Bartholomew et al. 2017). The zone of greatest infection (nidus) has varied during annual monitoring from 2006 through 2017. Bartholomew et al. (2017, 2018) conducted sentinel fish exposures studies to measure mortality of juvenile Chinook with *C. shasta* infections at index sites in the mainstem Klamath River. Bartholomew et al. (2017, 2018) report that the 2016 infectious zone was the most extensive since monitoring began in 2006 and extended from the I-5 Bridge (RM 182.1) downstream to Orleans (RM 59), with the greatest losses observed near Orleans. In 2017, the

zone retracted to the reach from the I-5 Bridge downstream to Seiad Valley (RM 132.7), with the greatest sentinel fish loss and spore abundance near Beaver Creek (RM 163.4). Other references to the existing disease nidus downstream from Iron Gate Dam refer to the reach described above.

Despite potential resistance to *C. shasta* and *P. minibicornis* in native populations, salmon exposed to high levels of the parasite may be more susceptible to disease—particularly juvenile salmon, and more so at higher (>59ºF [>15ºC]) water temperatures. In summarizing data collected from 2005 through 2008, Bartholomew and Foott (2010) reported that juvenile Chinook and coho salmon migrating downstream had infection rates as high as 90 percent and 50 percent, respectively. During April to August 2009 True et al. (2010) found 54 percent of juvenile Chinook salmon in the Klamath River upstream of the confluence with the Trinity River had parasitic infection from *C. shasta*, and 85 percent were infected with *P. minibicornis*. Water temperatures were not reported. During April to August 2012 True et al. (2013) found 30 percent of juvenile Chinook salmon in the Klamath River upstream of the confluence with the Trinity River had parasitic infection from *C. shasta*, and 69 percent were infected with *P. minibicornis.* True et al. (2013) reported that both *C. shasta* prevalence of infection increased in 2012 compared to 2011 (2011 results not reported). Environmentally, 2012 consisted of a relatively normal temperature profile for the Klamath River. No manipulated pulse flow from Iron Gate Dam (as in 2011) or extended period of precipitation (as in 2010) occurred. True et al. (2013) concluded that the typically warm river temperatures (59–75.2°F) observed in May–July, coupled with earlier high *C. shasta* actinospore densities (May versus June in 2011) in the infectious zone, resulted in an increase in annual infection prevalence compared to the previous monitoring year. Overall, the 2012 annual infection prevalence for juvenile Chinook salmon during outmigration was relatively moderate compared to historical levels observed for the monitoring program (2006–2011). True et al. (2017) and Voss et al. (2018) used the quantitative polymerase chain reaction (qPCR) analysis technique and histology to measure myxosporean parasite infection of juvenile Chinook salmon in the Klamath River. Voss et al. (2018) reported lower rates of *C. shasta* infection in 2017 (5 percent) and 2018 (11 percent) than the high levels observed during 2016 (27 percent). The researchers report the mean *C. shasta* prevalence of infection (POI) for natural (non-hatchery) fish from 2009–2018 is 27 percent and has ranged from a low of 4 percent in 2012, to 75–76 percent during the drought years of 2014–2015. Voss et al. (2018) suggest that the increase in POI observed in 2018 could be due to lower flows and slightly higher spring water temperatures. Environmental conditions were very favorable for fish in 2017 (True et al. 2017), therefore Voss et al. (2018) were not surprised to see an increase in POI in the drier year of 2018. Following surface flushing flows in 2019 POI in juvenile Chinook salmon captured in the Klamath River in the reach from Shasta to Scott River confluences ranged from 60 percent in late April to 80 percent in early May (USFWS 2019b).

High disease infection rates are apparently resulting in high mortality of outmigrating smolts. Studies of outmigrating coho salmon smolts by Beeman et al. (2008) estimated that mortality rates were between 35 and 70 percent in the Klamath River near Iron Gate Dam. Their studies also suggested that higher spring discharge increased smolt survival (Beeman et al. 2008).

Between May and July 2004, the USFWS, the Yurok Tribe, and the Karuk Tribe reported high levels of mortality and disease infections among naturally produced juvenile Chinook salmon captured in downstream migrant traps fished in the Klamath River (Nichols and Foott 2005). Visible symptoms observed included bloated abdominal cavities, pale gills, bloody vents, and pop-eye. Infected fish also exhibited lethargic behavior, poor swimming ability and increased vulnerability to handling stress. The primary cause of the disease was found to be *C. shasta*, with *P. minibicornis* observed as well. Weekly prevalence of *C. shasta* infection for all sites combined ranged from 15 to 56 percent, with the peak observed in fish captured in late May. Expanding from the trap efficiency data the authors estimated 45 percent of the population passing Big Bar was infected with *C. shasta.* Weekly prevalence of *P. minibicornis* infection for all sites combined ranged from 36 to 93 percent with the peak observed in fish captured on mid-June. Expanding from the trap efficiency data the authors estimated 94 percent of the population passing Big Bar was infected with *P. minibicornis.* The authors concluded that the high incidence of dual myxozoan infection (98 percent of *Ceratomyxa* infected fish), and associated pathology suggested that most of the *C. shasta* infected juvenile Chinook salmon would not survive. The 2004 mortality event was not quantified because of limited resources and other problems associated with sampling small fish in a large river system.

Other recent fish kills include the June 1998 and June 2000 fish kills. CDFG (2000) estimated 10,000 to 300,000 individuals, mostly young-of-year, killed in the June 2000 event. CDFG (2000) stated that, “we did not attempt to systematically or statistically quantify total [young of the year] chinook and steelhead mortality. CDFG’s initial assessment of mortality in the “tens of thousands” range should be considered a very conservative minimum. I [CDFW staff] believe many more fish died than we originally observed during our surveys because of the time period involved (mid-to-late June; approximately three weeks) and the apparent high rate of scavenging (dead fish being quickly consumed and therefore unavailable for observation). It is probable that a number on an order of magnitude greater (i.e., >100,000 to 300,000) may be more realistic.”

The cause of the 2000 fish kill was believed to be infection with *C*. *shasta* and columnaris. For comparison, in 2010 through 2012, years with lower river temperatures and conditions less conducive to disease infection, prevalence of *C. shasta* in emigrating juvenile Chinook salmon during the peak migration period was less than 30 percent (True et al. 2013).

For adult salmon, disease has been less frequent and of a different nature. Ich, a protozoan parasite that spreads horizontally from fish to fish (Figure 3.3-3), and columnaris have occasionally had a substantial impact, particularly when habitat conditions include exceptionally low flows, high water temperatures, and high densities of fish (such as adult Chinook salmon migrating upstream in the fall and holding at high densities in pools). For adult salmon the effects of Ich and columnaris are generally not as harmful as the observed effects of the myxozoan parasites on juveniles, although the 2002 fish kill in the Lower Klamath River provided dramatic evidence of the ability of Ich and columnaris to cause significant adult salmon mortality, with more than 33,000 adult salmon and steelhead lost during a disease outbreak (CDFG 2004). Most of the fish affected by the 2002 fish die-off were fall-run Chinook salmon in the lower 36 miles of the Klamath River (CDFG 2004). Based on the analysis in CDFG (2004), the total fish estimate of 34,056 fish was a conservative estimate, and the CDFG analysis indicate the actual losses may have been more than double that number. Based on a review of available literature and historical records, this was the largest known pre-spawning adult salmonid die-off recorded on the Klamath River and possibly the Pacific Coast (USFWS 2003). Subsequent reviews of the 2002 fish kill by CDFG (2004), NRC (2004), and USFWS (2003) determined several factors contributed to the epizootic outbreak of Ich and columnaris. An above-average number of Chinook salmon entered the Klamath River during this period. Flows in September 2002 were among the lowest recorded in the last 50 years (CDFG 2004), which may have caused crowding in holding areas that increased transmission of disease. Low flows can also be associated with high water temperature and lower than normal dissolved oxygen concentrations (NRC 2004). While high temperatures may have contributed to the fish kill, temperatures were not unusually high in 2002 when compared to the historical record (Belchick et al. 2004). There is little historical data on dissolved oxygen, but it has been monitoring since 2001—and dissolved oxygen concentrations were similar in 2001 and 2002. During the 2002 fish kill, dissolved oxygen concentrations did not fall below 6.0 mg/L and were eliminated as a potential cause (Belchick et al. 2004). Low river discharges were apparently unsuitable for migrating adult salmon, resulting in a large number congregating in the warm water of the Lower Klamath River (USFWS 2003). Fish passage may also have been impeded by low flows, contributing to crowding (CDFG 2004). The NRC did not rule out low flows as a contributing factor but hypothesized that high water temperatures may have also inhibited the fish from moving upstream (NRC 2004). Whether inhibited by low flows, high temperatures, or both, fish in the Lower Klamath River stopped migrating upstream, resulting in crowded, stressful conditions and possibly longer residence times in a confined reach of the river. Belchick et al. (2004) states that “consideration of all pertinent data led to the conclusion that in 2002 a relatively robust run of adult fall Chinook entered the Klamath River approximately one week earlier than usual. Environmental conditions in the River at the time of the 2002 fall-run Chinook salmon run were characterized by low flow rates and volume, and an apparent lack of migration

cues to proceed upriver. The resultant migration delay, crowded conditions, and warm water temperatures provided an ideal environment for the proliferation of Ich and columnaris.

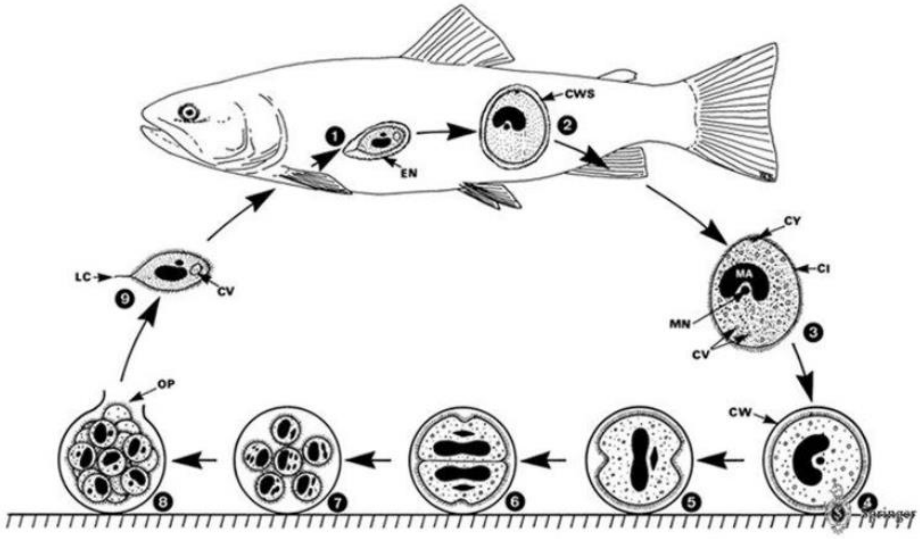

Figure 3.3-3. Lifecycle of *Ichthyophthirius Multifis* (Ich). In stages 1 and 2 the adult parasite lives within the fish host; in stage 3 the adult parasite is motile outside of the host fish and attaches to a bottom substrate before dividing into an immature form; in stages 4 through 8 the immature form divides numerous times and is then released as stage 9, the infective stage of the parasite. Source: Strange 2010.

Although losses of adult salmonids can be substantial when events such as the 2002 fish die-off occur, the combination of factors that leads to adult infection by Ich and columnaris disease are not be as frequent as the annual exposure of juvenile salmon to *C. shasta* and *P. minibicornis*, as many juveniles must migrate each spring downstream past established populations of the invertebrate polychaete worm host.

FERC (2007) concluded that the Klamath Hydroelectric Project has likely contributed to conditions that foster disease and lead to salmon losses in the Middle and Lower Klamath River by (1) increasing the density of spawning adult fall-run Chinook salmon downstream from Iron Gate Dam; (2) promoting the development of attached algae beds that provide favorable habitat for the polychaete alternate host for *C. shasta* and *P. minibicornis*; and (3) contributing to water quality conditions that increase the stress level of juvenile and adult salmonids and increase their susceptibility to disease. The water quality conditions that may increase stress levels include: (1) increased water temperatures in the late summer and fall; (2) elevated ammonia concentrations and swings in dissolved oxygen and pH associated with algal blooms in project

reservoirs; and (3) effects of exposure to elevated levels of microcystin produced from microcystis blooms in Klamath Hydroelectric Project reservoirs, which may also result in direct mortality. Dissolved oxygen and pH dynamics, including dissolved oxygen concentrations that do not meet the Basin Plan minimum dissolved oxygen criteria and pH concentrations that exceed the Basin Plan instantaneous maximum of 8.5 s.u., for the Hydroelectric Reach, the Middle and Lower Klamath River, and the Klamath River Estuary, are discussed in Section 3.2.2.5 *Dissolved Oxygen* and Section 3.2.2.6 *pH.* A discussion of fish exposure to microcystin toxin in the Hydroelectric Reach and the Klamath River downstream from Iron Gate Dam is presented below in Section 3.3.2.3 *Habitat Attributes Expected to be Affected by the Proposed Project – Algal Toxins*.

Seasonal production of ammonia occurs in the hypoxic (dissolved oxygen less than 2 mg/L) or anoxic (no dissolved oxygen) bottom waters of Copco No. 1 and/or Iron Gate reservoirs on a seasonal basis. But, no actual ammonia toxicity events have been reported in the reservoirs or in the Middle Klamath River downstream from Iron Gate Dam, and no acute or chronic toxicity exceedances of Basin Plan criteria for ammonia have been observed in the river (Appendix C – *Sections C.3.11* and *C.3.2.1*).

In 2013, NMFS and USFWS issued a joint BiOp (NMFS and USFWS 2013) of the proposed operations of the Klamath Irrigation Project by the USBR in Klamath County in Oregon, and Siskiyou and Modoc counties in California. In this 2013 BiOp, NMFS concluded that flow variability would increase mainstem Klamath River flows when precipitation and snow melt is occurring in the Upper Klamath Basin, which would help to dilute actinospore concentrations and/or disturb polychaetes and their habitats. Malakauskas et al. (2013) performed flume experiments to evaluate flow requirements for dislodging polychaetes. Their results highlight the resilience to flow-mediated disturbance. Their findings indicated substrate size has a great influence of resilience of polychaetes to disruption (smaller particles, greater susceptibility), and that when sheer velocities are sufficient dislodgment of polychaetes occurs. In addition, the 2013 BiOp found that flow variability would provide dynamic fluvial environments in the mainstem Klamath River that may impair polychaete fitness, reproductive success, or infection with *C. shasta* and *P. minibicornis*. Compared to observed conditions during the period of record, NMFS concluded that proposed operations of the Klamath Irrigation Project under the 2013 BiOp would increase the magnitude and frequency of peak flows, which would likely decrease the abundance of polychaetes in the spring and summer following a channel maintenance flow event (NMFS and USFWS 2013). The proposed operations of the Klamath Irrigation Project would increase the magnitude and frequency of channel maintenance flows between 5,000 and 10,000 cfs relative to the observed period of record (e.g., the Klamath Irrigation Project would have an estimated two-year flood frequency of 5,454 cfs whereas the observed period of record had 5,168 cfs). This conclusion is also supported by the analysis of Shea et al. (2016), who examined the flow history in the Klamath River relative to

sediment mobilization. The increase in magnitude and frequency of channel maintenance flows between 5,000 and 10,000 cfs would likely decrease the abundance of polychaetes in the spring and summer following a channel maintenance flow event (NMFS and USFWS 2013, Alexander et al. 2016, Som et al. 2016b). In the 2013 BiOp, NMFS concluded that the increase in magnitude and frequency of channel maintenance flows between 5,000 and 10,000 cfs would likely decrease the actinospore concentrations relative to the observed period of record when the channel maintenance flow event occurs in the spring, particularly in May and June.

However, the first years of 2013 BiOp implementation included severe drought conditions, and although the USBR was operating the Klamath Irrigation Project in accordance with the 2013 BiOp, the infection rate for *C. shasta* in the Klamath River downstream of Iron Gate Dam greatly exceeded the incidental take maximum (U.S. District Court 2017a). As described in Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*, this led to a court-order requiring USBR to provide, as necessary, three specific flows in the Klamath River, as measured immediately downstream of Iron Gate Dam: annual winter-spring surface flushing flows, biennial winter-spring deep flushing flows, and spring-summer emergency dilution flows, if needed (U.S. District Court 2017a–c). The court-ordered flushing flows and emergency dilution flows are not modeled as part of existing conditions hydrology under the Proposed Project. As described in Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*, the 2017 court-ordered flows included a requirement to ensure that certain high flows are reached each winter, and they also included an emergency dilution requirement if juvenile fish disease reached high levels in the infection nidus. The emergency dilution flows were used in 2018. In March 2019, the court-required re-initiation of USBR consultation with NMFS and USFWS was completed and new biological opinions (BiOps) were issued by NMFS (2019) and USFWS (2019a). The 2019 BiOp flow requirements include annual surface flushing flows of at least 6,030 cubic feet per second (cfs) for 72 hours at Iron Gate Dam between March 1 and April 15, and the potential for dilution flows and/or enhanced spring flows should water be available and disease conditions support their use. Dilution flows also occurred in June 2019 under the new BiOp flow requirements.

Klamath River Estuary and Pacific Ocean Nearshore Environment
While disease and parasites occur in the Klamath River Estuary and Pacific Ocean nearshore environment, these areas are not known to be important source areas for these stressors. Juvenile salmonids that are weakened by disease or parasites upstream may succumb to those diseases once they enter the estuary or ocean as a result of the additional stress created by adapting to the saline environment, but there is no evidence or observations of disease effects in this environment to date.

Fish Hatcheries

Under existing conditions, there are two fish hatcheries located along the Klamath River: Fall Creek Hatchery and Iron Gate Hatchery. Fall Creek Hatchery was built in 1919 by the California Oregon Power Company in Fall Creek, near its confluence with the Klamath River (RM 200.3), as compensation for the loss of spawning grounds that occurred with the construction of Copco No. 1 Dam. Fall Creek Hatchery facilities were last used by CDFW periodically from 1979 to 2003 to raise Chinook salmon yearlings. Fall Creek Hatchery yearlings were released into the Klamath River at Iron Gate Hatchery. Although many of the Fall Creek Hatchery facilities remain operable, the hatchery has not produced fish since 2003 when all fish production was moved to Iron Gate Hatchery.

Iron Gate Hatchery is part of the Lower Klamath Project and was originally constructed in 1962 as mitigation for blockage of fish passage caused by the construction of Iron Gate Dam. Iron Gate Hatchery facilities are located approximately 0.5 miles downstream of Iron Gate Dam, adjacent to the Bogus Creek tributary. CDFW operates Iron Gate Hatchery with the following annual production goal (CDFW and PacifiCorp 2014):

- 75,000 yearling coho salmon (age-1 releases during spring)
- 900,000 yearling fall-run Chinook salmon (age-1 releases during fall)
- 5,100,000 fall-run Chinook salmon smolts (age-0 releases during spring)
- 200,000 yearling steelhead (age-1 releases during spring)

However, the ability to meet the above production goals varies annually based on adult returns and hatchery performance. Coho salmon production has averaged 73,281 yearlings (nearly achieving production goals) for the 24-year period from 1993–2016 while adult returns have averaged 982 fish over the last 56 years (Giudice and Knechtle 2018). More recently juvenile coho salmon production has averaged 70,444 yearlings for the period of 2009–2018 (K. Pomeroy, CDFW, pers. comm., 2018). Although adult coho salmon returns to Iron Gate Hatchery are highly variable between years, recent coho salmon returns to Iron Gate Hatchery have significantly and steadily declined. During the period of 2008–2017, coho salmon returns averaged 501 fish with only two years where returns to Iron Gate Hatchery exceeded the 56-year average (Giudice and Knechtle 2018).

From 1991 through 2017 actual fall-run Chinook salmon yearling production has averaged 973,574 (exceeding production goals), and actual smolt production from 1991 through 2018 has averaged 4,593,220 (around a half-million fewer smolts than the goal on average) (K. Pomeroy, CDFW, pers. comm., 2018). Based on coded wire tagging between 1990 and 2015, adult returns of smolts has averaged 0.178 percent, and returns of yearlings has averaged 0.352 percent (Giudice and Knechtle 2018). Despite higher survival of yearling releases, the substantially higher number of smolt releases results in most hatchery adult returns being fish released as age-0 smolts. The fall-run Chinook

salmon hatchery spawner return goal is 8,000 fish. Total Chinook salmon returns to Iron Gate Hatchery between 1978 and 2018 ranged from 2,558 to 72,474 and averaged 15,625 fish (CDFW 2019). Recent returns of adult Chinook salmon to Iron Gate Hatchery have been similar to the long-term average, with an average of 15,625 adult Chinook salmon returning over the period of 2009–2018 (CDFW 2019). Adult steelhead (fall- and spring-run) returns to Iron Gate Hatchery averaged 1,064 fish for the period of 1963–2016 (CDFW 2016b). More recent returns have been much lower with an average of 82 adult steelhead returning to Iron Gate Hatchery for the period of 2007–2016 (CDFW 2016b). Returns have been declining, and in 2016 no adult steelhead returned to the hatchery (CDFW 2016b). The low adult returns of steelhead have resulted in no production of steelhead yearlings from Iron Gate Hatchery since 2013.

It appears that progeny from Iron Gate Hatchery releases have contributed significantly to the ocean and in-river fisheries since the late 1960s (PacifiCorp 2004a). PacifiCorp (2004a) estimates that based on smolt-to-adult survival studies conducted on Iron Gate fall Chinook salmon, the Iron Gate Hatchery production contributes about 50,000 fish annually to the Chinook salmon, coho salmon, and steelhead fisheries, in addition to escapement back to the hatchery.

The net effect of hatchery releases on naturally occurring stocks is difficult to assess, with both positive and negative consequences potentially occurring due to a multitude of factors including, brood stock source, system carrying capacity, timing of release, degree of competition, and environmental selection pressures (NMFS 2017b), as discussed below. Potential benefits of hatchery releases include increases in adult abundance supporting fisheries and increased marine-derived nutrient transfer to freshwater systems from returning hatchery-origin adults (NMFS 2017b). Potential negative effects include genetic risks, competition and predation, hatchery facility effects on water quality, effects of weirs and other hatchery infrastructure, masking of current wild population status due to the presence of large numbers of hatchery-origin fish, incidental fishing pressure, and disease transfer from hatchery to wild fish. CDFW (2014) noted that in the Klamath River, adverse hatchery-related effects pose a very high stress to all life stages of natural salmon populations because hatchery origin adults make up greater than 30 percent of the total number of adults. Data from Ackerman et al. (2006) indicate that substantial straying of Iron Gate Hatchery fish may be occurring into important tributaries of the Middle Klamath River. Hatchery strays in the Klamath River (primarily of Chinook salmon) have the potential to reduce the reproductive success of natural salmonid populations (Mclean et al. 2003, Chilcote 2003, Araki et al. 2007) and negatively affect the diversity of the populations via outbreeding depression[68] (Reisenbichler and Rubin 1999). Returns of adult salmon to Iron Gate Hatchery, and fall-run Chinook salmon in particular, influence aquatic resources in the Middle and

[68] Outbreeding depression is the displacement of locally adapted genes in a wild population.

Lower Klamath River. Iron Gate Hatchery (RM 192.4) has a profound influence on Klamath River fall Chinook salmon in the vicinity of the hatchery. Kinziger et al. (2013) found the proportion of naturally spawning fall Chinook salmon of origin decreased with distance from the hatchery. Natural origin Chinook sampled in Bogus Creek (RM 192.6), Shasta River (RM 179.5), and the Scott River (RM 145.1) had decreasing proportions of hatchery genetics with increasing distance from the hatchery. The influence of Iron Gate Hatchery genetics on fall Chinook salmon is greatly diminished by the confluence with the Scott River.

A Hatchery Genetic Management Plan (HGMP) for the Iron Gate Hatchery (CDFW and PacifiCorp 2014) recently redefined the operation of this hatchery from a mitigation hatchery to one now operated to protect and conserve the genetic resources of the Upper Klamath population unit of the SONCC coho salmon ESU. Included in the HGMP are defined monitoring and evaluation activities to evaluate effects of the hatchery activities on the abundance, productivity, spatial structure, and diversity of the SONCC coho salmon and the magnitude or relative impact of the hatchery program on other actions that influence SONCC coho salmon.

Fall-run Chinook salmon returns to Iron Gate Hatchery and the blockage created by Iron Gate Dam, concentrate spawners and post-spawn carcass densities between Iron Gate Dam and the Shasta River confluence. As described in the *Disease and Parasites* section above, high parasite prevalence in the Lower Klamath River is considered to be a combined effect of high spore input from heavily infected, spawned adult salmon that congregate downstream from Iron Gate Dam and Iron Gate Hatchery and the proximity to dense populations of polychaetes (Bartholomew et al. 2007).

The release of Chinook salmon smolts and yearlings from Iron Gate Hatchery also affects disease interactions. The release from Iron Gate Hatchery overlaps temporally and spatially with the period of high infection potential, and studies suggest that therefore a high proportion of the Iron Gate Hatchery Chinook salmon stock can become infected with *C. shasta* and *P. minibicornis* (Som et al. 2016a). The hatchery-released juvenile fish that become infected and experience mortality lower in the Klamath River may become another source of myxospores to the Lower Klamath River.

The Chinook salmon released to the Klamath River annually also likely result in deleterious effects on natural spawning populations, including competitive pressure between hatchery-derived and natural origin fish in the limited habitat areas (e.g., thermal refugia) used by rearing juveniles in the Klamath River (NMFS 2010a). Iron Gate Hatchery releases Chinook salmon from the middle of May to the end of June, a period when discharge from Iron Gate Dam is in steep decline and water temperatures are rapidly rising, which may create competition between hatchery and natural fish (Chinook salmon, coho salmon, and steelhead) for food and limited resources, especially limited space and resources

in thermal refugia (NMFS 2010a). Negative hatchery effects due to competition, leading to displacement and lower growth, are well documented (Flagg et al. 2000, McMichael et al. 1997). Large releases of hatchery juveniles have also been shown to increase predation on and reduce survival of naturally produced juvenile salmonids (Kostow 2009). In the Clackamas River, Oregon, hatchery steelhead released in the upper basin resulted in an exceedance of system carrying capacity, resulting in negative outcomes for natural-origin fish (Kostow et al. 2003 and Kostow and Zhou 2006) and up to a 50 percent decline in the number of recruits per spawner and a 22 percent decline in the maximum number of natural-origin recruits. These trends appear to have reversed after releases of hatchery fish were discontinued in 2000. Such density-dependent negative effects of hatchery-released fish can extend even into the marine environment, especially during periods of poor ocean conditions (Beamish et al. 1997, Sweeting et al. 2003).

Algal Toxins

Algae produced in Upper Klamath Lake and the reservoirs in the Klamath Hydropower Reach (Copco No. 1 and Iron Gate reservoirs) may be deleterious to the health of aquatic organisms in Upper Klamath Lake and the Klamath River. Some cyanobacteria species, such as *Microcystis aeruginosa*, produce toxins that can cause irritation, sickness, or in extreme cases, death to exposed organisms (see Section 3.2.2.7 *Chlorophyll-a and Algal Toxins* and Appendix C.6). Algal toxins produced by *Microcystis aeruginosa* are prevalent in Upper Klamath Lake and the Keno Reservoir and these sources would remain under the Proposed Project. While direct links to fish health are still somewhat unclear, data collected from the Klamath Basin indicates that algal toxins bioaccumulate in tissue from fish and mussels at concentrations that may be detrimental to the affected species (Fetcho 2011), as discussed below.

While the Proposed Project would not affect the occurrence of algal toxins in Upper Klamath Lake, the following summary is provided to characterize ongoing research regarding the effects of microcystin toxin on native fish species in the Klamath Basin. A reconnaissance study was conducted in Upper Klamath Lake to evaluate the presence, concentration, and dynamics of microcystin exposure in Lost River sucker and shortnose suckers. The U.S. Geological Survey (USGS) collected water samples at multiple lake sites from July to October 2007 and June through September 2008 and found evidence of gastrointestinal lesions in juvenile suckers sampled from around the lake, although organ damage was absent from many fish and most of the affected fish were collected in the northern portion of the lake. The pathology of the lesions was consistent with exposure to microcystin, and evidence of a route of exposure was suggested by gut analysis showing that juvenile suckers had ingested chironomid larvae, which had in turn ingested *Aphanizomenon flos-aquae* and colonies of *Microcystis aeruginosa*. The authors hypothesized that the lesions were caused by algal toxins, and that the route of exposure to toxins was an oral route through the food chain, rather than exposure to dissolved toxins at the gills (VanderKooi et al.

2010). Based on these observations, NMFS and USFWS (2013) cited high microcystin levels as a "possible high threat" to Lost River and shortnose suckers in the 2013 joint NMFS and USFWS Biological Opinion. Further research conducted by Saraf et al. (2018) found that early life stage fish exposed to natural levels of microcystin had reduced larval survival rates, premature hatching, yolk sac edema, and stunted growth rates. Additionally, early life stage fish exposed to natural levels of microcystin experienced cardiotoxic effects which resulted in poor heart development and reduced survival (Saraf et al. 2018).

In the Hydroelectric Reach and the Klamath River downstream from Iron Gate Dam, the occurrence of microcystin toxin in fish and mussel tissue has been reported in multiple studies with variable results depending on season, location, and fish species (Fetcho 2006; Kann 2008; CH2M Hill 2009a,b; Prendergast and Foster 2010; Kann et al. 2010 a,b; Kann et al. 2013; Fetcho 2011). During July through September 2007, 85 percent of fish and mussel tissue samples collected from the Klamath River, including samples from Iron Gate and Copco No. 1 reservoirs, exhibited microcystin bioaccumulation, with the total microcystin congeners ranging from less than detection levels to 2,803 ng/g (Kann 2008). While it is not known whether the levels of microcystin bioaccumulation measured in 2007 were harmful to fish and/or mussel populations, levels exceeded the public health guidelines defined by Ibelings and Chorus (2007), indicating that ingestion of the fish or mussels would potentially pose a health hazard to humans (Kann 2008). Within Copco No. 1 and Iron Gate reservoirs, samples of muscle and liver tissues from resident fish (e.g., yellow perch [*Perca flavescens*] and crappie [*Pomoxis nigromaculatus*]) exhibited detectable levels of two of eight microcystin congeners (i.e., chemically different forms of microcystin) in muscle and liver tissues of 36 yellow perch samples during September 2007 (Kann 2008). Unbound or "free" microcystin (the form of microcystin that could be further bioaccumulated if the fish were to be ingested by humans or other predators) was not detected in muscle tissues of yellow perch and crappie during May, June, July, September, and November 2008 (total samples = 196) (CH2M Hill 2009a). In 2010, algal toxins were found in salmonid tissues collected from the Middle Klamath River near Happy Camp (Kann et al. 2013). In contrast, data from 2008 and 2009 did not show microcystin bioaccumulation in the tissue and liver samples from fish collected from Copco No. 1 and Iron Gate reservoirs (CH2M Hill 2009, PacifiCorp 2010).

Further downstream in the Lower Klamath River, Fetcho (2006) reported that liver and muscle tissue samples from five Chinook salmon taken from the Klamath River at or near Weitchpec (near RM 43.3) in 2005 did not contain detectable levels of microcystin. However, two steelhead liver samples, collected on October 3, 2005 did contain measurable levels of microcystin at trace and 0.54 ug/g concentrations. PacifiCorp collected liver and muscle tissue samples from five Chinook salmon and three steelhead in the middle Klamath River and the Lower Klamath River downstream from the Trinity River in October 2007 and

reported that no detectable levels of un-bound or "free" microcystin (the form of microcystin that could be further bioaccumulated if the fish were to be ingested by humans or other predators) were found (CH2M Hill 2009b). Because fish livers are not typically consumed, those fish exhibiting elevated microcystin levels in liver tissue may not have posed a public health concern with respect to consumption.

While it is not known whether the levels of microcystin measured in the Lower Klamath River fish tissue samples were harmful to fish populations, the range of concentrations (up to approximately 2,800 ng/g) indicate that direct effects to fish health due to microcystin exposure such as stress and/or disease are a possibility (Kann et al. 2013). During the October period that Chinook salmon samples were collected, the 2010 longitudinal microcystin sampling in river water showed very high microcystin levels being exported from Iron Gate Reservoir and transported downstream to areas where Chinook salmon were migrating upstream. The variation in fish tissue results in Copco No. 1 and Iron Gate reservoirs and the Klamath River downstream from Iron Gate Dam across multiple studies suggests that a combination factors is likely to influence the concentration of microcystin in fish tissue, including patchy distributions of algal blooms within the Lower Klamath Project reservoirs and the downstream Klamath River, the ability of fish to move in and out of algal bloom areas where microcystin is likely most prevalent, and food web interactions that may result in differing degrees of bioaccumulation depending on the fish species.

Microcystin can also bioaccumulate in the tissue of mussels in the Lower Klamath River. Kann (2008) reported on the concentrations of eight individual microcystin congeners in freshwater mussel tissue samples obtained from the Klamath River in July and November 2007. Microcystin congeners were detected in July in composite and individual tissue samples from the Klamath River near the Klamath Highway Rest Area (at RM 178), near Seiad Valley (at RM 132.7) and at Big Bar (near RM 51). Individual mussel samples taken later in the year in November from the Klamath River near Orleans (at RM 59), near Happy Camp (at RM 108), near Seiad Valley (at RM 132.7), at the Brown Bear River Access (at RM 157.5), and near the Klamath Highway Rest Area (at RM 178) did not contain detectable levels of microcystin congeners. As noted above, 85 percent of fish and mussel tissue samples collected during July through September 2007 in the Klamath River, including Iron Gate and Copco No. 1 reservoirs, exhibited microcystin bioaccumulation (Kann 2008). While it is not known whether the levels of microcystin measured in the Lower Klamath River mussel tissue samples were harmful to mussel populations, results indicated that all of the World Health Organization (WHO) total daily intake guideline values were exceeded, including several observations of values exceeding acute total daily intake thresholds (Kann 2008). In a retrospective letter to PacifiCorp (August 6, 2008), the California OEHHA stated that they "would have recommended against consuming mussels from the affected section of the Klamath River, and yellow perch from Iron Gate and Copco No. 1 Reservoirs,

because their average concentrations exceeded 26 nanograms per gram (ng/g)," which is the OEHHA upper bound of advisory tissue levels fish or shellfish consumption (for a single serving per week based on 8 ounces uncooked fish). Additional public health advisories were issued in 2009 and 2010 in Copco No. 1 and Iron Gate reservoirs, as well as downstream locations in the Klamath River (including locations on the Yurok Reservation), for microcystin levels in ambient and/or freshwater mussel tissue (Kann et al. 2010a,b, Fetcho 2011).

Aquatic Habitat and Instream Flows

Instream flows influence habitat availability for aquatic species. USBR manages Upper Klamath Lake to meet the requirements of the biological opinions issued by NMFS for protection of coho salmon in the Klamath River and USFWS for protection of shortnose and Lost River suckers in Upper Klamath Lake, which are incorporated into contract requirements for USBR's Klamath Irrigation Project. The 2013 BiOp Flows served as the operational flow requirement for the Klamath River at the time of the Notice of Preparation for the Lower Klamath Project EIR (i.e., December 22, 2016) and the Draft EIR considered the potential effects of dam removal using the 2013 BiOp Flows to represent existing hydrology for the period May 2013 – March 2019. The flow-related analyses in this EIR acknowledge the re-initiation of consultation on the 2013 BiOp Flows by considering the 2017 court-ordered flushing and emergency dilution flow requirements downstream of Iron Gate Dam as interim flow requirements until completion of formal consultation. The 2017 court-ordered flushing and emergency dilution flows are not part of existing conditions hydrology for the Proposed Project, because they went into effect in February 2017 after the December 2016 Notice of Preparation was filed. The applicable biological opinion for the Klamath River is now the 2019 BiOp (NMFS 2019, USFWS 2019a). The 2019 BiOp Flows are analyzed in the Lower Klamath Project Final EIR as a second CEQA baseline, representing flows under new conditions defined and implemented during Final EIR development. Inclusion of two baseline hydrology regimes in the Lower Klamath Project Final EIR is consistent with CEQA Guidelines section 15125 (a). For additional detail, see Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*.

The Klamath Irrigation Project affects instream flows in the Klamath River downstream of Upper Klamath Lake, including the California portion of the Area of Analysis for aquatic resources. Studies to determine how fish habitat changes with flow have been conducted in portions of the Klamath River, including two reaches between J.C. Boyle Reservoir and Iron Gate Dam, for selected life stages of rainbow trout (BLM 2002) and seven locations between Iron Gate Dam and the Klamath River Estuary for selected life stages of Chinook salmon, coho salmon, and steelhead (Hardy et al. 2006).

The following sections describe the amount of flow-related aquatic species habitat in various portions of the Klamath. Where specific information is not available for a species or area, the analysis contained herein uses hydrologic

changes, species habitat requirements, and comparisons with those species for which there is specific information to qualitatively assess changes in flow-related habitat. This information was used to evaluate how the Proposed Project might result in changes to the amount of flow-related habitat. It was not possible to rely on the hydrologic record of the past decade for describing the amount of habitat available under existing conditions because of management actions made over the past eight years to protect listed fish species (e.g., minimum Upper Klamath Lake elevations, minimum flows downstream from Iron Gate Dam). These changes are described in the 2013 BiOp for the Klamath Irrigation Project (NMFS and USFWS 2013), and the instream flows under existing conditions are described in Table 3.6-8 in Section 3.6.2.2 *Basin Hydrology*.

The natural hydrograph (flow regime) of a river is the characteristic pattern of flow quantity, timing, rate of change of hydrologic conditions, and variability across time scales (hours to multiple years), all without the influence of human activities (Poff et al. 1997). There are no measured river discharge data downstream from Keno Dam prior to implementation of USBR's Klamath Irrigation Project. However, modeled flows downstream of Iron Gate Dam that explicitly remove the Klamath Irrigation Project flow component offer a reasonable approximation of natural discharge downstream of Keno Dam (USBR 2005). Model results indicate that the historical, natural hydrograph for the Klamath River and its tributaries was characterized by high spring flows triggered by melting snow, typically near the end of April, followed by receding flows during summer months, and the base flow condition by September (NRC 2004). This recurring seasonal flow pattern influenced the adaptations of native aquatic organisms, as reflected in the timing of their key life history stages (NRC 2004). Given the diversity of flows inherent to the natural hydrograph, the Klamath River historically supported a range of riverine habitats and allowed the various anadromous fish species and life history strategies to evolve over time.

Upper Klamath River and Connected Waterbodies

USBR manages Upper Klamath Lake to meet the requirements of the 2013 BiOp (NMFS and USFWS 2013)[69] and its contract requirements for USBR's Klamath Irrigation Project (USBR 2010). Aquatic habitat and instream flows in the Upper Klamath River upstream of the influence of J.C. Boyle Reservoir are not thoroughly analyzed for this EIR, since aquatic species within California are not heavily influenced by these flows other than through the operation of the USBR's

[69] As described in Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*, following implementation of the 2013 BiOp a court-order required USBR to implement three specific flows in the Klamath River: winter-spring surface flushing flows, winter-spring deep flushing flows, and spring-summer emergency dilution flows (U.S. District Court 2017a–c). The court-ordered flushing flows and emergency dilution flows are not part of existing conditions for the Proposed Project, because they went into effect after the Notice of Preparation was filed by the State Water Board in December 2016.

Klamath Irrigation Project, where the latter is controlled through the requirements of the 2013 BiOp (see below discussions).

Upper Klamath River − Hydroelectric Reach
Under its existing license, PacifiCorp operates the J.C. Boyle Powerhouse as a peaking facility, meaning that water is run through the powerhouse to generate electricity cyclically depending on water availability and power demand. Rapid changes in flow associated with hydropower peaking operations, can result in inhospitable conditions for aquatic species downstream. Peaking operations at J.C. Boyle Powerhouse result in fluctuating flows in the Hydroelectric Reach of the Upper Klamath River that vary based on power generation needs. For example, substantial changes in flow (from 350 to 3,000 cfs) can occur within the course of a single day in the 17-mile long J.C. Boyle Peaking Reach (the reach of the Klamath River between J.C. Boyle Powerhouse and Copco No. 1 Reservoir). These flow fluctuations in this reach can also result in rapid temperature changes between 5 and 59°F during the summer months (ODEQ 2010). These flow fluctuations may also result in stranding of fish and invertebrates (Dunsmoor 2006), reductions in aquatic invertebrate production (City of Klamath Falls 1986, as cited in Hamilton et al. 2011), displacement of fish, and higher energetic costs to fish to maintain their position (FERC 2007). In the trial-type hearing for the relicensing of the Klamath Hydroelectric Project (NMFS 2006a), it was found that this reach had lower macroinvertebrate drift rates than would occur without the hydroelectric project operations.

Middle and Lower Klamath River
As described in Section 3.1.6.1 *Klamath River Flows under the Klamath Irrigation Project's 2013 BiOp*, the 2013 BiOp provided minimum flows downstream of Iron Gate Dam for the protection of coho salmon. The 2013 BiOp also included an Environmental Water Account (EWA) with provisions for flow alterations to protect ESA-listed species, including the release of dilution/flushing water from Upper Klamath Lake to reduce juvenile coho salmon disease below Iron Gate Dam. The 2013 BiOp Flows served as the operational flow requirement for the Klamath River at the time of the Notice of Preparation for the Lower Klamath Project EIR (i.e., December 22, 2016) and the Draft EIR considered the potential effects of dam removal using the 2013 BiOp Flows to represent existing hydrology for the period May 2013–March 2019. As described in Section 3.1.6.3 *Klamath River Flows under the Klamath Irrigation Project's 2019 BiOp*, the 2019 BiOp, which is the current operational flow requirement for the Klamath River, also provides minimum flows downstream of Iron Gate Dam for the protection of coho salmon and an EWA with provisions for release of flushing flows, and the potential for release of dilution flows and/or enhanced spring flows, from Upper Klamath Lake to reduce juvenile coho salmon disease below Iron Gate Dam. Additional detail on flows and habitat in the Middle and Lower Klamath River are provided in Section 3.6.2.2 *Basin Hydrology*.

Klamath River Estuary and Pacific Ocean
Aquatic habitat within the Klamath River Estuary is highly influenced by freshwater inflows from upstream, and physical processes in the estuary such as sand-berm dynamics at the river mouth. The Klamath River Estuary spans approximately four to five miles upstream of the mouth. Wallace (1998) notes the formation of a sill at the river mouth in late summer or early fall causing a standing water backup up to six miles upstream. During high tides, saltwater was observed in the summer and early fall from the mouth upstream, ranging approximately 2.5 to four miles depending on the time period in which samples were taken (Wallace 1998).

Water temperatures in the Klamath River Estuary are related to temperatures and flows entering the estuary, the presence and location of a saltwater wedge, and the timing and duration of the formation of a sand berm across the estuary mouth. The saltwater wedge is formed when the estuary mouth is open and denser saltwater from the ocean sinks below the lighter fresh river water; the resulting wedge moves up and down the estuary with the daily tides. The saltwater wedge results in thermal stratification of the estuary with cooler, high salinity ocean waters remaining near the estuary bottom, and warmer, low salinity river water near the surface. Input of cool ocean water and fog along the coast minimizes extreme water temperatures much of the time (see also Section 3.2.2.2 *Water Temperature*).

Critical Habitat
The ESA requires that USFWS and NMFS designate critical habitat[70] for the listed species they manage. Critical habitat has been designated for four species within the California portion of the Area of Analysis for aquatic resources: coho salmon, shortnose suckers, Lost River suckers, and eulachon. The endangered population of Southern Resident Killer Whales that includes Klamath River salmon in its diet is also discussed here, and critical habitat for green sturgeon is discussed as well, despite the exclusion of Klamath River from the critical habitat designation.

Coho Salmon
Critical habitat for the SONCC coho salmon ESU was designated on May 5, 1999 and includes the water, substrate, off-channel habitat, and adjacent riparian zones of estuarine and riverine reaches accessible to listed coho salmon between Cape Blanco, Oregon and Punta Gorda, California. Marine areas were excluded from the final critical habitat designation. “Accessible reaches” are

[70] The ESA defines critical habitat as “the specific areas within the geographical area occupied by the species, at the time it is listed, on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and specific areas outside the geographical area occupied by the species at the time it is listed that are determined by the Secretary to be essential for the conservation of the species.”

defined as those within the historical range of the ESU that can still be occupied by any life stage of coho salmon. Specifically, in the Klamath Basin, all river reaches downstream from Iron Gate Dam on the Klamath River and Lewiston Dam on the Trinity River are designated as critical habitat (NMFS 1999b).

Features of critical habitat considered essential for the conservation of the SONCC ESU (NMFS 1997b) include (1) substrate, (2) water quality, (3) water quantity, (4) water temperature, (5) water velocity, (6) cover/shelter, (7) food, (8) riparian vegetation, (9) space, and (10) safe passage conditions. Primary Constituent Elements (PCEs) for SONCC coho salmon are described in NMFS (1999b) as follows: "In addition to these factors, NMFS also focuses on the known physical and biological features (PCEs) within the designated area that are essential to the conservation of the species and that may require special management considerations or protection. These essential features may include, but are not limited to, spawning sites, food resources, water quality and quantity, and riparian vegetation."

Shortnose Sucker and Lost River Sucker

The final designation of critical habitat for shortnose and Lost River suckers was published by the USFWS on December 11, 2012 (USFWS 2012a). The proposed critical habitat area is within Klamath and Lake Counties, Oregon, and Modoc County, California. Critical habitat units include: (1) approximately 146 stream miles and 117,848 acres of lakes and reservoirs for Lost River sucker; and (2) approximately 128 stream miles and 123,590 acres of lakes and reservoirs for shortnose sucker (USFWS 2012a).

The 2013 Revised Recovery Plan (USFWS 2012b) identifies a recovery unit for both shortnose and Lost River within the California portion of the Area of Analysis: the reservoirs along the Klamath River downstream of Keno Dam (including Copco No. 1, Copco No. 1, and Iron Gate reservoirs), known as the Klamath River Management Unit.

When proposing critical habitat, USFWS considers the physical and biological features essential to the conservation of the species which may require special management considerations or protection. These include, but are not limited to: (1) space for individual and population growth and for normal behavior; (2) food, water, air, light, minerals, or other nutritional or physiological requirements; (3) cover or shelter; (4) sites for breeding, reproduction, or rearing (or development) of offspring; and (5) habitats that are protected from disturbance or are representative of the historical, geographical, and ecological distributions of a species. PCEs are the specific elements of physical and biological features that are essential to the conservation of the species. The PCEs identified in the critical habitat designation are as follows: (1) water in sufficient depths and quantity; (2) spawning and rearing habitat; and (3) areas that contain abundant food (USFWS 2012b). The 2013 Revised Recovery Plan (USFWS 2012b) cites predominant threats to these suckers as lack of spawning habitat, continued loss

of habitat, lake elevation fluctuations that reduce access to vegetated habitat, water diversions, competition and predation by introduced species, hybridization with other sucker species, isolation of remaining habitats, and drought. Degradation of water quality resulting from timber harvest, dredging activities, removal of riparian vegetation, and livestock grazing may also cause problems for these species (USFWS 2012b).

Green Sturgeon

In 2009, NMFS designated critical habitat for the Southern DPS of green sturgeon which encompasses all coastal marine waters of the United States less than 60 fathoms deep (approximately 360 ft) from Monterey Bay, California north to Cape Flattery, Washington. The estuary portion of the Eel and Klamath/Trinity rivers was specifically excluded from the critical habitat designation (NMFS 2009b). The Northern DPS of green sturgeon, the only DPS documented to occur in the Klamath Basin, is not federally listed and therefore critical habitat has not been designated for this DPS.

Eulachon

Critical habitat for the Southern DPS eulachon in the Klamath River was designated by NMFS on October 20, 2011 (NMFS 2011). NMFS designated approximately 539 miles of riverine and estuarine habitat in California, Oregon, and Washington within the geographical area occupied by the Southern DPS of eulachon. The designation includes 16 rivers and creeks extending from and including the Mad River, California to the Elwha River, Washington. NMFS did not include any nearshore marine or offshore areas in the Eulachon critical habitat designation. NMFS did not identify any unoccupied areas as being essential to conservation and thus, did not designate any unoccupied areas as critical habitat. Tribal lands were excluded from designation after evaluating the impacts of designation and benefits of exclusion associated with Tribal land ownership and management by the Tribes. NMFS excluded from designation all lands of the Lower Elwha Tribe, Quinault Tribe, Yurok Tribe, and Resighini Rancheria. These lands were excluded because designating these Tribes' Indian lands as critical habitat would have an impact on federal policies promoting Tribal sovereignty and self-governance. In the Lower Klamath River, designated critical habitat extends from the mouth of the Klamath River upstream to Omogar Creek, a distance of 10.7 miles, excluding tribal lands. The physical or biological features essential for conservation of this species include: (1) freshwater spawning and incubation sites with water flow, quality, and temperature conditions and substrate supporting spawning and incubation; (2) freshwater and estuarine migration corridors free of obstructions with water flow, quality and temperature conditions supporting larval and adult mobility, and with abundant prey items supporting larval feeding after the yolk sac is depleted; and (3) nearshore and offshore marine foraging habitat with water quality and available prey, supporting juveniles and adult survival.

Southern Resident Killer Whale
In November 2006, NMFS designated critical habitat for Southern Resident Killer Whales (NMFS 2006c). Critical habitat includes all waters seaward from a contiguous line delimited by the 20-foot depth relative to extreme high water within three designated areas: (1) the Haro Strait and waters around the San Juan Islands; (2) Puget Sound; and (3) the Strait of Juan de Fuca. Coastal and offshore areas have not been designated as critical habitat, though they are recognized as important for the Southern Resident Killer Whales. No critical habitat for Southern Resident Killer Whales occurs within the Area of Analysis for aquatic resources. However, the PCEs for Southern Resident Killer Whales includes: (1) water quality to support growth and development; (2) prey species of sufficient quantity, quality and availability to support individual growth, reproduction and development, as well as overall population growth; and (3) passage conditions to allow for migration, resting, and foraging.

Within the Area of Analysis, the PDE for "prey species" is relevant. During winter, two of the three pods of Southern Resident Killer Whales (named the K and L Pods) frequent the outer west coast of the United States as far south as California, eating Columbia/Snake River, Central Valley, Puget Sound, Fraser River, and other coastal stocks of Chinook salmon. While Southern Resident Killer Whales have been shown to consume Klamath River Chinook Salmon, the Klamath River is considered by NMFS and WDFW tenth out of the 17 priority Chinook Salmon populations for Southern Resident Killer Whales (NMFS 2018b, NMFS and WDFW 2018).

Essential Fish Habitat (EFH)
EFH is designated for commercially fished species under the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act (Magnuson-Stevens Act). The Magnuson-Stevens Act (section 3) defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Adverse effects occur when EFH quality or quantity is reduced by a direct or indirect physical, chemical, or biological alteration of the waters or substrate, or by the loss of (or injury to) benthic organisms, prey species and their habitat, or other ecosystem components. The Magnuson-Stevens Act requires federal fishery management plans, developed by NMFS and the Regional Fishery Management Councils, to describe the habitat essential to the fish being managed and to describe threats to that habitat from both fishing and non-fishing activities. To protect EFH, federal agencies are required to consult with NMFS on activities that may adversely affect EFH.

EFH has been designated for three species of salmon, 83 groundfish species, and five pelagic species in the Area of Analysis for aquatic resources. EFH includes freshwater, estuarine and marine waters for salmon, and marine waters for coastal pelagic and groundfish species. More specific descriptions of EFH are provided below.

Chinook and Coho Salmon
Coho and Chinook salmon are managed under the Magnuson-Stevens Act and EFH is described in Amendment 14 to the Pacific Coast Salmon Fishery Management Plan (PFMC 2012). EFH for Chinook salmon is also described in the same management plan and is identical to that for coho salmon in the Klamath Basin. EFH has been designated for the mainstem Klamath River and its tributaries from its mouth to Iron Gate Dam, and upstream the Trinity River to Lewiston Dam. EFH includes the water quality and quantity necessary for successful adult migration and holding, spawning, egg-to-fry survival, fry rearing, smolt migration, and estuarine rearing of juvenile coho and Chinook salmon.

Groundfish
EFH for Pacific Coast groundfish includes all waters and substrate within areas with a depth less than or equal to 1,914 fathoms (approximately 3,500 meters) shoreward to the mean higher high-water level or the upstream extent of saltwater intrusion (defined as upstream and landward to where ocean-derived salts measure less than 0.5 ppt during the period of average annual low flow). The Klamath River Estuary, which extends from the river's mouth upstream to near the confluence with Ah Pah Creek, is included in the Pacific groundfish EFH (50 CFR § 660.395).

Pelagic Fish
EFH for coastal pelagic species, including finfish (northern anchovy, Pacific sardine, Pacific [chub] mackerel, and jack mackerel) and market squid, occurs from the shorelines of California, Oregon, and Washington westward to the exclusive economic zone[71] (370 km off coast) and above the thermocline where sea surface temperatures range from 50 to 78.8ºF. During colder winters, the northern extent of EFH for coastal pelagic species may be as far south as Cape Mendocino, and during warm summers it may extend into Alaska's Aleutian Islands. In each of these seasonal examples, the Klamath River Estuary and coastline would be included as EFH for these species.

3.3.3 Significance Criteria

The Proposed Project could affect aquatic resources directly or indirectly, and through a variety of mechanisms. These effects could be additive or offsetting. In determining the significance criteria, the Lower Klamath Project EIR analysis considers the total effect of the factors described above on native fish populations and their habitat in relation to the Proposed Project. These impacts could vary substantially in intensity, severity, geographic extent, population-level impact, and duration. The intensity of an impact refers to how severely it affects an organism. This severity can range from sublethal behavioral adaptations such as avoidance of a specific condition, to mortality. The geographic extent refers to

[71] Exclusive economic zone is a sea zone prescribed by the United Nations Convention on the Law of the Sea over which a state has special rights regarding the exploration and use of marine resources.

how much of the species' potential habitat is affected. Population-level impact refers to the proportion of the total population that is expected to be affected. As described above in Section 3.3.2.1 *Aquatic Species [coho salmon]*, Williams et al. (2006) described nine population units of coho salmon in the Klamath Basin to support recovery planning for the listed coho salmon SONCC ESU. Analysis of coho salmon in this EIR considers impacts and benefits for each of the nine population units in the Klamath Basin separately but makes a significance determination for all population units combined within the Klamath Basin to be consistent with the approach to assessing other aquatic species populations, and to be consistent with the NMFS 2014 Southern Oregon/Northern California Coast (SONCC) Recovery Plan, which assesses all of the coho salmon in the Klamath River Basin as part of the same ESU. Duration refers to how long the effect is anticipated to persist (hours, days, months, or years), and considers resiliency of the population to the impact (e.g., resilient populations recovery more quickly to impacts). Criteria for determining significant impacts on aquatic resources are also informed by Appendix G of the CEQA Guidelines (California Code of Regulations title 14, section 15000 et seq.).

The Lower Klamath Project EIR considers short- and long-term effects to aquatic resources. For the Proposed Project aquatic resources impact analysis, short term is defined as less than five years following dam removal (unless otherwise indicated), which includes the periods of reservoir drawdown, dam deconstruction, and early restoration activities. A period of five years was selected as short-term, because for most aquatic resources this represents one to two generations. Long term is defined as more than five years following dam removal (unless otherwise indicated), which in most cases is more than two generations.

In the short term, effects of the Proposed Project would be significant if they:

- Substantially reduce the abundance of a year class for aquatic species, based on a comprehensive analysis that includes numeric analysis where available, qualitative analysis, and other relevant information. Any reduction of 50 percent or greater of a year class is necessarily a substantial reduction.
- Substantially decrease the quality or availability of habitat for a native aquatic species, based on a comprehensive analysis that includes numeric analysis where available, qualitative analysis, and other relevant information. Any reduction in habitat area of 50 percent or greater is necessarily a substantial reduction.
- Substantially decrease the quality of designated PCEs, or availability of designated critical habitat under the ESA, or EFH under the Magnuson-Stevens Act, based on a comprehensive analysis that includes numeric analysis where available, qualitative analysis, and other relevant information. Any reduction in habitat area of 50 percent or greater is necessarily a substantial reduction.

In the long term; five years after removal of all dams, effects of the Proposed Project would be significant if they:

- Substantially reduce the abundance of an adult population or year class for aquatic species in any one generation, based on a comprehensive analysis that includes numeric analysis where available, qualitative analysis, and other relevant information. Any reduction of 50 percent or greater of a year class is necessarily a substantial reduction.
- Substantially decrease the quality or availability of habitat for a native aquatic species, based on a comprehensive analysis that includes numeric analysis where available, qualitative analysis, and other relevant information. Any reduction in habitat of 50 percent or greater is necessarily a substantial reduction.
- Substantially decrease the quality of designated PCEs, or availability of designated critical habitat under the ESA, or EFH under the Magnuson-Stevens Act, based on a comprehensive analysis that includes numeric analysis where available, qualitative analysis, and other relevant information. Any reduction in habitat of 50 percent or greater is necessarily a substantial reduction.

3.3.4 Impact Analysis Approach

This section provides an overview of the methods used in the evaluation of aquatic resources. This section is organized to describe methods used to evaluate effects on physical habitat (e.g., from suspended sediment, bed elevation, water quality, etc.), as well as the methods used to address effects on biological process such as fish disease and parasites. Methods are also described to specifically address aquatic habitat, critical habitat, Essential Fish Habitat (EFH), and communities that respond to environmental impacts unique from fish species such as freshwater mussels and benthic macroinvertebrates.

The following sources were assessed to determine the scope of existing local policies relevant to the Proposed Project:

- Del Norte County General Plan (Mintier & Associates et al. 2003):
  - Section 1 (Natural Resources/Conservation), Policies 1.A.1, 1.A.6, 1.A.14, 1.B.1, 1.C.1, 1.C.2, 1.C.3, 1.C.4, 1.E.2, 1.E.3, 1.E.8, 1.E.9, 1.E.11, 1.E.12, 1.E.28, and 1.E.29
- Humboldt County General Plan for Areas Outside of the Coastal Zone (Humboldt County 2017):
  - Conservation and Open Space Element, Water Resources Element, Policies BR-P4, BR-P11, BR-P12, BR-S2, BR-S4, BR-S6, WR-P5, WR-P23, WR-P39, and WR-P46
- Klamath County Comprehensive Plan (Klamath County 2010):
  - Goal 5 (Open Space, Scenic, and Historic Area and Natural Resources), Policy 16

- Siskiyou County General Plan (Siskiyou County 1980):
  - The Conservation Element (Siskiyou County 1973), Wildlife Habitat, Objectives 1, 5–8
  - The Land Use Element (Siskiyou County 1997), Policy 41.13

Most of the aforementioned policies (and objectives) are stated in generalized terms, consistent with their overall intent to protect aquatic resources, including special-status aquatic species. By focusing on the potential for impacts to specific aquatic resources within the Area of Analysis, consideration of the more general local policies listed above is addressed through the specific, individual analyses presented in Section 3.3.5 *[Aquatic Resources] Potential Impacts and Mitigation*.

The following sources were assessed to determine the scope of existing HCPs relevant to the Proposed Project and potential for overlap with the Primary Area of Analysis for Aquatic Resources: (a) PacifiCorp's Interim Operations Habitat Conservation Plan for the Klamath Hydroelectric Project (PacifiCorp 2012) and (b) Green Diamond Forest Habitat Conservation Plan (Green Diamond Resource Company 2018). These HCPs also provide generalized terms for protection of aquatic resources, including special-status aquatic species. Consideration of the HCPs is inherently addressed by the individual analyses presented in Section 3.3.5 *[Aquatic Resources] Potential Impacts and Mitigation*, which focus on the potential for impacts to specific special-status aquatic species and other aquatic resources defined in Area of Analysis.

3.3.4.1 Suspended Sediment

Suspended sediment can have a multitude of effects on aquatic species, including direct lethal impacts, or sublethal effects on behavior and physiology. The most commonly observed effects of suspended sediment on fish reported in the scientific literature include: (1) avoidance of turbid waters in homing adult anadromous salmonids, (2) avoidance or alarm reactions by juvenile salmonids, (3) displacement of juvenile salmonids, (4) reduced feeding and growth, (5) physiological stress and respiratory impairment, (6) damage to gills, (7) reduced tolerance to disease and toxicants, (8) reduced survival, and (9) direct mortality (Newcombe and Jensen 1996). Information on both concentration and duration of suspended sediment is necessary for understanding the potential severity of its effects on salmonids (Newcombe and MacDonald 1991). Herbert and Merkens (1961) stated that "there is no doubt that many species of fresh-water fish can withstand extremely high concentrations of suspended solids for short periods, but this does not mean that much lower concentrations are harmless to fish which remain in contact with them for a very long time." Effects of suspended sediment on fish may be exacerbated if pollutants or other stressors (e.g., water temperature, disease) are present as well.

As described in Appendix E of this EIR, the potential effects of suspended sediment on anadromous fish species for the Proposed Project were assessed using the SRH-1D model (Huang and Greimann 2010, as summarized in USBR 2012). The SRH-1D model provides an estimate of SSCs at different points on the Klamath River on a daily average estimate. This information is used to assess the impacts of SSCs on fish in dam removal years 1 and 2, based on the concentration and duration of exposure using an approach described by Newcombe and Jensen's (1996). Newcombe and Jensen (1996) reviewed and synthesized 80 published reports of fish responses to suspended sediment in laboratories, streams, and estuaries and established a set of equations to calculate "severity of ill effect" (SEV) indices. A suite of six equations were developed that evaluate the effects of suspended sediment (at various concentrations, durations of exposure, and particle sizes) on various taxonomic groups of fishes and life stages of species within those groups. These effects are compared to those that fish would be expected to encounter under existing conditions, as described in Section 3.6.1 *Summary of Available Hydrology Information for the Proposed Project*.

For each simulation year in the 48-year record, the duration of SSCs at a range of concentrations was calculated for each species and life-history stage (e.g., duration of SSC over 1,000 mg/L during spring-run Chinook salmon adult upstream migration). The results of modeling all potential years were summarized for each life-stage of each species assessed. Because the suspended sediment varies with hydrology, and in order to account for (and compare) the range of results and impacts that might occur under each alternative, three scenarios were selected for analysis, with the goal of defining a most likely impacts on fish scenario for the potential impacts to fish, as well as a reasonable range of potential impacts, encompassed by extremes—a "least impacts on fish scenario" and a "worst impacts on fish scenario." These represent the sediment concentrations for the median, the lowest 10 percent, and highest 10 percent of years in the available hydrological record.

- **Most-likely impacts on fish:** This scenario represents the conditions that are most likely to occur for each species and life stage—that is to say SSCs and durations with a 50 percent (median) exceedance probability for the mainstem Klamath River downstream from Iron Gate Dam. This means that there is an equal chance that the SSCs would be higher or lower than described. Exceedance probabilities were based on modeling SSCs for all water years from 1961 to 2009 under the Proposed Project.
- **Least impacts on fish:** This scenario represents the least impacts on fish from potential sediment-related impacts to a species and life stage. It uses suspended sediment concentrations and durations with a 90 percent exceedance probability. This means that under this rare, least-impacts-on-fish scenario the probability of these concentrations and durations being equal to or less than this level for each assessed species and life-stage in

any one year is 10 percent, and the probability of them being exceeded is 90 percent.

- **Worst impacts on fish:** This scenario represents the worst impacts on fish of potential sediment-related impacts to the species and life stage. It uses SSCs and durations with a 10 percent exceedance probability. This means that under this rare, worst-impacts-on-fish scenario the probability of these concentrations and durations being equal to or greater than this level for each assessed species and life-stage in any one year is 10 percent, and the probability of them being less than this level is 90 percent.

The likelihood, however, that conditions under the Proposed Project would track the aforementioned scenarios precisely for each species is slim. It is more likely that different species and different life stages would be exposed to different SSCs and durations within the ranges described. For example, there are relatively few instances in modeled hydrologic record in which the median "most-likely impacts on fish" condition would occur in the same water year for all life-stages of a given species, and even fewer instances in which the median condition would occur in the same water year for all species and all life-stages. For the "least impacts on fish" and "worst impacts on fish" scenarios, the predicted SSCs and durations would be unlikely to occur (10 percent probability) during nearly all water years in the modeled hydrologic record. There are even fewer, and potentially no, instances in which the "least impacts on fish" and "worst impacts on fish" scenarios for SSCs and durations would occur in the same water year for all life-stages of a given species, and no instances in which they would occur in the same water year for all species and all life-stages.

An alternative analytic approach was considered using predicted SSCs and exposure durations associated with a particular water year type. However, it was determined that this approach had too much potential to exaggerate or understate the range of possible impacts, as it did not provide sufficient granularity in terms of the range of possible conditions experienced by particular species and/or life stages.

In assessing impacts, the above scenarios were applied for each species, and for each life stage of that species, taking into account when the species and what percent of the population is likely to be present in the Klamath River mainstem (including avoidance behavior). This EIR analysis describes the range of potential impacts to various life stages of aquatic species including relative mortality rates and sublethal impacts and were evaluated against the relevant significance criteria.

3.3.4.2 Bed Elevation and Grain Size Distribution

As described in Section 3.11 *Geology, Soils, and Mineral Resources* and Appendix F of this EIR, the analysis of potential changes in channel bed elevations and grain size distribution in response to increased bedload supply

and transport also relied upon output from the SRH-1D model (Huang and Greimann 2010, USBR 2012). The changes were evaluated for a range of hydrologic conditions for short-term changes (using a 2-year timeframe) and long-term changes (including analysis of 5, 10, 25, 50 years in the future) changes using a range of flows taken from historical hydrology. For bedload dynamics two years following the changes associated with dam removal is considered sufficient for assessing short-term impacts. Long-term simulations were not conducted for the Klamath River upstream of Iron Gate Dam based on observations that the bedload sediment conditions in that reach are relatively stable and persistent, and therefore at the end of 2 years following dam removal would be representative and would persist through time, allowing for mild fluctuations as a function of hydrology rather than project effects (USBR 2012).

The effects determination used analysis of the model results and knowledge of habitat requirements of affected fish species to determine how changes in bed elevation and substrate composition would affect aquatic resources (e.g., pool habitat, spawning gravel, benthic habitat). Changes in substrate composition occurring as a result of dam removal that decreased habitat suitability were assumed to be harmful to aquatic resources and were evaluated against the relevant significance criteria.

Bedload transport in the area upstream of the influence of J.C. Boyle Reservoir are not anticipated to be affected by dam removal and are not expected to be substantially affected by the Proposed Project, are not within California, and are not evaluated further in this EIR. Link River Dam and Keno Dam would remain in place and would continue to affect hydrology and sediment transport as they do currently.

3.3.4.3 Water Quality

The analysis of potential short-term (0−5 years) and long-term (5 or more years) water quality-related effects on fish under the Proposed Project is based on the water quality impacts analysis (see Section 3.2.5 *[Water Quality] Potential Impacts and Mitigation*) for parameters to which fish are sensitive (e.g., suspended sediment concentrations [SSCs], dissolved oxygen, pH), as well as effects determinations for state and approved tribal designated beneficial uses that are directly related to fish.

This EIR evaluates the potential effects of sediment-associated toxins on fish under the Proposed Project by using the results of multiple screening-level comparisons of sediment contaminant levels identified in reservoir sediments that are currently trapped behind the dams. These water quality methods are described in greater detail in Section 3.2.4.7 *Inorganic and Organic Contaminants*. Alterations in water quality occurring as a result of dam removal under the Proposed Project that are projected to decrease (or increase) habitat suitability or to result in direct effects on aquatic species are evaluated against the relevant significance criteria.

3.3.4.4 Water Temperature

The EIR uses water temperature output from three quantitative models (see Section 3.2.4.1 *[Impact Analysis Approach] Water Temperature* and Appendix D for details regarding the water temperature models) to evaluate the potential impacts related to changes in water temperature on species within each study reach of the Area of Analysis. Water temperature modeling results were compared to the thermal tolerances of focal species and associated life stages to determine relative suitability for these species under the Proposed Project. Thermal tolerances of focal salmonid species were defined for critical life-history stages using the widely accepted MWMT (Table 3.3-11). Alternative metrics, such as average daily water temperature, were considered to exceed the threshold only when greater than the MWMT, with the understanding that comparisons of differing metrics while not precise, are useful in determining the likelihood of temperature thresholds being met or exceeded. Criteria were selected based on USEPA (2003) guidelines for salmonids, specific to life-history stage.

Table 3.3-11. Salmonid Water Temperature Criteria.

Salmonid Life-history Stage	MWMT (°C)	MWMT (°F)
Adult Migration	20	68
Adult Migration plus Non-Core[1] Juvenile Rearing	18	64.4
Core[2] Juvenile Rearing	16	60.8
Spawning, Egg Incubation, and Fry Emergence	13	55.4

[1] Non-Core is defined as moderate to low density salmon and trout rearing usually occurring in the mid or lower part of the basin ("moderate" and "low" not specially defined).

[2] Core is defined as areas of high-density rearing ("high" is not specifically defined) (USEPA 2003).

Changes in water temperature occurring as a result of dam removal that were predicted to decrease (or increase) habitat suitability or result in direct effects on aquatic species were evaluated against the relevant significance criteria.

3.3.4.5 Fish Disease and Parasites

Fish diseases, specifically *C. shasta* and *P. minibicornis*, have periodically contributed to substantial mortality for Klamath River salmonids (discussed in detail in Section 3.3.2.3 *Habitat Attributes Expected to be Affected by the Proposed Project*). Environmental variables such as temperature, flow, sediment (bedload composition and stability), plankton (high quality food abundance), and nutrients are thought to affect the abundance of *P. minibicornis* and *C. shasta* via

habitat for the intermediate invertebrate host (annelid polychaete worm *Manayunkia speciosa*); therefore, differences in river habitat conditions that are predicted under the Proposed Project are anticipated to affect the abundance of these parasites and their infection rates in Klamath Basin salmonids. Bartholomew and Foott (2010) prepared a compilation of available information regarding Myxozoan disease relative to the Klamath River and, in their analysis they considered several factors that could, if co-occurring, lead to high disease infection rates of fish, including:

- Physical habitat components that support the invertebrate host species (pools, eddies, sediment, mats of filamentous green algae [periphyton])
- Microhabitats with low velocity and unnaturally stable flows
- Close proximity to salmon spawning areas
- Water temperatures higher than 59°F

Ich and columnaris may also occasionally have a substantial impact on aquatic resource (e.g., 2002 fish kill, CDFW 2004). Factors that could, if co-occurring, lead to high Ich and columnaris infection rates of fish, including:

- Exceptionally low flows
- Water temperatures higher than 59°F
- High densities of fish (such as adult Chinook salmon migrating upstream in the fall and holding at high densities in pools).

The potential effects of the Proposed Project on fish disease were evaluated based on the predicted effect of dam removal on the environmental factors that drive disease infection rates. The predicted outcome for increased or decreased fish disease and mortality were evaluated against the relevant significance criteria.

3.3.4.6 Aquatic Habitat

To assess the effect of the Proposed Project on available aquatic habitat, changes to habitat area were assessed for each life stage qualitatively, using available data on suitable habitat area upstream of existing barriers predicted to be affected by the alternatives, habitat requirements, and expected changes in instream flows under the alternatives. Qualitative analyses in this EIR rely on data evaluated for other affected factors (water temperature and fish passage) and expected changes in geomorphic processes, such as short- and long-term changes in sediment transport and deposition, to determine increases or decreases in habitat relative to existing conditions for the different species and life stages in the various reaches. Changes in aquatic habitat quality and quantity occurring as a result of dam removal were evaluated against the relevant significance criteria.

3.3.4.7 Critical Habitat

NMFS has designated critical habitat for coho salmon, Southern Resident Killer Whales, and eulachon, and USFWS has designated critical habitat for shortnose and Lost River suckers. Within critical habitat, NMFS and USFWS has determined that the PCEs essential for the conservation of these species are those sites and habitat components that support one or more life stage. Critical habitat for Southern Resident Killer Whales does not extend into coastal or offshore habitats (NMFS 2006c). The effects of each alternative on critical habitat were based on evaluation of the physical, chemical and biological changes that were expected to occur to designated critical habitat within the Area of Analysis for aquatic resources and how those changes would affect the PCEs (for those species for which PCEs have been designated) for that critical habitat in the short- and long-term; and were evaluated against the relevant significance criteria for critical habitat.

3.3.4.8 Essential Fish Habitat

The effects of the Proposed Project and each alternative on EFH were based on evaluation of the physical, chemical and biological changes that were expected to occur to EFH within the Area of Analysis for aquatic resources and whether those changes would have short- and long-term negative or beneficial effects on this habitat in terms of its quantity and quality; and were evaluated against the relevant significance criteria for EFH.

3.3.4.9 Freshwater Mollusks

Increased levels of fine sediment, both suspended in the water column and along the channel bed, can inhibit the growth, production, and abundance of freshwater mollusks (especially mussels and clams). Therefore, the analysis of impacts associated with the Proposed Project focuses on short- and long-term changes in SSCs (Aldridge et al. 1987, as cited in Henley et al. 2000) and stream substrate texture (Howard and Cuffey 2003, Vannote and Minshall 1982). The evaluation focuses on freshwater mussels because of their similar distribution to other freshwater mollusks, similar habitat requirements, their longer life-span, and lack of information regarding the effects of sediment on clams and other mollusks. Suspended sediment impacts on freshwater mussel species were evaluated using output from the SRH-1D (Huang and Greimann 2010) sediment transport model as discussed above for suspended and bedload sediment.

Aldridge et al. (1987, as cited in Henley et al. 2000) showed that exposure to SSCs of 600-750 mg/L led to reduced survival of freshwater mussels found in the eastern United States. No duration of exposure was cited in the study. No comparable data are available for the species in the Klamath River. Using 600 mg/L as the minimum SSCs that would be detrimental to freshwater mussels, alternatives were compared to each other by determining the number of days during which this criterion threshold would be exceeded.

Analysis of impacts due to changes in bedload transport on the four species of freshwater mussels considered modeled changes in median sediment size, under the Proposed Project. Changes in habitat quality and quantity predicted for mussels and clams, as well as predictions of potential direct impacts (mortality), were evaluated against the relevant significance criteria.

3.3.4.10 Benthic Macroinvertebrates

Benthic macroinvertebrates (BMI) are the primary food source for most freshwater fish species, and therefore, changes in abundance, distribution, or community structure can affect fish populations (see Section 3.3.2.1 *[Aquatic Species] Benthic Macroinvertebrates*). Suspended sediment and turbidity can cause stress to BMI populations through impaired respiration; reduced feeding, growth, and reproductive abilities; and reduced primary production (Lemly 1982, Vuori and Joensuu 1996). Therefore, potential short-term and long-term effects of the Proposed Project on BMIs were evaluated for both short- and long-term changes in SSCs and bedload sediment. Suspended sediment impacts on BMIs were evaluated using output from the SRH-1D (Huang and Greimann 2010) sediment transport model as discussed above for suspended and bedload sediment.

Changes in substrate size or embeddedness may influence the distribution, abundance, and community structure of BMIs (Bjornn et al. 1977, McClelland and Brusven 1980, Ryan 1991). Bed texture changes that would occur under the Proposed Project were qualitatively evaluated to determine whether changes in substrate composition would likely decrease macroinvertebrate abundance or alter the community composition to the extent that these communities could no longer support sufficient fish populations in the Area of Analysis for aquatic resources.

The effects on BMIs were based on water quality determinations (e.g., dissolved oxygen, toxicity) (see Section 3.2 *Water Quality*) and evaluated in the same manner as described for fish and mollusks. Changes in habitat quality and quantity predicted for BMIs, as well as predictions of potential direct impacts (mortality), were evaluated against the relevant significance criteria.

3.3.5 Potential Impacts and Mitigation

The Proposed Project would affect the physical, chemical, and biological components of habitat within portions of the Klamath Basin. These effects would result from changes in suspended sediment, bedload sediment, water quality, water temperature, disease and parasites, habitat availability, and flow-related habitat. As described in the following sections, these changes would act in both beneficial and harmful ways on species, critical habitat, and EFH. Some of the changes would be short-term, and others permanent. This section first describes the Proposed Project's anticipated effects on these key ecological attributes that

could affect aquatic resources. As was the case under the descriptions of key attributes under the Section 3.3.2.3 *Habitat Attributes Expected to be Affected by the Proposed Project*, this section includes, as relevant, specific analysis relevant to specific segments of the Area of Analysis. More detailed technical descriptions of the Proposed Project's projected effects on suspended sediment, bedload sediment, and potential impacts on aquatic species, can be found in Appendices E and F of this EIR. Based on the analysis of effects to key ecological attributes, this section then goes on to discuss specific impacts and evaluate them under the significance criteria, discuss mitigation measures, and determine impact significance.

3.3.5.1 Suspended Sediment

Suspended sediment effects under the Proposed Project are summarized here, and are described in more detail in Potential Impact 3.2-3 *Short-term increases in suspended sediments due to release of sediments currently trapped behind the Lower Klamath Project dams*, and Appendix E. As discussed below, suspended sediment analysis interprets model output from USBR (2012) with modifications in light of proposed changes to the drawdown rate that would increase the peak sediment concentrations and decrease the duration of such elevated concentrations.

Hydroelectric Reach

Sediment transport modeling of the impacts of dam removal indicate high short-term SSCs in the Hydroelectric Reach under the Proposed Project (USBR 2012, 2016). Modeled SSCs downstream of J.C. Boyle Reservoir would be high (>1,000 mg/L) in the short term, but concentrations would be considerably less than those anticipated to occur downstream from Copco No. 1 and Iron Gate reservoirs due to the relatively small volume of the sediment deposits behind J.C. Boyle Dam (eight percent of total volume for the Lower Klamath Project). The suspended sediments released from J.C. Boyle would quickly move into the California portion of the Hydroelectric Reach. Elevated suspended sediments in the Hydroelectric Reach during reservoir drawdown would be a significant and unavoidable impact (see Potential Impact 3.2-3). Predicted SSCs decrease to less than 100 mg/L within five to seven months following drawdown, and concentrations further decrease to less than 10 mg/L within six to 10 months following drawdown of J.C. Boyle Reservoir.

Modeling of sediment concentrations downstream of Copco No. 1 Reservoir during drawdown also indicates short-term sediment concentrations would be high (>5,000 mg/L) in the California portion of the Hydroelectric Reach due to dam removal. Predicted spikes in SSC after one to two months of reservoir drawdown correspond to increases in Klamath River flow through the Hydroelectric Reach due to spring storm events, and within six to 10 months following drawdown would decrease to levels that exist under existing conditions (e.g., <100 mg/L).

Middle and Lower Klamath River

Under the Proposed Project, full removal of the Lower Klamath Project reservoirs would result in the release of 5.3 to 8.6 million cubic yards (1.2 to 2.3 million tons) of sediment stored in the reservoirs into the Klamath River downstream from Iron Gate Dam (USBR 2012), resulting in higher SSCs than would normally occur under existing conditions. Reservoir drawdown (lowering of reservoir water surface elevation) is expected to commence in dam removal year 1, and to be completed in dam removal year 2 (Section 2.7.2 *Reservoir Drawdown*). Based on the suspended sediment modeling (USBR 2012), SSCs are expected to exceed 1,000 mg/L directly downstream of Iron Gate Dam for around two to three continuous months, with the potential for peak concentrations exceeding 5,000 mg/L for hours or days, depending on hydrologic conditions during dam removal. Model results indicate SSC would be highest during the period of greatest reservoir drawdown (January through mid-March of dam removal year 2), as erodible material behind the dams is mobilized downstream (see Potential Impact 3.2-3). During normal to dry water years, modeled SSCs would begin to decline in late March of dam removal year 2 and would continue declining through early summer of dam removal year 2 (USBR 2012). If it is a wet year, it may take longer to drain the reservoirs and high (>250 mg/L) concentrations may extend until June. Differences between the modeled conditions and the Proposed Project would be expected to increase the magnitude of peak SSCs but decrease the duration of elevated SSCs compared to modeled SSCs (see Potential Impact 3.2-3). The Proposed Project incorporates a higher maximum drawdown rate (i.e., 5 feet per day compared to 3 feet per day) and sediment jetting during drawdown that would transport more erodible material, so less erodible material would be available to be transported after drawdown concludes and SSCs potentially would decline more rapidly after drawdown. However, modeled SSCs are used as a conservative estimate of the duration of elevated SSCs. The SSCs would be near background conditions for all water year types within the first year following removal. Tributaries between the Hydroelectric Reach and the estuary contribute a significant amount of both water and suspended sediments to the Klamath River mainstem (USBR 2012). This causes the influence of Lower Klamath Project reservoir sediment releases to decline in the downstream direction. At Iron Gate Dam (Figure 3.2-11 through 3.2-13), where SSCs are artificially low under existing conditions (because of sediment trapping by the dam) SSCs would remain elevated above existing conditions throughout the first 2 years, and in the long term would decrease (as reservoir deposited sediments evacuated) to return to levels slightly higher than the current levels as sediment naturally transports downstream. At Orleans, where SSCs under existing conditions are higher because of inputs of tributaries, under a most-likely impact on fish scenario, the effects of the Proposed Project would be similar to existing conditions by late April when SSCs from the Proposed Project are predicted to decrease. Under a worst impacts on fish scenario SSCs are projected to remain somewhat elevated above existing conditions until October during the year of dam removal. By Klamath Station (downstream of confluence with Trinity River) SSCs under existing conditions are

higher than at the upstream sites as a result of sediment input from tributaries. As a result, SSCs from the Proposed Project and those under existing conditions would be similar under all scenarios by late spring of the year of dam removal.

Klamath River Estuary

As a result of the influence of Lower Klamath Project reservoir sediment releases declining in a downstream direction, the difference between SSCs from the Proposed Project and those under existing conditions would be relatively minor in the Klamath River Estuary (USBR 2012). The SSCs and durations under the most-likely impacts on fish scenario would be similar to those that occur under existing extreme conditions (10 percent exceedance) and resemble those that would be expected to occur about one in 10 years on average under existing conditions. Under the worst impacts on fish simulation, SSCs and durations would be slightly higher (around 10 percent) than those for the existing extreme conditions during the winter of dam removal.

Pacific Ocean Nearshore Environment

In contrast to the Lower Klamath River, modeled short-term SSCs following dam removal are not available for the nearshore marine environment adjacent to the Klamath River. Substantial dilution of the mainstem river SSCs is expected to occur in the nearshore under the Proposed Project. Based on data from 110 coastal watersheds in California, where nearshore SSCs were measured at greater than 100 mg/L during the El Niño winter of 1998 (Mertes and Warrick 2001), peak SSCs leaving the Klamath River Estuary from upstream sources including the Proposed Project may be diluted by 1 to 2 orders of magnitude; for example from greater than 1,000 mg/L to greater than 10–100 mg/L. Therefore, the SSCs in the nearshore ocean would be expected to be similar to what would occur during existing extreme conditions.

As described in detail in Potential Impact 3.2-3, during several large flood events on the geographically proximal Eel River in the winter of 1997 and 1998, Geyer et al. (2000) found that: 1) flood conditions were usually accompanied by strong winds from the southern quadrant; 2) the structure of the river plume was strongly influenced by the wind-forcing conditions; and 3) during periods of strong southerly (i.e., downwelling favorable) winds, the plume was confined inside the 164-ft isobath (i.e., sea floor contour at around 164-ft below the water surface), within about 4 miles of shore. Based upon Eel River plume studies and current knowledge of northern California oceanographic patterns, the fine sediment discharged to the Pacific Ocean nearshore environment under the Proposed Project would likely be delivered to the ocean in a buoyant river plume that hugs the shoreline as it is transported northward. However, since the flushing of sediments from behind the dams would occur over a number of weeks to months (and perhaps to some degree over 1–2 years), the plume carrying reservoir sediments would likely be influenced by a range of meteorological and ocean conditions (e.g., storm and non-storm periods, differing storm directions). Therefore, some of the time the plume would likely be constrained to shallower

nearshore waters, while at other times it would likely extend farther offshore and spread more widely, including within some or all of the Klamath River Management Zone. While elevated SSCs (i.e., 10–100 mg/L) created in the nearshore plume would affect physical water quality characteristics specified in the Ocean Plan (i.e., visible floating particulates, natural light attenuation, the deposition rate of inert solids), the effects are likely to be within the range of concentrations and duration caused by historical storm events.

River plumes and the associated habitat conditions they create are considered to be areas of high productivity for marine organisms (Grimes and Funucane 1991, Morgan et al. 2005), and create abrupt changes in marine water quality conditions (e.g., water temperature, salinity, sediment) that support salmonids (Schabetsberger et al. 2003, De Robertis et al. 2005). Due to the relatively small magnitude of SSCs released to the nearshore environment, the anticipated rapid dilution of the sediment plume as it expands in the ocean, and the relatively low rate of deposition of sediments to the Pacific Ocean nearshore environment bottom substrates, any SSCs elevations associated with the Proposed Project are not anticipated to have effects on species distinguishable from existing conditions.

3.3.5.2 Bed Elevation and Grain Size Distribution

The potential effects of increased bedload supply and transport on channel bed elevations and grain size under the Proposed Project are described in Appendix F and summarized in Potential Impact 3.11-5. As a result of the Proposed Project, the bedload transport processes that salmon evolved with and depend upon to provide substrate suitable for spawning and early rearing in streams and rivers (that are currently interrupted by the Lower Klamath Project dams) would be restored to a more natural condition.

3.3.5.3 Water Quality

Upper Klamath River and Connected Waterbodies

Dam removal activities under the Proposed Project would not affect water quality in the following areas of the Upper Klamath Basin: Wood, Williamson, and Sprague Rivers, Upper Klamath Lake, and Link River to the upstream end of J.C. Boyle Reservoir.

However, existing water quality problems have the potential to negatively impact anadromous salmonids' ability to access waters upstream of the Hydroelectric Reach under the Proposed Project. Water quality problems (e.g., excessive water temperatures and low dissolved oxygen) in the Keno Impoundment/Lake Ewauna during late spring, summer, and early autumn, led NMFS and USFWS to prescribe interim trap-and-haul measures in their Section 18 Prescriptions for the Klamath Hydroelectric Project (DOI 2006) to transport primarily adult fall-run Chinook salmon past Keno Impoundment/Lake Ewauna during periods when conditions would be harmful to salmonids. This would entail seasonal, upstream

trap and haul for primarily fall-run adult Chinook salmon around the Keno Impoundment/Lake Ewauna when dissolved oxygen and water temperatures do not meet the applicable criteria (i.e., typically during July through October), since migrating salmonids would have access to this reach of the Klamath River. In the downstream Keno Impoundment/Lake Ewauna, dissolved oxygen reaches very low levels (less than 1 to 2 mg/L) during July through October of most years as algae transported from Upper Klamath Lake settle out of the water and decay (see Figure 3.4-9 in Appendix C.4.1.1). During most years, the Keno Impoundment/Lake Ewauna reach of the Klamath River (Link River Dam to Keno Dam) maintains dissolved oxygen concentrations greater than 6 mg/L from mid-November through mid-June (Appendix C.4.1.1). These dissolved oxygen concentrations are generally acceptable for migrating adult anadromous salmonids (USEPA 1986) for these months and are typically above the ODEQ water quality objective for cool water aquatic life (6.5 mg/L minimum, see Section 3.2.2.5 *Dissolved Oxygen*). Under KHSA Section 7.5.1, the Secretary of the Interior shall initiate a study to evaluate disposition of Keno Dam, including fish passage. Eventual attainment of the Oregon (ODEQ 2002, 2010) and California (USEPA 2008) TMDLs for dissolved oxygen (and other water quality parameters that would improve dissolved oxygen [i.e., pH, chlorophyll-*a*]) would improve water quality in the Keno Impoundment/Lake Ewauna and potentially eliminate water quality as a potential limitation to fall-run Chinook salmon migration, and therefore the need for trap and haul activities around these waterbodies. However, full TMDL compliance does not reflect the existing condition and it would be speculative at this point to identify either the mechanisms necessary to implement the TMDLs or the timing required to achieve full compliance.

Upper Klamath River – Hydroelectric Reach

As described in Potential Impact 3.2-9, dam removal would result in short-term increases in oxygen demand and corresponding reductions in dissolved oxygen within the Hydroelectric Reach, with anoxia (0 mg/L) possible during reservoir drawdown periods when suspended sediment concentrations are at their peak (January to March of dam removal year 2). This would be a significant and unavoidable impact. In the long term, the Proposed Project would result in somewhat reduced daily fluctuations in dissolved oxygen in the Peaking Reach from the Oregon-California state line to Copco No. 1 Reservoir, which may be due to elimination of hydropower peaking operations (Potential Impact 3.2-10). Dissolved oxygen in the free-flowing river reaches replacing the reservoirs would no longer experience the extreme conditions of super-saturation (i.e., greater than 100 percent saturation) in surface waters and hypolimnetic oxygen depletion in bottom waters of Copco No. 1 and Iron Gate reservoirs during the April/May through October/November period, which would be generally beneficial.

Under the Proposed Project, pH in the Hydroelectric Reach would no longer experience high levels (pH greater than 9) during seasonal algal blooms in the surface waters of Copco No. 1 and Iron Gate reservoirs (Potential Impact 3.2-11). pH in the free-flowing reaches of the river replacing the reservoirs would not

exhibit such high levels, instead possessing a more typical riverine signal. While daily fluctuations in pH could occur due to periphyton growth in the river reaches previously occupied by Lower Klamath Project reservoirs, the increases are expected to consistently meet water quality objectives to support beneficial uses and would therefore be beneficial.

Middle and Lower Klamath River

Sediment release associated with dam removal under the Proposed Project would cause short-term increases in oxygen demand and corresponding reductions in dissolved oxygen (Potential Impact 3.2-9) in the Middle Klamath River. During reservoir drawdown periods when suspended sediment concentrations are at their peak (January to March of dam removal year 2), dissolved oxygen concentrations would drop to very low levels (potentially 0 mg/L) immediately downstream from Iron Gate Dam and, depending on background conditions at the time of reservoir drawdown, would remain below 5 mg/L until approximately the confluence with the Shasta River (RM 179.5), or as far downstream as RM 121.7 (approximately 10 miles downstream of Seiad Valley [RM 132]). Recovery to the North Coast Basin Plan water quality objective of 90 percent saturation (i.e., 10–11 mg/L) is anticipated to occur in the reach from Seiad Valley to the mainstem confluence with Salmon River (RM 66), and would therefore not affect dissolved oxygen in the Lower Klamath River, the Klamath River Estuary or the Pacific Ocean nearshore environment.

Removal of the Lower Klamath Project dams under the Proposed Project and conversion of the reservoir reaches to a free-flowing river would result in long-term seasonal (July through November) increases in dissolved oxygen for the reach immediately downstream from Iron Gate Dam (Potential Impact 3.2-10), which would be beneficial relative to existing conditions. Increased diel (i.e., 24-hour period) variability in dissolved oxygen would also occur in the reach immediately downstream of Iron Gate Dam to approximately Seiad Valley (RM 132.7), with modeled concentrations consistently in compliance with the Basin Plan water quality objective of 85 percent saturation. Long-term effects of dam removal on dissolved oxygen would diminish with distance downstream from Iron Gate Dam, with similar or the same predicted dissolved oxygen concentrations and similar magnitude and duration of diel fluctuations by Seiad Valley (RM 132.7) and no differences by the confluence with the Trinity River (RM 43.3).

Under the Proposed Project, pH in the Middle Klamath River downstream from Iron Gate Dam (particularly upstream of the Shasta River confluence [RM 179.5]) during late-summer and early-fall months (August–September) would experience generally high pH (8 to slightly greater than 9 s.u.) and large daily variations in pH during periods of high photosynthesis (Potential Impact 3.2-11). The magnitude of photosynthesis and community respiration from periphyton growth in the Middle Klamath River under the Proposed Project is not entirely certain, but differences in pH between the Klamath TMDL model “TMDL dams-in” (T4BSRN) and “TMDL dams-out” (TOD2RN) scenarios decrease in magnitude

with distance downstream from Iron Gate Dam, and are considerably dampened by the Scott River confluence (RM 145.1).

3.3.5.4 Water Temperature

Upper Klamath River – Hydroelectric Reach

Under the Proposed Project, the Hydroelectric Reach would no longer be dominated by hydropower peaking events and flows would more closely mimic the natural hydrograph. Elimination of peaking operations at J.C. Boyle Powerhouse would result in water temperatures in the J.C. Boyle Peaking Reach at the Oregon-California state line (RM 214.1) that exhibit slightly lower daily maximum values (0.0–3.6°F) and lower diel (i.e., 24-hour period) water temperature variation during June through September as compared to a "dams-in" condition, with temperatures moving toward the natural thermal regime (see also Potential Impact 3.2-1).

In the absence of the Lower Klamath Project reservoirs, hydraulic residence time (summarized in Table 3.6-4) in this reach would likely decrease to less than a day, and water temperature suitability for native aquatic species would be improved (Hamilton et al. 2011). Removal of the Lower Klamath Project reservoirs would result in a slight increase in flow as the evaporative losses would be reduced. Evaporation from the surface of the reservoirs is currently about 11,000 acre-feet/year and after dam removal the evapotranspiration in the same reaches is expected to be approximately 4,800 acre-feet/year, potentially resulting in a gain in flow to the Klamath River of up to approximately 6,200 acre-feet/year (USBR 2011). Whether this increase would contribute to increased instream flows or be used upstream to supplement irrigation deliveries is uncertain, so this EIR discloses the potential increase but does not rely on it for conclusions (see also Section 3.8.4 *[Water Supply/Water Rights] Impacts Analysis Approach*). The reservoir drawdowns would allow tributaries and springs such as Fall, Shovel, and Spencer creeks and Big Springs to flow directly into the mainstem Klamath River, creating patches of cooler water that could be used as temperature refugia by fish during summer and fall, as well as providing slightly warmer winter water temperatures (Hamilton et al. 2011), conducive to the growth of salmonids. To assess whether hot springs near the Shovel Creek confluence with the Klamath River heat the water to an extent that it would be necessary to assess impacts to fisheries, water temperatures were recorded in Shovel Creek on November 1, 2017, and were 3.3°F cooler than in the mainstem Klamath River (46°F in Shovel Creek), and 0.6°F cooler on December 5, 2017 (39.9°F in Shovel Creek) (KRRC 2018). On the same dates, water temperature data was collected both upstream and downstream of the Klamath Hot Springs, located in the Klamath River downstream of the confluence with Shovel Creek. Water temperatures on November 1, 2017 were 1.4°F warmer downstream of the hot springs, and 0.2°F cooler on December 5, 2017; no evidence of appreciable warming as a result of the hot springs was observed on these dates (KRRC 2018).

Temperature conditions would also improve farther downstream in the Hydroelectric Reach. From Copco No. 1 Reservoir to Iron Gate Reservoir, removal of the Lower Klamath Project reservoirs would result in a decrease in water temperatures during the summer and fall (discussed in detail in Potential Impact 3.2-1). The effects of changes in temperature regimes within this reach would be similar to those discussed in detail below for the Middle and Lower Klamath River.

Removing the Lower Klamath Project dams would allow access to tributaries upstream of Iron Gate Dam that could provide additional habitat for anadromous fish (DOI 2007), including groundwater-fed areas resistant to water temperature increases caused by changes in climate (Hamilton et al. 2011). In addition, the mainstem downstream from Iron Gate Dam would reflect natural temperature regimes (Hamilton et al. 2011). The conversion of an additional 22 miles of reservoir habitat to riverine and riparian habitat (Cunanan 2009) would improve water quality by restoring the nutrient cycling and aeration processes provided by a natural channel. These improvements resulting from implementing the Proposed Project would help to offset the anticipated late summer/fall stream water temperature increases resulting from climate change (see Potential Impact 3.2-1).

Middle and Lower Klamath River

The thermal lag caused by water storage in Lower Klamath Project reservoirs and the associated increased thermal mass would be eliminated in the Lower Klamath River under the Proposed Project (see Potential Impact 3.2-1). This elimination would cause water temperatures to become more in sync with historical migration and spawning periods for the Klamath River, warming earlier in the spring, and cooling earlier in the fall compared to existing conditions (Hamilton et al. 2011).

Fall-run Chinook salmon in the Klamath River are observed to primarily spawn in mid-October through early November when water temperatures are generally below 59°F (15°C) (Bartholow and Henriksen 2006). Therefore, under the Proposed Project cooler water temperatures during fall are anticipated to result in a shift in the median date of spawning from mid-October to mid-September (Figure 3.3-4). The shift in earlier spawning is predicted to result in a more rapid, and earlier date of emergence (Figure 3.3-4, FERC 2007). Under the Proposed Project, cooler water temperatures during fall and warmer springtime temperatures would result in fry emerging earlier (Sykes et al. 2009), encountering favorable temperatures for growth sooner than under existing conditions (Figure 3.3-4), which could support higher growth rates and encourage earlier outmigration downstream similar to what likely occurred under historical conditions, and reducing stress and disease (Bartholow et al. 2005, FERC 2007).

A predicted earlier outmigration in response to elevated water temperatures in the spring is also supported by a vast body of literature relating to increased growth rates and thermal response of outmigrating salmonids (as reviewed by Hoar 1988). In addition, fall-run Chinook salmon spawning in the mainstem during fall would have less of a risk of d delayed spawning related to water temperature (Bartholow and Henriksen 2006, FERC 2007), potentially reducing pre-spawn mortality in at least some years, and adult migration would occur in more favorable water temperatures than under existing conditions (Figure 3.3-5). Overall, these changes would result in water temperatures more favorable for salmonids in the mainstem Klamath River downstream from Iron Gate Dam.

The elimination of the thermal lag would also cause water temperatures to have natural diel variations (Figure 3.3-5) similar to what would have occurred historically in the Klamath River. This effect would be most pronounced downstream from Iron Gate Dam, would decline with distance downstream, and by the confluence of the Salmon River (RM 66) would exhibit no difference between the Proposed Project and existing conditions. The highest temperatures experienced by aquatic species would increase during summer (June through August), which could increase physiological stress, reduce growth rates, and increase susceptibility to disease during summer (Figure 3.3-5).

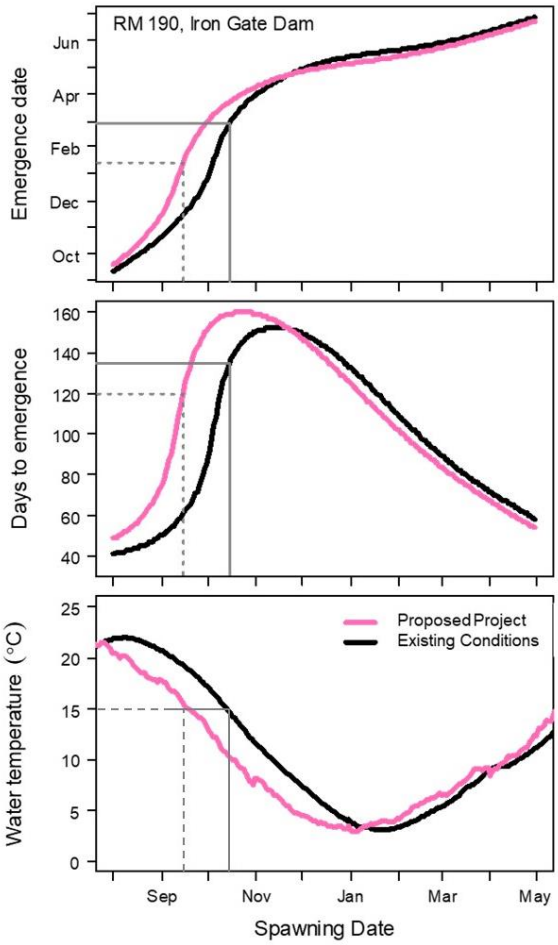

Figure 3.3-4. Modeled time Series of Average Daily Mean Water Temperature (lower panel) Predicted at Iron Gate Dam (RM 193.1) Under the Proposed Project and Existing Conditions. In the lower panel median date of spawning at 15ºC is shown for existing conditions (solid gray line) and Proposed Project (dashed gray line). Days to emergence (middle panel) and date of emergence (upper panel) for fall-run Chinook salmon was estimated as a function of spawning date assuming that emergence would occur at 889-degree days (accumulated heat related to development) after spawning. In the middle panel days to emergence is shown for existing conditions (solid gray line indicates timing based on existing conditions) and Proposed Project (dashed gray line indicates timing based on Proposed Project). In the upper panel median emergence date is shown for existing conditions (solid gray line indicates timing based on existing conditions) and Proposed Project (dashed gray line indicates timing based on Proposed Project). Source: Water temperature modeling based on Perry et al. (2011); emergence timing based on unpublished analysis conducted by R. Perry, USGS, June 2012. Provided in pers. comm. from Mark Hampton, CDFW, June 2012.

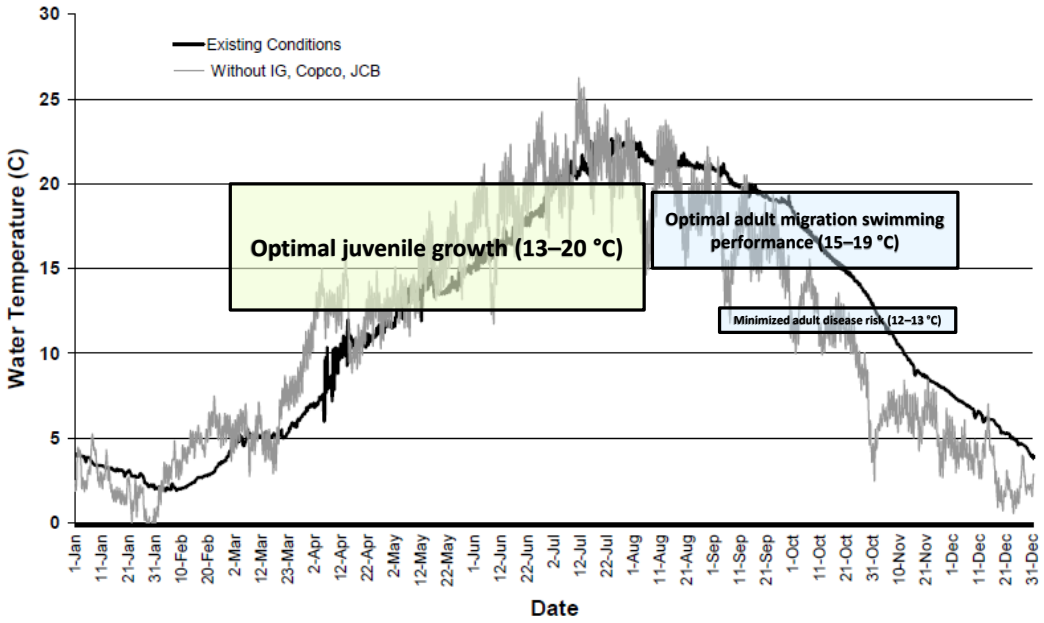

Figure 3.3-5. PacifiCorp (2005) simulated Hourly Water Temperatures Below Iron Gate Dam Based on a Dry Water Year (WY 2002) for Existing Conditions Compared to the Proposed Project (without Lower Klamath Project dams), and USEPA (2003) Water Temperature Criteria for Salmonid Growth and Migration. Note that simulated water temperatures are presented as hourly data, whereas USEPA criteria are expressed as mean weekly maximum temperature (MWMT).

However, the FERC EIS (2007) states that the increase in average and maximum daily temperatures may be compensated for by lower temperatures at night, which NRC (2004) concludes may allow rearing fish to move out of temperature refugia to forage at night, allowing growth to occur even when ambient day time temperatures are above optimal. Foott et al. (2012) observed positive growth and no apparent effect of elevated temperature on immune function or fitness in Klamath River juvenile Chinook salmon held over a 23-day period under conditions in the laboratory that simulated fluctuating water temperature profiles similar to what would be observed in the Klamath River under the Proposed Project. Salmonids in the Klamath River have been observed to use cooler hours to migrate between thermal refugia (Belchik 2003), and the decrease in minimum temperatures during the spring, summer, and fall under the Proposed Project would be beneficial for fish (Figure 3.3-5). Increased nighttime cooling of water temperatures is important to salmonids in warm systems, providing regular thermal relief, time for repair of proteins damaged by thermal stress, and significant bioenergetic benefits that help fish persist under marginal conditions (Schrank et al. 2003, NRC 2004). In addition, Dunsmoor and Huntington (2006) suggest that lower nighttime temperatures with dam removal

would allow fish to leave thermal refugia in the Klamath River to forage and thereby allow more effective use of the available refugia habitat. Overall, the Proposed Project reductions in minimum daily temperatures below those under existing conditions would benefit salmonids in the Klamath River mainstem, helping them to tolerate the warmer periods of the year when dwelling in the mainstem, but also allowing feeding excursions when confined to refugia during the warmer times of the day.

Simulations of water temperatures without the Lower Klamath Project reservoirs (as discussed in Hamilton et al. 2011) show that the temperature difference with and without dams would be greatest directly downstream from Iron Gate Dam but could extend an additional 120 to 130 river miles downstream. Estimated decreases in stream temperature with dam removal relative to existing conditions are likely to be smaller with continued climate change; however, temperature conditions for aquatic resources would be much improved under the Proposed Project as compared to existing conditions (see Potential Impact 3.2-1).

Klamath River Estuary and Pacific Ocean Nearshore Environment

The influence of the Proposed Project on water temperature would likely decrease with distance downstream from Iron Gate Dam, and it is unlikely that dam removal under the Proposed Project would have detectable effects on water temperatures in the Klamath River Estuary and Pacific Ocean nearshore environment (see Potential Impact 3.2-1).

3.3.5.5 Fish Disease and Parasites

The Proposed Project would be expected to reduce impacts on salmon from fish disease. As discussed in detail in Section 3.3.2.3 *Habitat Attributes Expected to be Affected by the Proposed Project*, currently the greatest disease-related mortality is for juvenile salmonids due to *C. shasta* and *P. minibicornis* in the Middle Klamath River downstream from Iron Gate Dam. Among all of the salmon life stages, juvenile salmon tend to be most susceptible to *P. minibicornis* and *C. shasta*, particularly during their outmigration in the spring months (Beeman et al. 2008). The main factors contributing to risk of juvenile salmonid infection by *C. shasta* and *P. minibicornis* include availability of habitat (pools, eddies, and sediment) for the polychaete worm intermediate host *(Manayunkia speciosa)*; microhabitat characteristics (static flows and low velocities); congregations of spawned adult salmon with high spore counts; polychaete proximity to spawning areas; planktonic food sources for polychaete from Lower Klamath Project reservoirs; and water temperatures greater than 59°F (Bartholomew and Foott 2010). For adult salmon, Ich and columnaris have occasionally resulted in substantial mortality, particularly when habitat conditions include exceptionally low flows, high water temperatures, and high densities of fish (such as adult Chinook salmon migrating upstream in the fall and holding at high densities in pools). This section addresses changes to these disease factors anticipated under the Proposed Project and predicted affects for juvenile and adult salmonid life stages.

Under current conditions (2000 through 2018) adult salmon carcasses in the 5.6 mile (9.0 km) reach downstream of Iron Gate Dam to the Shasta River average 5,127 carcasses per year, with an estimated average density of 916 carcasses per mile (570 carcasses per km) (S. Gough, USFWS, pers. comm., June 2019). Within the area directly downstream of Iron Gate Dam (within 0.3 mi [0.5 km]), carcass estimates have averaged 396 (ranging from a low of 17 to a high of 1,592); corresponding to a density averaging 1,321 carcasses per mile [3,183 carcasses per km], and ranging from 57 carcasses per mile (99 carcasses per km) to 5,307 carcasses per mile (3,184 carcasses per km) (S. Gough, USFWS, pers. comm., June 2019).

Removal of Iron Gate Dam and the three upstream facilities would reduce the concentration of adult salmon and carcasses that presently occurs downstream of Iron Gate Dam to the Shasta River. Greater dispersal of spawning adult salmon would reduce their proximity to existing dense populations of polychaetes. FERC's analysis (FERC 2007) concluded that restoring access to reaches upstream of Iron Gate Dam for anadromous fish would allow adult fall-run Chinook salmon to distribute over a greater length of the river, reducing crowding and the concentration of disease pathogens that currently occur in the reach between Iron Gate Dam and the Shasta River. As discussed in detail in Section 3.3.5.9 Potential Impact 3.3-7, under the Proposed Project, estimated Chinook salmon abundance upstream of Iron Gate Dam to Keno Dam is predicted to increase by a median of 10,000 Chinook salmon (Hendrix 2011) within an estimated 80 miles of suitable spawning habitat within tributaries and the mainstem (DOI 2007, Cunanan 2009). Although Chinook salmon spawning is not expected to be evenly distributed, this could result in carcass density upstream of Iron Gate Dam of around 125 carcasses per mile (78 carcasses per km). Even if spawning is unevenly distributed, a much lower carcass density than currently observed downstream of Iron Gate Dam is anticipated owing to access to substantial amounts of additional habitat.

Under the Proposed Project juvenile salmon spawned and reared upstream of Iron Gate Dam would be exposed to actinospores within the mainstem Klamath River for a longer period than salmon spawned and reared downstream, since the migration distance to the Klamath River Estuary is greater. For example, juvenile salmonids produced from Spencer Creek (RM 232.6) would migrate 40 miles further within the mainstem Klamath River than juveniles produced from Bogus Creek (192.6). Assuming the median migration rate of 18.4 miles/day reported for radio tagged Chinook salmon smolts, these fish would be exposed to actinospores for just over two days longer than fish produced from downstream of Iron Gate Dam. Infection rate is partly a function of exposure duration (True et al. 2013), and thus this specific risk factor (duration of exposure) may be higher for fish produced upstream of Iron Gate Dam than juveniles produced downstream with a shorter duration of exposure. However, many other factors affect also influence disease risk, as discussed below.

Under the Proposed Project, sediment bedload transport rates would increase downstream from the current location of Iron Gate Dam which currently includes habitats with large populations of polychaetes. Under existing conditions, actinospores released from this portion of the Klamath River pass downstream and infect juvenile salmon in the current infectious zone downstream from the Shasta River to Seiad (RM 132.7) (Bartholomew and Foott 2010). In addition, while the area of significant sediment deposition under the Proposed Project is located upstream of Cottonwood Creek, sediment transport rates would also increase downstream from Cottonwood Creek (Appendix F). This increased movement and transport of sediment (sand, silt, and clay) is anticipated to disrupt polychaete habitat from the current location of Iron Gate Dam to downstream from Shasta River, resulting in reduced actinospore releases.

Warm water temperatures increase risk of disease transmission. Dam removal would mean cooler temperatures in the late summer and fall, but slightly warmer temperatures during spring and early summer. FERC (2007) concluded that dam removal would enhance water quality and reduce the cumulative effects on water quality and habitat that contribute to disease-induced salmon die-offs in the Klamath River downstream from Iron Gate Dam. In turn, this would benefit salmon outmigrants from tributaries downstream from Iron Gate Dam, such as the Shasta and Scott rivers. Based on existing data it appears that a reduction in temperature during late summer and fall would have the effect of reducing disease rates (Bartholomew and Foott 2010). Reduced disease in the mainstem is anticipated to benefit outmigrating smolts that are currently exposed at high rates in disease hotspots.

FERC (2007) concluded that more rapid cooling of river temperatures in the fall with the Lower Klamath Project dams removed may also allow for fall Chinook salmon spawning to occur earlier in the fall. Bartholow et al. (2005) and FERC (2007) also suggest that earlier warming of the river system could trigger juvenile salmonids to out migrate earlier. This is consistent with findings that the cumulative exposure of temperature is more important predictors of migration of juvenile Chinook salmon than flow or length-of-day (Sykes et al. 2009). As previously described, increased water temperatures in the spring would likely result in earlier emergence and growth and encourage earlier migration downstream. In addition, a slight increase in the rate at which water temperatures increase in the spring would be likely to improve the growth rates of newly emerged fall Chinook salmon fry (FERC 2007). Earlier migration downstream and improved growth would likely mean most outmigrants would avoid periods of high disease infection of juvenile salmon (Bartholow et al. 2005).

Flows also play an important role in the regulation of disease in the Klamath River. Elimination of Lower Klamath Project reservoirs under the Proposed Project would not result in major flow alterations as flows in the Klamath River are regulated through mandatory federal conditions imposed on the Klamath

Irrigation Project located upstream of J.C. Boyle. However, elimination of the Lower Klamath Project would create more flow variability downstream of Iron Gate Dam due to peak flows from storm events no longer being retained in Lower Klamath Project reservoirs. While there would be a loss of flow variability in the portion of the Lower Klamath River downstream of J.C. Boyle Dam due to cessation of peaking operations, flows would continue to be controlled by Keno Dam and the 2019 BiOp (described below), and they would be within the range of historical conditions. As described in Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*, 2017 court-ordered flushing and emergency dilution flows were required downstream of Iron Gate Dam in 2017 and 2018, with the intent of reducing disease in the Middle and Lower Klamath River by mobilizing bedload sediments to disrupt the periphyton intermediate host. The court-ordered flows are not modeled as part of existing conditions hydrology under the Proposed Project. As described in Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*, the 2017 court-ordered flows included a requirement to ensure that certain high flows are reached each winter, and they also included an emergency dilution requirement if juvenile fish disease reached high levels in the infection nidus. The emergency dilution flows were used in 2018. In March 2019, the court-required re-initiation of USBR consultation with NMFS and USFWS was completed and new biological opinions (BiOps) were issued by NMFS (2019) and USFWS (2019a). The 2019 BiOp flow requirements include annual surface flushing flows of at least 6,030 cubic feet per second (cfs) for 72 hours at Iron Gate Dam between March 1 and April 15, and the potential for dilution flows and/or enhanced spring flows should water be available and disease conditions support their use. Dilution flows also occurred in June 2019 under the new BiOp flow requirements. While there has not been sufficient time to collect data characterizing the efficacy of the flushing flows since they were initiated in 2017, the necessity to use dilution flows in 2018 and 2019 suggests that flushing flows are insufficient on their own to resolve the issue of fish disease downstream of Iron Gate Dam. Because polychaete populations are located outside of the main flow along the margins of the river (Bartholomew and Foott 2010), variable flows disrupt this habitat. Therefore, removal of the Lower Klamath Project dams would disrupt microhabitat conditions and is expected to reduce polychaete populations (Stocking and Bartholomew 2007, Bartholomew and Foott 2010) and presumably, reduce infection rates within polychaete populations both in the short and long term (Hetrick et al. 2009).

Periphyton (attached algae) provides habitat for the intermediate host of *C. shasta* and *P. minibicornis*, and thus its abundance and distribution under the Proposed Project would also affect disease in the Klamath River. Some of the Proposed Project's anticipated effects would tend to support increased attached algal growth (i.e., periphyton growth), while others would tend to reduce it compared with existing conditions. Under the Proposed Project, additional periphytic growth including *Cladophora* is anticipated within the Hydroelectric Reach in the long term (see Potential Impact 3.4-5). This is because while the

existing reservoirs foster growth of phytoplankton algae, in a riverine system, phytoplankton's ecological advantage is reduced, and attached aquatic vegetation including periphyton would tend to increase. In the absence of other factors, this could possibly increase the prevalence of the intermediate host for *C. shasta* and *P. minibicornis*. However, dam removal would also create other conditions that tend to offset the growth of aquatic vegetation including periphyton. These conditions include a restoration of bedload sediment transport, increased flow variability, and a more normal (and variable), riverine temperature regime with substantially cooler fall water temperatures. FERC (2007) concluded that restoring natural sediment transport processes would likely contribute to the scour of periphyton downstream from the current site of Iron Gate Dam, and deposited gravel and sand would provide a less favorable substrate for periphyton because of its greater mobility during high flow events than the existing armored substrate (see also Section 3.4.5.2 *Periphyton*).

The current infectious nidus (reach with high infectivity) for *C. shasta* and *P. minibicornis* is located in the Klamath River downstream of Iron Gate Dam, where returning adult spawners congregate. Removal of the Lower Klamath Project dams would allow anadromous salmonids to move upstream in the mainstem Klamath River and tributaries upstream of Iron Gate Dam. With Iron Gate Dam blocking upstream fish passage and trapping sediment, 2017 court-ordered flushing flows were released from this dam in 2017 and 2018 for the purpose of disrupting the nidus downstream of this dam and reducing disease risk. The 2019 BiOp Flows, which are the current operational flow requirement for the Klamath River, also include flushing flows. As described above, the change in flow regime has not, in isolation, been successful in avoiding high disease concentrations, as evidenced by dilution flows that were used subsequent to the flushing flows in both 2018 (under the 2017 court order) and 2019 (under the new 2019 BiOp flow requirements). Under the Proposed Project, it is anticipated that the nidus would no longer form downstream of Iron Gate Dam, and the risk of a new nidus forming upstream is low, in the absence of the flushing flow requirements for the reasons described above. Because the flushing flow requirements ensure a minimum level of bedload-sediment movement in winter to disrupt the disease cycle, the likelihood of reduction in disease risk would be enhanced by including the additional flow releases.

Although the conditions leading to the nidus forming downstream of Iron Gate Dam would be ameliorated, some disease factors would continue under the Proposed Project, including eight years of additional Iron Gate Hatchery operations that would potentially result in continued (through post-dam removal year 10) congregations of mostly adult fall-run Chinook salmon in the reach from Iron Gate Dam downstream to Seiad Valley (Section 3.3.5.6 *Fish Hatcheries*). Under the Proposed Project, if a nidus were to remain in the vicinity of Iron Gate Hatchery, or theoretically were to form within newly accessible upstream habitat (however unlikely), flushing and emergency dilution flow releases (as previously required by the 2017 court order) and flushing flows and

the potential for dilution flows and/or enhanced spring flows (as currently required by the 2019 BiOp Flows) may be required from a new upstream location to achieve the same ecological benefits (i.e., disruption of nidus).

In the reach from Keno Dam to Iron Gate Dam, under the Proposed Project both the 2017 court-ordered flushing flows and the 2019 BiOp Flows would ensure a minimum level of bedload-sediment movement to disrupt polychaete habitat and thus the disease cycle. Both flow regimes require flushing flows of 6,030 cfs for 72 hours, as measured at Iron Gate Dam. Based on accretion flows in the Upper Klamath River (Section 3.6.2.2 *Basin Hydrology*), this equates to approximately 4,500 to 5,000 cfs released at Keno Dam to achieve the flow requirement at Iron Gate Dam. Although detailed scour analysis has not been conducted in this reach, based on the work of Shea et al. (2016) for the reach downstream of Iron Gate Dam, and the particle sizes, channel geometry and channel slope in the reach (Section 3.11.2.2 *Geomporphology*), flows of 4,500 to 5,000 cfs are anticipated to mobilize surface substrate sufficiently to disrupt polychaete habitat downstream of Keno Dam, and especially downstream of J.C. Boyle Dam (due to increased accretion in that reach).

Based on available information, it is unlikely that a new infectious nidus would be re-created upstream. The current infectious zone and high parasite loads below Iron Gate Dam are the result of a synergistic effect of numerous factors that occur within the current disease zone in the Klamath River from the reach from Shasta River downstream to Seiad Valley (FERC 2007, Hamilton et al. 2011, Bartholomew and Foott 2010). These factors include: (1) close proximity of myxospore-shedding carcasses (concentration of carcasses); (2) abundant polychaete populations that are found in stable habitats; (3) suitable water temperatures (greater than 59°F) during periods when juvenile salmonids are present; and 4) low flow variability (Bartholomew and Foott 2010). This synergy would be unlikely in the Upper Klamath River (Hamilton et al. 2011). The likelihood of those synergistic factors developing upstream of Iron Gate Dam would be reduced as carcasses would likely be more dispersed in the watershed than occurs in the restricted habitat downstream of Iron Gate Dam (Foott et al. 2012). Iron Gate Dam is both the limit of anadromy, and the site of the current fish hatchery that accounts for a substantial proportion of all adult returning fish annually. As discussed under Section 3.3.5.3 *Water Quality*, the Keno Impoundment/Lake Ewuana has the potential to be a habitat barrier during most years for fall-run Chinook due to poor water quality during the late summer, and therefore NMFS and USFWS prescribed fish passage measures for the Keno Impoundment/Lake Ewuana for the Klamath Hydroelectric Project relicensing to be used during periods of poor water quality (DOI 2007, NMFS 2007b). If fish passage were not provided at Keno Impoundment/Lake Ewuana, upstream migrating adults would presumably locate spawning habitat downstream of the impoundment. Although few adult fall-run Chinook salmon would have a natal cue to migrate past this location, congregations of fall-run Chinook salmon could occur downstream of Keno Impoundment during some periods. If these

congregations become large this would increase the risk of nidus forming at that location. In comparison, downstream of Iron Gate Dam thousands of adults have a natal cue to return to the hatchery, and congregations regularly occur during the fall. The conditions that result in a nidus forming downstream of Iron Gate Dam are less likely to occur under the Proposed Project, either downstream or upstream of Iron Gate Dam.

Historically, it appears spawning concentrations of Upper Klamath Basin Chinook salmon were located primarily in the Sprague River (Lane and Lane Associates 1981). Spring-run Chinook salmon, and fall-run Chinook salmon (if water quality conditions improved in the Keno Impoundment/Lake Ewuana, or if fish passage were provided) could spawn in the Sprague River again under the Proposed Project, increasing the risk of a nidus forming there. However, there is no information indicating that high densities of polychaetes occur in the Sprague River (Foott et al. 2012). Thus, the synergistic factors that contribute to an infectious nidus for emigrants below Iron Gate Dam and near the Iron Gate Hatchery are unlikely to occur at this location under the Proposed Project either.

There is some concern regarding a disease zone in the lower Williamson River downstream from the confluence with the Sprague River, where there are currently high parasite densities observed (Hurst et al. 2012). However, there are no fish passage obstacles, holding pools, or other unique environmental factors anticipated to result in large congregations of adult migrants at this location (M. Hereford, ODFW, pers. comm., May 2019). In addition, maximum temperatures in the Williamson River do not exceed the disease threshold of 59°F in all years (Bartholomew and Foott 2010, Hamilton et al. 2011). Overall, the risk of a juvenile salmon disease response in the Williamson River would be lower than existing conditions in the Middle Klamath River, but not negligible in all water years (S. Foott, USFWS, pers. comm., 2012).

Removal of the Lower Klamath Project dams would allow anadromous salmonids to move upstream in the mainstem Klamath River and tributaries upstream of Iron Gate Dam, altering disease dynamics between anadromous salmonids and resident species upstream of Iron Gate Dam. However, available information indicates that fish passage would not increase the risk of disease for resident species that occur upstream of Iron Gate Dam (NMFS 2006a). Pathogens (e.g., *C. shasta* and *P. minibicornis)* exist throughout the Klamath River System in both the Upper and Lower Basins, so migration of wild anadromous fish upstream and downstream from Iron Gate Dam would not increase the risk of introducing new pathogens to resident trout residing upstream of Iron Gate Dam (NMFS 2006a). In addition, native Klamath River trout are generally resistant to *C. shasta*. Recently several new *C. shasta* genotypes have been discovered in the Klamath River (described in Section 3.3.2.3 *Habitat Attributes Expected to be Affected by the Proposed Project*). Disease risk is related to host genotype specificity (Atkinson and Bartholomew 2010). It is not expected that introduction of *C. shasta* genotypes upstream would be deleterious because fish in the upstream

Basin have shown resistance to the downstream genotypes. Redband trout would presumably have been exposed to genotypes of *C. shasta* during the pre-dam period, and their populations were abundant. Because the salmonid species in the Klamath Basin already co-occur with the genotype of *C. shasta* to which they are susceptible, and the salmonid species are less susceptible to other genotypes of *C. shasta*, expanding the distribution of the different genotypes of *C. shasta* would be unlikely to be deleterious to salmonids. In addition, the Chinook Salmon Expert Panel convened to attempt to answer specific questions related to the Proposed Project compared with existing conditions (Goodman et al. 2011), concluded that the Proposed Project offers greater potential than the existing conditions in reducing disease-related mortality in Klamath River Chinook salmon. Overall, movement of anadromous salmonids into the Upper Klamath Basin presents a relatively low risk of introducing pathogens to resident fish (NMFS 2006a, USFWS/NOAA Fisheries Service Issue 2(B)).

3.3.5.6 Fish Hatcheries

As described under Section 2.7.6 *Hatchery Operations*, under the Proposed Project, the Fall Creek Hatchery would be reopened, and both the Iron Gate Hatchery and Fall Creek Hatchery would continue to operate for a period of eight years following dam removal (through post-dam removal year 7, Table 3.3-11), with the following production goals (Appendix B: *Definite Plan – Section 7.8.3*):

- 3,400,000 fall-run Chinook salmon age 0 smolts at Iron Gate Hatchery (released in spring)
- 115,000 fall-run Chinook salmon age 1 yearling smolts at Fall Creek Hatchery (released in fall)
- 75,000 age 1 yearling coho salmon smolts at Fall Creek Hatchery (released in spring)

Although the ability to meet the production goals varies annually based on adult returns and hatchery performance, since 2005 the current fall-run Chinook salmon yearling smolt goals, and current coho salmon yearling smolt goals have been achieved on average, whereas fall-run Chinook salmon age 0 smolts are typically about a million smolts shy of current production goals (K. Pomeroy, CDFW, pers. comm., 2018). Considering actual production achieved, hatchery operations under the Proposed Project would constitute a reduction in production goals from existing conditions of around 87 percent for yearling fall-run Chinook salmon smolts, 20 percent for fall-run Chinook salmon age 0 smolts, 100 percent for steelhead (although no steelhead have been released since 2012), and no change in production goals for coho salmon smolts. Moving production and releases from Iron Gate Hatchery to Fall Creek Hatchery is not anticipated to have a discernable effect on aquatic resources.

A Hatchery Genetic Management Plan (HGMP) for the Iron Gate Hatchery (CDFW and PacifiCorp 2014) recently redefined the operation of this hatchery

from a mitigation hatchery to one now operated to protect and conserve the genetic resources of the Upper Klamath population unit of the SONCC coho salmon ESU. Included in the HGMP are defined monitoring and evaluation activities to evaluate effects of the hatchery activities on the abundance, productivity, spatial structure, and diversity of the SONCC coho salmon and the magnitude or relative impact of the hatchery program on other actions that influence SONCC coho salmon. Operation of the Fall Creek Hatchery would therefore be managed with a particular focus on supporting recolonization of coho salmon in newly accessible habitat.

For the first eight years following dam removal, the effect of hatchery production on aquatic resources would be similar to existing conditions, as described in Section 3.3.2.3 *Habitat Attributes Expected to be Affected by the Proposed Project*. The continuation of production (albeit reduced) would affect adult returns for fall-run Chinook and coho salmon, as described for species specific aquatic resource impacts in Section 3.3.5.9 *Aquatic Resource Impacts*.

The elimination of hatchery production eight years after Lower Klamath Project dam removals under the Proposed Project would affect aquatic resources in the Area of Analysis. When production is ceased (post-dam removal year 7), adult coho salmon progeny of hatchery releases would potentially continue to return through post-dam removal year 9 (three-year old returns released as age 1), and hatchery adult fall-run Chinook salmon through post-dam removal year 10 (four-year old returns released in post-dam removal year 7) (Table 3.3-11). After post-dam removal year 3, fewer coho and Chinook salmon adults would possess a natal cue to return to the location of Iron Gate Hatchery (and none after post-dam removal year 10), because there would be fewer smolts released there starting in dam removal year 2, and no artificial supplementation of the population from that location after post-dam removal year 7. In addition, during post-dam removal years 7 through 10 for fall-run Chinook salmon and dam removal years 7 through 9 for coho salmon hatchery adults would continue to return to Iron Gate or Fall Creek hatcheries (natal cue) but would not be collected. For this three to four-year period, straying of hatchery adults into areas of natural spawning may increase. Straying has the potential to reduce the reproductive success of natural salmonid populations (Mclean et al. 2003, Chilcote 2003, Araki et al. 2007) and negatively affect the genetic diversity of the populations (Reisenbichler and Rubin 1999). Based on the current low numbers of adult returns of coho salmon, increased straying into Fall Creek for a few years is unlikely to have a substantial effect. Fall-run Chinook salmon adults straying into Bogus Creek and Fall Creek may be high during this period, but there would also be greater access to newly available habitat, likely dispersing adults over a greater area and reducing potential impacts.

The current infectious nidus for salmonid smolts (i.e., reach with highest infectivity) for *C. shasta* and *P. minibicornis* appears to be the result of the synergistic effect high spore input from heavily infected, spawned adult salmon

that congregate downstream from Iron Gate Dam and Iron Gate Hatchery and the proximity to dense populations of polychaetes (Bartholomew et al. 2007). Som et al. (2016a), citing “a decade of monitoring” and the work of Foott et al. (2016) conclude that Iron Gate Hatchery (via homing returns) and Iron Gate Dam (via migration barrier) influence the current concentration of adult carcasses upstream of the Shasta River confluence, which contribute the bulk of myxospores that continue the parasites life cycle within the nidus. Juveniles released from Iron Gate Hatchery may also contribute to the infectious nidus (Som et al. 2016a), as hatchery-released juvenile fish that become infected and experience mortality further downstream in the Klamath River and potentially become another source of myxospores threatening aquatic resources in the Lower Klamath River. The greater dispersal of release locations of smolts (Iron Gate Hatchery and Fall Creek Hatchery) starting in post-dam removal year 1 would reduce density of juveniles in that year, and reduce congregations of adults by post-dam removal year 3, and therefore reduce the risk of the infectious nidus forming in the Middle Klamath River in the short- and long-term.

Table 3.3-12. Hatchery releases and adult returns under the Proposed Project.

Species		Dam Removal Year		Post-dam Removal Year							
		1	**2[a]**	**1**	**2**	**3**	**4**	**5–7[b]**	**8**	**9**	**10**
Chinook salmon	Produced	N smolts from existing habitat and existing H smolts (age 0 in spring and age 1 in fall)	N smolts from existing habitat and reduced H smolts	N smolts from new habitat and reduced H smolts	N and reduced H smolts	N and reduced H smolts	N and reduced H smolts	N and reduced H smolts	N smolts	N smolts	N smolts
	Returning	N and H adults (age 3–4) downstream of Iron Gate Dam	N and H adults access new habitat	N and H adults	N and H adults	N adults from new habitat (progeny of post-dam removal year 1 outmigration) and reduced H adults	N and reduced H adults	N and reduced H adults	N and reduced H adults	N and reduced H adults	N adults and last H adults (age 4, progeny of post-dam removal year 7 outmigration)

Species		Dam Removal Year		Post-dam Removal Year							
		1	**2[a]**	**1**	**2**	**3**	**4**	**5–7[b]**	**8**	**9**	**10**
Coho salmon	Produced	N smolts from existing habitat and H smolts (age 1)	N smolts from existing habitat and H smolts	N smolts from new habitat and H smolts from Fall Creek	N and H smolts	N and H smolts	N and H smolts	N and H smolts	N smolts	N Smolts	N smolts
	Returning	N and H (age 3) downstream of Iron Gate Dam	N and H adults access new habitat	N and H adults	N and H adults	N adults from new habitat (progeny of post-dam removal year 1 outmigration) and H adults	N and H adults	N and H adults	N and H adults	N and last H adults (progeny of post-dam removal year 7 outmigration)	N adults

[a] Early drawdown of Copco No. 1 begins in dam removal year 1. Drawdown of all reservoirs occurs and dams are removed in dam removal year 2 (see Table 2.7-1). Reduced hatchery releases begin in dam removal year 2 and continue for eight years until post-dam removal year 7.

[b] Final year of hatchery releases occurs in post-dam removal year 7.

H smolt from hatchery releases or adult progeny of hatchery release

N smolt from natural spawning or adult progeny of natural spawning

Overall, dispersing hatchery operations in the short term and discontinuing hatchery operations after eight years following Lower Klamath Project dam removal would reduce the risk of nidus forming in the mainstem Klamath River in the short- and long-term. In addition, hatchery juveniles would no longer be released after post-dam removal year 7 during natural smolt outmigration. Therefore, it is anticipated that the Proposed Project would result in reduced impacts to aquatic resources due to fish disease and parasites in the short- and long-term. Population and other impacts of altered hatchery operations vary for aquatic species and are discussed for specific impacts below.

3.3.5.7 Algal Toxins

The removal of the Lower Klamath Project reservoirs, particularly the larger Copco No. 1 and Iron Gate reservoirs, would decrease or eliminate excessive growth of phytoplankton, and in particular large seasonal blooms of blue-green algae and associated toxins (e.g., microcystin), by eliminating large areas of quiescent habitat where these phytoplankton species currently thrive. In the nutrient-rich Klamath River system, the elevated water temperatures and increased light levels that occur during the summer and early fall under existing conditions result in seasonal blue-green algae blooms in the phytoplankton and periphyton Area of Analysis, and especially the Hydroelectric Reach (Section 3.4.2.3 *Hydroelectric Reach*). As analyzed in Potential Impact 3.4-2, the Proposed Project would dramatically decrease the amount of optimal (calm, slow-moving reservoir) habitat available to support nuisance and/or noxious phytoplankton species, resulting in a corresponding decrease in phytoplankton blooms, alleviating high seasonal concentrations of algal toxins and associated bioaccumulation of microcystin in fish and freshwater mollusk tissue for species downstream of the Lower Klamath Project reservoirs.

While some microcystin may be transported to downstream reaches of the Klamath River from large blooms occurring in Upper Klamath Lake, the levels would not be nearly as high as those experienced under existing conditions, because seasonal blooms in Copco No. 1 and Iron Gate reservoirs are the primary source of *Microcystis aeruginosa* to the Middle and Lower Klamath River (see Section 3.4.2 *Phytoplankton*). Overall, bioaccumulation of algal toxins in freshwater mollusk and fish tissue would be expected to decrease in the mainstem Klamath River from the Hydroelectric Reach to the Klamath River Estuary.

3.3.5.8 Aquatic Habitat

As described in Section 2.1 *Project Objectives*, a primary purpose of the Proposed Project is to increase habitat availability for anadromous salmonids in the Klamath River, for the benefit of the salmonid populations and the recreational, commercial, and cultural uses related to the health of the salmon fishery. The Proposed Project is intended to increase the amount of aquatic habitat by removing migration barriers, and also to improve the quality of the

habitat, as related to the operation of the existing hydroelectric facilities. There is some disagreement among experts as to the amount of habitat that Chinook salmon and steelhead would be able to reach, based primarily[72] on the impact of water quality problems in the Lake Ewauna/Keno Reservoir reach and in Upper Klamath Lake, discussed in greater detail in Upper Klamath River and Connected Waterbodies, immediately below. Because coho salmon are not expected to migrate to these reaches, the same concern does not affect estimates of additional coho habitat.

It is worth noting that based on comments received during the public scoping process (Appendix A), it appears that there is concern from some about the historic distribution of salmonids in the Klamath River Basin, with individuals asserting that historical geomorphic features or water quality may have limited upstream migration prior to dam construction (see below paragraph). However, as this document is an analysis of habitat availability upon implementation of the Proposed Project, including consideration of existing and projected future river conditions, this EIR does not further address questions of the historic distribution of salmonids in the Klamath River Basin.

A few commenters (Appendix A) have suggested that a reef existed at the location of Copco No. 1 Dam that would have limited anadromous salmon passage. Boyle (1976) describes an andesite "reef" at the location of Copco No. 1 Dam prior to dam construction and reservoir inundation. He observed evidence of a historical lake formed by this reef that extended approximately five river miles upstream. While the reef may have been a barrier to migration of Chinook salmon when it was originally formed, Boyle is clear that the reef was one of the oldest exposed formations found in the Siskiyou Mountains, and that this barrier and lake existed in the geologic history. At the time of Copco No. 1 Dam construction, no impediments to upstream Chinook salmon migration were described by Boyle. Boyle (1976) describes large runs of salmon at the site of Copco No. 1 in the early 1900's, and details that a fish ladder was considered for construction at Copco No. 1 Dam, but in coordination with California Fish and Game Commission a fish hatchery was proposed for Fall Creek in lieu of passage. Further, historical records reviewed by Hamilton et al. (2005) and Hamilton et al. (2016), and genetic information obtained from archaeological sites analyzed by Butler et al. (2010), indicate that prior to the construction of Copco No. 1 Dam, Chinook salmon (fall- and spring-run based on observed and documented timing) were abundant in, and spawned in, tributaries of the Upper Klamath Basin (i.e., upstream of the described reef and eventual location of Copco No. 1 Dam), Shovel and Spencer creeks, as well as the Sprague, Williamson, and Wood rivers. This conclusion was further recognized in a trial-type hearing concerning federal fisheries requirements in *Klamath Hydroelectric Project* (FERC Project No. 2082, Docket # 2006-NMFS-0001) (Sept. 29, 2006)

[72] Both dams that would remain under the Proposed Project (Keno Dam and Link River Dam), have fish passage facilities.

(hereinafter "NMFS 2006a"). Thus, it appears that there was no "reef" forming a barrier to fish migration at the time Copco No. 1 was built.

The habitat quantity and quality that would be accessible under the Proposed Project within the Area of Analysis are described below for each of the key reaches.

Upper Klamath River and Connected Waterbodies

Removal of the four hydroelectric dams eliminates all of the impassable dams that prevent salmon from accessing an estimated 360 miles of potential anadromous fish habitat upstream of Upper Klamath Lake and Keno Impoundment/Lake Ewauna, with key habitat tributaries being the Woods, Williamson and Sprague rivers (Huntington 2006, DOI 2007, NMFS 2007b). However, FERC's (2007) analysis of habitat access for anadromous fish with fish passage excluded these 360 miles of potential anadromous fish habitat based upon poor water quality conditions in Upper Klamath Lake and Keno Impoundment/Lake Ewauna during summer months. The Chinook Salmon Expert Panel (Goodman et al. 2011) also concluded that substantial gains in Chinook salmon abundance for areas upstream of Keno Impoundment/Lake Ewauna would be contingent upon successfully resolving limitations associated with poor water quality problems in Upper Klamath Lake and Keno Impoundment/Lake Ewauna. The Coho Salmon and Steelhead Expert Panel (Dunne et al. 2011) stated that poor water quality in Keno Impoundment/Lake Ewauna and in Upper Klamath Lake, and the possibility of difficult passage at Keno Dam, could impede steelhead from reaching improved habitat in the Upper Klamath River. Note that as discussed above (Section 3.3.2.2 *Physical Habitat Descriptions*), fish passage improvements at Keno Dam are currently being discussed by the USBR.

These concerns for anadromous salmonid migration and spawning overstate the seasonal habitat limitations of Keno Impoundment/Lake Ewauna and Upper Klamath Lake because of the manner in which the seasonal water quality impairments intersect with steelhead, spring-run Chinook, and certain fall-run Chinook life histories.

Regarding Upper Klamath Lake's availability as habitat/migration corridor, a study by Maule et al. (2009) strongly suggests that Upper Klamath Lake habitat can support salmonids, except during the summer (June through September). Maule et al. (2009) examined the response of salmon to Upper Klamath Lake under existing conditions. Iron Gate Hatchery Chinook salmon were tested in the lake and the lower Williamson River to assess whether existing conditions would physiologically impair salmon reintroduced into the Upper Klamath Basin. Juvenile Chinook salmon were tested in cages in 2005 and 2006. These juveniles showed normal development as smolts in Upper Klamath Lake and survived well in both locations (Maule et al. 2009). Maule et al. (2009) concluded that there was little evidence of physiological impairment that would preclude this

stock from being reintroduced into the Upper Klamath Basin. In addition, the dominant life history of fall-run Chinook salmon (Type I) outmigrate to the ocean in spring and would not rear during the stressful summer period in the Upper Klamath Basin. Type II and Type III life history would rear during summer and outmigrate during either fall (Type II) or spring (Type III). Thus, conditions for juvenile fall-run Chinook emigration through Upper Klamath Lake appear favorable. Due to the spring migration period for adult and juvenile spring-run Chinook salmon and steelhead, the migratory life stages would generally avoid the period of poor water quality in Upper Klamath Lake as well. Cool groundwater spring inputs in the Williamson River and on the west side of Upper Klamath Lake would likely provide thermal refugia for the non-migratory juvenile salmonid rearing life stages.

Similar to the severe water quality impairments in Upper Klamath Lake, the serious water quality issues in Keno Impoundment/Lake Ewauna are not year-round. Both DOI and NMFS have long recognized the issue of seasonally poor water quality typically between June 15 and November 15 in Keno Impoundment/Lake Ewauna. This is a time period when nearly all adult fall- and some (later portion) spring-run Chinook salmon would be migrating upstream. When water quality is poor both DOI and NMFS, as part of the Klamath Hydroelectric Project relicensing, prescribed the transfer of primarily adult fall-run Chinook salmon upstream of the Keno Impoundment/Lake Ewauna for the purposes of restoration and safe, effective, and timely passage (DOI 2007, NMFS 2007b). If fish passage were not provided, upstream migrating adults would presumably locate spawning habitat downstream.

Upper Klamath River – Hydroelectric Reach

This reach would be fundamentally altered under the Proposed Project, with the removal of the dams and associated reservoirs, and the restoration of riverine systems and habitat connectivity. Under the Proposed Project anadromous fish (Chinook salmon, steelhead, coho salmon, and Pacific lamprey) access would be restored to an estimated 80 miles of habitat within the mainstem Klamath River and tributaries upstream of Iron Gate Dam and downstream of Keno Dam (DOI 2007, Cunanan 2009). Primary tributary habitat that would be available for salmonids includes Fall, Jenny, Shovel, and Spencer creeks. In addition to the tributaries and the current reaches of the mainstem, the 80 miles of habitat includes restoration of 21.2 miles of currently inundated mainstem and tributary riverine habitat (Cunanan 2009) for resident and anadromous fish. The current reservoirs inundate sections of the river that had high sinuosity and complex channels that historically provided high quality salmonid spawning and rearing habitats (Hetrick et al. 2009). Modeling indicates that the river would return to a similar channel morphology following dam removal, ad discussed in Appendix F. In addition, proposed habitat restoration within the reservoir areas (described in Section 2.7.4 *Restoration Within the Reservoir Footprint*) is designed to slow water velocities along the bank and thus has the potential to create backwater and rearing habitat for coho salmon. Proposed habitat restoration components

include manually creating connectivity to tributaries, incorporating floodplain habitat features (e.g., side channels), creating bank-line complexity to slow water velocities, and placing large wood habitat features (Appendix B: *Definite Plan*).

Under the Proposed Project, short-term alterations to the hydrograph would result from the release of water stored in the Lower Klamath Project reservoirs. Based on modeling results, this release is expected to last about three months, from January 1 into mid-March of dam removal year 2, but could vary depending on hydrologic conditions (USBR 2012), increasing the magnitude of flows downstream from the dams during the drawdown period. River flows would be expected to remain below the 10-year flood event.

In the long term, flows would increase not only in the bypass reaches, but also in all other mainstem reaches due to changes in operations and the absence of reservoir evaporation. Hydrology in the J.C. Boyle Peaking Reach would follow the natural hydrograph more closely, including increased duration and magnitude of high flows, and cessation of daily extreme flow fluctuations (characteristic of hydroelectric peaking operations).

Increases in flows resulting from changes in peaking operations at J.C. Boyle Dam would provide more habitat than under existing conditions for redband/rainbow trout and other resident riverine species, as well as anadromous fish or lamprey that reestablish in this area. These flows are expected to meet channel maintenance needs to route coarse sediments, build bars, erode banks, flush fine sediments, scour vegetation and undercut and topple large woody riparian vegetation (NRC 2008). The removal of Lower Klamath Project dams would reestablish geomorphic and vegetative processes that form channels that provide fish habitat and spawning gravels in this reach, especially in the former bypassed reaches (FERC 2007). In addition, the impacts associated with daily extreme flow fluctuations resulting from hydroelectric peaking operations (e.g., stranding, displacement, reduced food production, and increased stress) would no longer occur.

Middle and Lower Klamath River

As described above, reservoir drawdown under the Proposed Project would result in increased flows for about four months once drawdown begins. Over the long term, the Proposed Project would alter the hydrograph so that the duration, timing, and magnitude of flows would be more similar to the unregulated conditions under which the native fish community evolved (Hetrick et al. 2009). While mean annual flows would not substantially change from existing flows due to the lack of active reservoir storage (Stillwater Sciences 2009b, USBR 2012), daily, seasonal, and annual flow variability would increase. It is anticipated that restoration of the hydrologic function of the river system under the Proposed Project would support the creation of habitat diversity and maintain biophysical attributes of the Klamath River (Stanford et al. 1996, Poff et al. 1997).

The Proposed Project would substantially decrease the transit time of water in the Hydroelectric Reach, because it would no longer be impounded by the reservoirs, resulting in a shift in the timing of the occurrence of low flow periods to earlier in summer than currently occurs (Balance Hydrologics Inc. 1996, NRC 2004). These hydrologic effects would likely be more important in upstream areas (directly downstream from Iron Gate Dam) than downstream areas (downstream from the confluence of the Scott River) due to the substantial flow contribution of tributaries to the Klamath River (USBR 2012). In addition, these hydraulic changes would result in changes to water quality, water temperatures, sediment transport, and riparian habitat, as described in subsequent sections.

Klamath River Estuary and Pacific Ocean Nearshore Environment

Hydrologic and hydraulic modeling results (described in Section 3.6.2.3 *Flood Hydrology*) indicate that because of the influence of the tributaries entering the Klamath River downstream from Iron Gate Dam, the flow changes for the Proposed Project would not substantially affect the flows entering the estuary. Specifically, Potential Impact 3.6-1 and Potential Impact 3.6-3 provide further discussion and information on this effect. Therefore, the Proposed Project would not affect flow-related fisheries habitat in the estuary or the Pacific Ocean.

3.3.5.9 Aquatic Resource Impacts

Potential Impact 3.3-1 Effects on coho salmon critical habitat quality and quantity due to short-term sediment releases and long-term changes in habitat quality and quantity due to dam removal.

In the short term, under the Proposed Project, designated critical habitat supporting SONCC coho salmon would be degraded from elevated SSCs and sediment deposition downstream of Iron Gate Dam (see Section 3.3.5.1 *Suspended Sediment* and Appendix E of this EIR, and Section 3.3.5.2 *Bed Elevation and Grain Size Distribution* and Appendix F of this EIR). The specific features of critical habitat and designated PCEs considered essential for the conservation of the SONCC ESU that would be adversely impacted in the short term include spawning substrate, water quality, and safe passage conditions. Quality of spawning substrate for coho salmon downstream of Iron Gate Dam would be substantially degraded during the spawning season following dam removal, while most of the spawning habitat occurring in tributaries would remain unaltered by the Proposed Project (Appendix E). Water quality in the mainstem Klamath River downstream of Iron Gate Dam would be substantially degraded in the short term from increased suspended sediment and decreased dissolved oxygen, resulting in a substantial reduction in rearing and migration habitat suitability for juvenile and smolt coho salmon during the winter and spring following dam removal (Appendix E). Passage conditions would be impaired for adult upstream migrants during the fall and winter of dam removal from both increased suspended sediment, and the risk of sediment deposits at tributary confluences (Appendices E and F). Passage conditions would be impaired for coho salmon smolts during spring following dam removal from increased suspended sediment (Appendix E). Based on the substantial short-term

decrease in quality of the features of critical habitat and PCEs supporting SONCC coho salmon, there would be a significant impact to coho salmon critical habitat under the Proposed Project in the short term.

However, the Proposed Project includes aquatic resource measures AR-1 (Mainstem Spawning) and AR-2 (Juvenile Outmigration) to reduce the short-term effects of SSCs on coho salmon PCEs of critical habitat. In addition, mitigation measures AQR-1 and AQR-2 (described below), would be required to increase certainty of the effectiveness of the aquatic resource measures AR-1 and AR-2 and to reduce the short-term significant adverse impacts of the Proposed Project on coho salmon critical habitat. Aquatic resource measures submitted as part of the Proposed Project are summarized in Section 2.7.8.1 *Aquatic Resource Measures* and detailed in Appendix B: *Definite Plan – Appendix I*. AR-1 includes the development and implementation of a monitoring and adaptive management plan to offset the impacts of Lower Klamath Project dam removal on mainstem spawning habitat. AR-1 actions include a 2-year tributary confluence monitoring effort and addressing sediment and debris obstructions that block volitional upstream passage from the Klamath River into tributaries. Monitoring would occur periodically for the two years following dam removal. Additionally, any 5-year flow event of 10,895 cfs or greater on the Klamath River recorded at the USGS Klamath River Below Iron Gate Dam CA gage (No. 11516530) within the first two years following reservoir drawdown would trigger a monitoring effort. Mitigation Measure AQR-1 Mainstem Spawning (detailed below) further specifies that monitoring shall also be conducted following a significant flow event, even if that flow event occurs more than two years following dam removal. Aquatic Resource Measure AR-1 also includes a spawning habitat evaluation on the Klamath River and tributaries in the Hydroelectric Reach. Most coho salmon spawning occurs in tributaries, and very few coho salmon have been observed spawning in the mainstem Klamath River. Therefore, the spawning habitat actions of AR-1 are focused on offsetting impacts of the Proposed Project on Chinook salmon and steelhead. However, due to the similar spawning habitat requirements of coho salmon to both species, these actions would benefit coho salmon as well. If spawning habitat conditions following dam removal do not meet target metrics[73] developed to offset the anticipated loss of Chinook salmon and steelhead redds due to the Proposed Project, AR-1 specifies that spawning gravel augmentation would be completed within the mainstem, with additional spawning habitat actions within tributaries. These tributary spawning habitat restoration actions would be completed in Jenny Creek, Shovel Creek, Fall Creek, and/or Spencer Creek and could include removal of artificial fish passage barriers, or placement of large woody debris to trap and retain spawning gravels. Mitigation Measure AQR-1 Mainstem Spawning (detailed below) further specifies the range of actions that shall be conducted in tributaries to offset impacts to critical habitat. Implementation of the Proposed Aquatic Resource Measure AR-

[73] Spawning gravel in the amount of 44,100 yd^2 for fall Chinook salmon and 4,700 yd^2 for steelhead

1 along with Mitigation Measure AQR-1 would reduce the short-term potential impacts of SSCs on coho salmon spawning habitat in dam removal year 2 by improving access to tributary habitat where impacts from SSC on habitat in the mainstem can be avoided, and by augmenting spawning gravel, ensuring that suitable spawning habitat in mainstem and tributaries is available following dam removal. Given implementation of AR-1 and AQR-1, suitable coho salmon spawning habitat quality and quantity would not be substantially reduced as a result of the Proposed Project.

Proposed Aquatic Resource Measure AR-2 includes three primary actions: 1) salvaging mainstem overwintering juvenile salmonids prior to reservoir drawdown; 2) maintaining tributary-mainstem connectivity to ensure volitional fish passage between tributaries and the Klamath River; and 3) developing a water quality monitoring network, trigger thresholds, and plan for salvaging and relocating juvenile fish from tributary confluence areas to cold water tributaries or nearby off-channel ponds. Implementation of proposed Aquatic Resource Measure AR-2 would reduce the short-term effects of SSCs on rearing habitat for coho salmon juveniles in the mainstem during dam removal by actively transporting up to 500 juvenile coho salmon from vulnerable mainstem areas to off-channel ponds protected from the effects of the Proposed Project, thus offsetting water quality impacts to critical habitat. Other native fish captured during the seining and trapping effort, such as juvenile steelhead and juvenile Chinook salmon would be relocated into tributary streams adjacent to the salvage locations. Proposed Aquatic Resource Measure AR-2 would also reduce the potential short-term effects of SSCs to migratory habitat for coho salmon smolts by maintaining tributary-mainstem connectivity to ensure volitional fish passage between tributaries and the Klamath River. Monitoring would occur regularly for the two years following dam removal. Additionally, any 5-year flow event of 10,895 cfs or greater on the Klamath River recorded at the USGS Klamath River Below Iron Gate Dam CA gage (No.11516530) within the first two years following reservoir drawdown would trigger a monitoring effort. Mitigation Measure AQR-2 Juvenile Outmigration (detailed below) further specifies that monitoring shall also be conducted following a significant flow event, even if that flow event occurs more than two years following dam removal. In addition, proposed Aquatic Resource Measure AR-2 would reduce the potential short-term effects of SSCs to migratory habitat for coho salmon smolts by rescuing and transporting smolts if mainstem SSC are high, and water temperatures within tributaries are too poor to provide safe refuge (a decision to be made in regular consultation with the Aquatic Technical Work Group [ATWG[74]]). These measures would effectively provide juvenile coho salmon short-term refuge in suitable habitat as an alternative to exposure to temporarily degraded critical habitat from periods of high SSC in the mainstem habitat following dam removal.

[74] The ATWG would be comprised of agency and tribal fisheries scientists to review the aquatic resource (AR) mitigation measures included in the Proposed Project.

Based on the wide distribution of coho salmon critical habitat within tributaries, implementation of the KRRC's proposed aquatic resource measures (AR-1 and AR-2), and implementation of the mitigation measures (AQR-1 and AQR-2) developed for this EIR (where both sets of measures were designed to offset short-term impacts to PCEs of critical habitat), there would not be a substantial decrease in the quality of a substantial proportion of habitat for coho salmon critical habitat in the short term. Therefore, the Proposed Project would have no significant impact on coho salmon critical habitat in the short term.

In the long term, the Proposed Project would increase the amount of habitat available to coho salmon upstream of currently designated critical habitat and improve water quality and bedload characteristics in the mainstem Klamath River within current critical habitat.

The Proposed Project would restore access for Upper Klamath River coho salmon populations to the Hydroelectric Reach. The 2006 administrative trial-type hearings evaluating fish passage mandatory conditions found that the record of evidence is inconclusive as to whether coho salmon's historical distribution extended upstream as far as Spencer Creek, but that the evidence definitively shows that based on historical records and tribal accounts coho salmon used habitat as far upstream as Fall Creek (NMFS 2006a). Based on Hamilton et al. (2005), the Proposed Project would expand coho salmon distribution to include historical high-quality spawning and rearing habitat along the mainstem Klamath River and all tributaries upstream at least as far as Spencer Creek, including in Jenny, Shovel, and Fall creeks. Together, this compromises around 80 miles of suitable potential habitat within the Hydroelectric Reach (DOI 2007, Cunanan 2009). Access to suitable habitat upstream of Iron Gate Dam would increase the availability of spawning sites, result in additional food resources, and provide access to areas of better water quality.

NMFS may consider whether to designate the newly available habitat as critical habitat as part of its five-year status review or as a separate reconsideration of the critical habitat designation for the species (J. Simondet, NMFS, pers. comm., 2011). But, it is speculative at this point to prejudge the outcome of any such consideration, so the EIR does not find that the anticipated coho habitat expansion would necessarily result in an increased in the amount of designated critical habitat.

As discussed in detail in Potential Impact 3.2-1, the thermal lag formerly caused by water storage in reservoirs and the associated increased thermal mass would be eliminated in the Lower Klamath River. This would result in Klamath River water temperatures that exhibit more natural diel (i.e., 24-hour period) variation and are more in sync with historical migration and spawning periods. These changes would result in water temperatures that are more favorable for

salmonids in the mainstem Klamath River in the long term, thus improving the water quality PCE of critical habitat. Removal of the Lower Klamath Project dams and associated facilities would also increase dissolved oxygen concentrations and eliminate reservoir habitat that creates the conditions necessary for the growth of blue-green algae and other phytoplankton. Under the Proposed Project, increased bedload supply and transport following dam removal would increase the supply of gravel downstream from the removed dams as far downstream as Cottonwood Creek (see Appendix F). In the long term this would likely improve critical habitat for coho salmon by reducing median substrate to a size more favorable for spawning (USBR 2012).

Overall, these changes would be a substantial increase in the quality and quantity of coho salmon critical habitat in the long term. Therefore, the Proposed Project would be beneficial for coho salmon critical habitat in the long term.

Mitigation Measure AQR-1 – Mainstem Spawning.
Implementation of Action 1 of proposed Aquatic Resource Measure AR-1 (tributary-mainstem connectivity) shall be implemented in the tributaries identified in Action 1 of AR-1, as well as all newly created stream channels that were previously inundated by Project reservoirs prior to drawdown. As described in Appendix B: *Definite Plan – Appendix I*, implementation of Action 1 of proposed Aquatic Resource Measure AR-1 would be conducted for at least two years following dam removal, including following a 5-year flow event if the event were to occur within that two years. This mitigation measure (AQR-1) ensures that in addition to the monitoring that shall be conducted as described for AR-1, monitoring shall also be conducted within one month following a 5-year flow event regardless of how many years since dam removal have passed, and if fish passage obstructions are identified, they shall be removed as described in AR-1 (Appendix B: *Definite Plan – Appendix I*). In addition, implementation of Action 1 of proposed Aquatic Resource Measure AR-1 shall include an evaluation and proposal of other actions to improve spawning and rearing habitat in tributaries to the Klamath River that meet the spawning targets identified in AR-1, which may include: installation of large woody material, riparian planting for shade coverage, wetland construction or enhancement, and cattle exclusion fencing.

Mitigation Measure AQR-2 – Juvenile Outmigration.
Implementation of Action 2 of proposed Aquatic Resource Measure AR-2 (tributary-mainstem connectivity monitoring) shall be implemented in the tributaries identified in Action 2 of AR-2 as well as all newly created stream channels that were previously inundated by Lower Klamath Project reservoirs prior to drawdown. As described in Appendix B: *Definite Plan – Appendix I*, implementation of Action 2 of AR-2 would be conducted for at least two years following dam removal, including following a 5-year flow event, if the event were to occur within that two years. This mitigation measure (AQR-2) ensures that in addition to monitoring described under AR-2, monitoring shall also be conducted within one month following a 5-year flow event regardless of how many years

since dam removal have passed, and requires that if fish passage obstructions are identified in relation to the Proposed Project, they shall be removed as described in AR-2 (Appendix B: *Definite Plan – Appendix I*).

Significance

No significant impact with mitigation to coho salmon critical habitat in the short term

Beneficial for coho salmon critical habitat in the long term

Potential Impact 3.3-2 Effects on Southern Resident Killer Whale critical habitat quality due to short-term and long-term alterations to salmon populations due to dam removal.

The Klamath River contributes to critical habitat for Southern Resident Killer Whales through its contribution of salmon to their food supply (included as a PCE). The Proposed Project would not affect the geographic extent of critical habitat for this species, as it is located in the state of Washington. In the short term, salmon population abundance is anticipated to reduce under the Proposed Project, as described in Potential Impacts 3.3-7, 3.3-8, and 3.3-9. In the long term, the Proposed Project is expected to increase salmon populations (as described in Potential Impacts 3.3-7, 3.3-8, and 3.3-9), which could increase food supply for Southern Resident Killer Whales. However, data on the Southern Resident Killer Whale diet indicate that based on the migratory range and behavior of the population, the Klamath River salmon are anticipated to provide less than one percent of the diet of Southern Resident Killer Whales in most months under current and future conditions. While Southern Resident Killer Whales have been shown to consume Klamath River Chinook salmon: the Klamath River is considered by NMFS and WDFW tenth out of 17 priority Chinook salmon populations for Southern Resident Killer Whales (NMFS 2018b, NMFS and WDFW 2018). If Chinook salmon abundance increases as predicted under the Proposed Project (EIR Section 3.3.5.9 Aquatic Resource Impacts), then Klamath River Chinook salmon could become a larger contributor to the diet of Southern Resident Killer Whale DPS. If this occurs as predicted, the Proposed Project would be a benefit to critical habitat for Southern Resident Killer Whales. Based on the low proportion of the Sothern Resident Killer Whale diet being composed of salmon from the Klamath River under existing conditions, the Proposed Project would not be likely to substantially impact the habitat quality (i.e., food supply) of Southern Resident Killer Whales in the short term or long term. Therefore, the Proposed Project would have no significant impact to Southern Resident Killer Whale critical habitat in the short term and long term.

Significance

No significant impact to Southern Resident Killer Whale critical habitat in the short term

No significant impact to Southern Resident Killer Whale critical habitat in the long term

Potential Impact 3.3-3 Effects on eulachon critical habitat quality due to short-term sediment releases due to dam removal.
In the short term, under the Proposed Project, PCEs of critical habitat supporting eulachon would be degraded, including short-term adverse effects of suspended sediment (see Section 3.3.5.1 *Suspended Sediment* and Appendix E) primarily on spawning and egg incubation habitat, and adult and larval migration habitat (NMFS 2011) during eulachon spawning, and adult and larval migration period (primarily January through April). Eulachon are highly adapted to migrating and spawning during periods of increases suspended sediment, and suspended sediment released under the Proposed Project is predicted to be at levels similar to what occurs under existing conditions within the Klamath River Estuary, at least during infrequent storm events.

Critical habitat for the Southern DPS eulachon includes approximately 539 miles of riverine and estuarine habitat in California, Oregon, and Washington, of which the Klamath River Estuary is a small proportion (less than two percent). Although the Proposed Project could result in short-term reductions in habitat quality detrimental to PCEs (potentially spawning substrate composition during the year of dam removal) under a worst impacts on fish scenario, a negligible amount (less than two percent) of eulachon critical habitat would be affected for a short duration. Therefore, impacts to eulachon critical habitat would not be significant in the short term.

In the long term, SSCs would be similar to those under existing conditions. Natural bedload transport processes would resume, as the dams would no longer trap sediment supplied from areas upstream of Iron Gate Dam (see Appendix F). Channel bed elevations and grains size in the estuary and ocean would not be appreciably affected, because of the small contribution of the area upstream of Iron Gate Dam to the total bedload in the system. Water quality benefits resulting from the Proposed Project would largely have dissipated upstream of the estuary, and therefore, water quality in the estuary would be expected to remain un-altered in the long term (WQST 2011). Therefore, there would be no impact to eulachon critical habitat in the long term.

Significance
No significant impact to eulachon critical habitat in the short term

No significant impact to eulachon critical habitat in the long term

Potential Impact 3.3-4 Effects on Chinook and coho salmon Essential Fish Habitat (EFH) quality and quantity due to short-term sediment releases and long-term changes in habitat quality and quantity due to dam removal.
In the short term, under the Proposed Project, Chinook and coho salmon Essential Fish Habitat (EFH) is identical for both species and would be degraded from elevated SSCs and sediment deposition downstream of Iron Gate Dam (see Section 3.3.5.1 *Suspended Sediment* and Appendix E of this EIR, and Section 3.3.5.2 *Bed Elevation and Grain Size Distribution* and Appendix F of this EIR). The specific features of EFH that would be adversely impacted in the short term include water quality necessary for successful adult migration and holding, spawning, egg-to-fry survival, fry rearing, smolt migration, and estuarine rearing of juvenile Chinook and coho salmon. Water quality in the mainstem Klamath River downstream of Iron Gate Dam would be substantially degraded in the short term from increased suspended sediment and decreased dissolved oxygen, resulting in a substantial reduction in rearing and migration habitat suitability for juvenile and smolt Chinook and coho salmon during the winter and spring following dam removal (Appendix E). Passage conditions would be impaired for adult upstream Chinook and coho salmon migrants during the fall and winter of dam removal from both increased suspended sediment, and the risk of sediment deposits at tributary confluences (Appendices E and F). Quality of spawning substrate for Chinook and coho salmon downstream of Iron Gate Dam would be substantially degraded during the spawning season following dam removal, while most of the spawning habitat occurring in tributaries would remain unaltered by the Proposed Project (Appendix E). Passage conditions would be impaired for Chinook and coho salmon smolts during spring following dam removal from increased suspended sediment (Appendix E). Based on the substantial short-term decrease in quality of EFH for Chinook and coho salmon, there would be a significant impact to Chinook and coho salmon EFH under the Proposed Project in the short term.

However, the Proposed Project includes aquatic resource measures AR-1 (Mainstem Spawning) and AR-2 (Juvenile Outmigration) to reduce the short-term effects of SSCs on Chinook and coho salmon EFH. In addition, mitigation measures AQR-1 and AQR-2 (described above for Potential Impact 3.3-1), would be required to increase certainty of the effectiveness of the aquatic resource measures AR-1 and AR-2 and reduce the potential for short-term significant adverse impacts of the Proposed Project on Chinook and coho salmon EFH. Aquatic resource measures are summarized in Section 2.7.8.1 *Aquatic Resource Measures* and detailed in Appendix B: *Definite Plan – Appendix I*. Proposed Aquatic Resource Measure AR-1 includes the development and implementation of a monitoring and adaptive management plan to offset the impacts of Lower Klamath Project dam removal on mainstem spawning habitat. Proposed Aquatic Resource Measure AR-1 actions include a 2-year tributary confluence monitoring effort and addressing sediment and debris obstructions that block volitional upstream passage from the Klamath River into tributaries. Monitoring would occur regularly for the two years following dam removal. Additionally, any 5-year

flow event of 10,895 cfs or greater on the Klamath River recorded at the USGS Klamath River Below Iron Gate Dam CA gage (No. 11516530) within the first two years following reservoir drawdown would trigger a monitoring effort. Mitigation Measure AQR-1 Mainstem Spawning (described in detail in Potential Impact 3.3-1), developed for this EIR, further specifies that monitoring shall also be conducted following a significant flow event, even if that flow event occurs more than two years following dam removal. Proposed Aquatic Resource Measure AR-1 also includes a spawning habitat evaluation on the Klamath River and tributaries in the Hydroelectric Reach. If spawning habitat conditions following dam removal do not meet target metrics[75] developed to offset the anticipated loss of Chinook salmon and steelhead redds due to the Proposed Project, spawning gravel augmentation would be completed within the mainstem, with additional spawning habitat actions within tributaries. Tributary spawning habitat restoration actions to be completed in Jenny Creek, Shovel Creek, Fall Creek, and/or Spencer Creek could include removal of artificial fish passage barriers, or placement of large woody debris to trap and retain spawning gravels. Mitigation Measure AQR-1 Mainstem Spawning further specifies the range of actions that shall be conducted in tributaries to offset impacts to EFH. Implementation of proposed Aquatic Resource Measure AR-1 and Mitigation Measure AQR-1 would reduce the short-term impacts of SSCs on Chinook and coho salmon EFH in dam removal year 2 by improving access to tributary habitat where impacts from SSC on habitat in the mainstem can be avoided, and by augmenting spawning gravel to ensure that an equivalent amount of spawning habitat is available following dam removal. Therefore, it is anticipated that, in the short term, fewer Chinook and coho salmon would spawn in the mainstem prior to and following the dam removal, and suitable spawning gravel access would be maintained.

Proposed Aquatic Resource Measure AR-2 includes three primary actions: (1) salvaging mainstem overwintering juvenile salmonids prior to reservoir drawdown; (2) maintaining tributary-mainstem connectivity to ensure volitional fish passage between tributaries and the Klamath River; and (3) developing a water quality monitoring network, trigger thresholds, and plan for salvaging and relocating juvenile fish from tributary confluence areas to cold water tributaries or nearby off-channel ponds. Implementation of proposed Aquatic Resource Measure AR-2 would reduce the short-term effects of SSCs on Chinook and coho salmon EFH in the mainstem during dam removal by actively transporting up to 500 juvenile coho salmon from vulnerable mainstem areas to off-channel ponds protected from the effects of the Proposed Project. Other native fish captured during the seining and trapping effort, such as juvenile Chinook salmon would also be relocated into tributary streams adjacent to the salvage locations, thus off-setting water quality impacts to Chinook and coho salmon EFH. In addition, proposed Aquatic Resource Measure AR-2 would reduce the short-term effects of SSCs to migratory Chinook and coho salmon EFH by rescuing and

[75] Spawning gravel in the amount of 44,100 yd^2 for fall Chinook salmon and 4,700 yd^2 for steelhead

transporting smolts if mainstem SSC are high, and water quality conditions within tributaries are too poor to provide safe refuge (a decision to be made in regular consultation with the ATWG). Proposed Aquatic Resource Measure AR-2 would also reduce the potential short-term effects of SSCs to migratory habitat for Chinook and coho salmon smolts by maintaining tributary-mainstem connectivity to ensure volitional fish passage between tributaries and the Klamath River. Monitoring would occur regularly for the two years following dam removal. Additionally, any 5-year flow event of 10,895 cfs or greater on the Klamath River recorded at the USGS Klamath River Below Iron Gate Dam CA gage (No.11516530) within the first two years following reservoir drawdown would trigger a monitoring effort. Mitigation Measure AQR-2 Mainstem Spawning (described in detail in Potential Impact 3.3-1) further specifies that monitoring shall also be conducted following a 5-year flow event, even if that flow event occurs more than two years following dam removal. These actions would effectively reduce the number of salmon juveniles and smolts potentially exposed to periods of high SSC in the mainstem habitat following dam removal, and therefore reduce the proportion of the population experiencing sub-lethal effects or mortality in temporarily degraded habitat.

Based on the wide distribution and use of tributaries by both juvenile and adult Chinook and coho salmon, implementation of the KRRC's proposed aquatic resource measures (AR-1 and AR-2), and implementation of mitigation measures (AQR-1 and AQR-2) developed for this EIR (where both sets of measures were designed to offset short-term impacts to Chinook and coho salmon EFH), there would not be a substantial decrease in the quality of a large proportion of Chinook and coho salmon EFH in the short term. Therefore, the Proposed Project would have no significant impact on Chinook and coho salmon EFH in the short term.

In the long term, bedload supply and transport following dam removal would increase supply of gravel downstream from the dam as far downstream as Cottonwood Creek (see Appendix F). This would potentially improve EFH for Chinook and coho salmon by reducing median substrate to a size more favorable for spawning (USBR 2012). In the long term, the Proposed Project would also increase habitat for Chinook and coho salmon (upstream of currently designated EFH) by providing access to habitats upstream of Iron Gate Dam. EFH quality would be affected by improved water quality, and decreased prevalence of disease, as described above for coho salmon critical habitat. Improved access to habitats (upstream of currently designated EFH), improved water quality, increased sediment transport, and decreased prevalence of disease, would be beneficial to EFH for Chinook and coho salmon in the long term.

Significance

No significant impact with mitigation to Chinook and coho salmon EFH in the short term

Beneficial for Chinook and coho salmon EFH in the long term

Potential Impact 3.3-5 Effects on groundfish Essential Fish Habitat (EFH) quality due to short-term sediment releases and long-term changes in habitat quality due to dam removal.
EFH for Pacific Coast groundfish includes all waters and substrate within areas with a depth less than or equal to 3,500 meters (1,914 fathoms [ftm]) shoreward to the mean high-water level or the upriver extent of saltwater intrusion. Within the Area of Analysis for aquatic resources, this includes the Klamath River Estuary and Pacific Ocean nearshore environment.

In the short term, under the Proposed Project, impacts to the nearshore environment are not anticipated to be distinguishable from existing conditions, based on a relatively small magnitude of SSCs released to the nearshore environment, an anticipated rapid dilution of the sediment plume as it expands in the ocean, and a relatively low rate of deposition of sediments to the Pacific Ocean nearshore environment bottom substrates (Section 3.3.5.1 *Suspended Sediment*). EFH in the Klamath River Estuary could be affected by elevated SSCs for about four months during the winter following dam removal, during which time many groundfish species could be spawning. After this time, SSCs would return to levels similar to existing conditions. SSCs in the estuary would be less than 40 percent of the peak concentrations that are anticipated to occur immediately downstream from Iron Gate Dam. These peaks (potentially > 1,000 mg/L) downstream from Iron Gate Dam would still be substantial and would be higher than the extreme values estimated by the sediment transport model for existing conditions (see Section 3.3.5.1 *Suspended Sediment*). However, increased suspended sediment is not anticipated to substantially decrease the quality of groundfish EFH, which is adapted to periodic pulses of high sediment. In addition, the area of EFH for groundfish affected by the Proposed Project within the Klamath River Estuary is a very small proportion (<1 percent) of the total EFH designated for groundfish along the Pacific Coast. Therefore, impacts to groundfish EFH from the Proposed Project would have no significant impact in the short term.

In the long term, SSCs would be similar to those under existing conditions. Water quality benefits resulting from the Proposed Project would largely have dissipated upstream of the estuary, and therefore, water quality in the estuary would be expected to remain similar to existing conditions. Therefore, there would no impact to groundfish EFH from the Proposed Project in the long term.

Significance
No significant impact to groundfish EFH in the short term

No significant impact to groundfish EFH in the long term

Potential Impact 3.3-6 Effects on pelagic fish Essential Fish Habitat (EFH) quality due to short-term sediment releases and long-term changes in habitat quality due to dam removal.

EFH for coastal pelagic species occurs from the shorelines of California, Oregon, and Washington westward to the exclusive economic zone and above the thermocline where sea surface temperatures range from 50 to 78.8°F. Within the Area of Analysis for aquatic resources, this includes the Pacific Ocean nearshore environment. Substantial dilution of the mainstem river SSCs is expected to occur in the nearshore under the Proposed Project, and therefore the SSCs in the nearshore ocean would be expected to be similar to what would occur during existing extreme conditions. Pelagic fish are highly adapted to periods of increased suspended sediment and have the ability to swim away from areas of temporary poor habitat quality. In addition, the area for EFH for pelagic fish affected by the Proposed Project within the near-shore environment is a very small proportion (less than one percent) of the total EFH designated for pelagic species along the Pacific Coast. Overall, there would be no substantial reduction in the quality of pelagic fish EFH, and thus there would be no significant impact to pelagic fish EFH from the Proposed Project in the short term or long term.

Significance

No significant impact to pelagic fish EFH in the short term

No significant impact to pelagic fish EFH in the long term

Potential Impact 3.3-7 Effects on the fall-run Chinook salmon population due to short-term sediment releases and long-term changes in habitat quality, habitat quantity, and hatchery operations due to dam removal.

The potential for the Proposed Project to significantly increase the salmonid population in the Klamath River, including the fall-run Chinook salmon population, is an underlying purpose for the Proposed Project (KHSA 2016, Appendix B: *Definite Plan*). Therefore, as described in Section 2.7 *Proposed Project*, the drawdown timing for J.C. Boyle, Copco No. 1, and Iron Gate reservoirs under the Proposed Project was selected to minimize impacts from sediment release following dam removal under the Proposed Project to aquatic species, including fall-run Chinook salmon. Based on the distribution and life-history timing of fall-run Chinook salmon in the Klamath Basin, only a portion of Chinook salmon adults, juveniles, and smolts are likely to be present in the mainstem Klamath River during the periods of greatest sediment transport between January and March. Most individuals are in tributaries, or further downstream during this time where concentrations would be diluted by tributary inflows. Additionally, the timing of drawdown coincides with periods of naturally high suspended sediment in the Klamath River, to which fall-run Chinook salmon have adapted by avoiding and tolerating.

This potential impact section begins with a summary of the available analysis predicting the response of the fall-run Chinook salmon population to the

Proposed Action in the short- and long-term. The section then discusses in detail the potential short-term and long-term changes from the Proposed Project in each of the five study reaches within the Area of Analysis.

Quantitative modeling of fall-run Chinook salmon populations predict that the Proposed Project would increase Chinook salmon abundance. Modeling of dam removal and existing conditions by Oosterhout (2005) suggests that dam removal would substantially increase Chinook full-run spawners over a 50-year period relative to other management scenarios. Additional population capacity and modeling efforts support this conclusion (Huntington 2006, Dunsmoor and Huntington 2006, Hendrix 2011, Lindley and Davis 2011). Of these, the Hendrix (2011) life-cycle model (Evaluation of Dam Removal and Restoration of Anadromy, EDRRA) approach is considered the most intensive and robust conducted to date, because it explicitly addressed the Proposed Project, used stock-recruitment data from the Klamath River, explicitly incorporated variability in watershed and ocean conditions, and presented variance estimates of uncertainty.

Hendrix (2011) applied EDRRA to forecast the abundance of ocean and stream-type Chinook salmon (Type I and Type III life history strategies) for both the Proposed Project and continuation of existing conditions for the years 2012 to 2061. The EDRRA model did not incorporate potential climate change effects. The EDRRA Chinook salmon life cycle model assumes that current management rules (fishery control rule) established by the Pacific Fishery Management Council (PFMC) for management of Klamath River Chinook salmon would remain in place throughout the 50-year period of analysis. The PFMC has regulatory jurisdiction over salmon fishing within the 317,690-square mile exclusive economic zone from three miles to 200 miles off the coast of Washington, Oregon, and California. Since the management of salmon considers many factors that can fluctuate greatly from year to year (population abundance and environmental conditions) it is impossible to predict how future management decisions regarding the specific harvest of Klamath Basin salmon might change as a result of the Proposed Project. As stated in Hendrix (2011) “this rule is based on an optimal (i.e., escapement that produces maximum sustainable yield) escapement target after harvest of 40,700 (PFMC 2005).” The analysis uses the same escapement target (40,700 fish) for both alternatives despite the fact that Klamath Basin spawning distribution would be extended by hundreds of miles under the Proposed Project (as described below) and would therefore presumably have a higher escapement target. Therefore, in the EDRRA model, harvest and escapement targets to sustain the population are being managed optimally under existing conditions, whereas under the Proposed Project the escapement target is likely lower than would be required to fill newly accessible habitat. If the PFMC changes management under the Proposed Project based on additional access to spawning and rearing habitat, the harvest and escapement targets could be higher than predicted by the EDRRA model.

The EDRRA model assumes a flow regime under the Proposed Project based on the 2010 BiOp flows (NMFS 2010a), and implicitly incorporates water quality and disease by modeling a smolt survival rate that varies based on flows. The model assumes habitat restoration actions in the Upper- and Mid-Klamath basins, and it further assumes that these actions would take time to become effective. This EIR's analysis selectively uses the EDRRA modeling results that characterize conditions prior to habitat restoration because habitat restoration in the Upper- and Mid-Klamath basins is not included as part of the Proposed Project (aside from habitat restoration in Lower Klamath Project reservoirs). The EDDRA model also assumes active reintroduction efforts described in Hooton and Smith (2008), which would fully seed available fry habitats upstream of Iron Gate Dam, including the Upper Klamath Basin upstream of Upper Klamath Lake, prior to dam removal. Active reintroduction of fall-run Chinook salmon is not currently planned following dam removal under the Proposed Project. Instead, natural volitional reintroduction is anticipated under the Proposed Project and would require a longer time to meet the production levels predicted by the EDRRA model and reported by Hendrix (2011).

The EDRRA model assumes that Iron Gate Hatchery production does not occur under the Proposed Project. Therefore, the eight years of hatchery releases of Chinook salmon, after Lower Klamath Project dam removal, albeit at reduced production goals compared with existing conditions, would somewhat offset the lack of active reintroduction included in the EDRRA model.

From 1978 through 2016, returns of fall-run Chinook salmon adults to the Iron Gate Hatchery have ranged from 2,558 (in 1980) to 72,474 (in 2001), and averaged 16,559 (CDFW 2016b). During the same period, natural returns in the Klamath River (excluding Trinity River returns) ranged from 6,957 to 91,757 fall-run Chinook salmon, with an average of 31,379 fish (CDFW 2016a). While natural returns typically outnumber hatchery returns, the proportion of the Chinook salmon escapement composed of Iron Gate Hatchery returns has historically been substantial (approximately 35 percent of age 3 adults, KRTT 2011, 2013, 2015). Under the Proposed Project, fall-run Chinook salmon smolt releases will decrease by 8 percent relative to current production (2009 through 2017), and yearling releases will decrease by 88 percent relative to current production (2009 through 2017). Based on coded wire tag adult returns (discussed in Section 3.3.2.3 *[Habitat Attributes Expected to be Affected by the Proposed Project] Fish Hatcheries*), these reductions will result in 534 fewer adult returns from smolt releases, and 3,018 fewer adult returns from yearling releases. Based on the same coded wire tag survival to smolt estimates for smolt and yearling releases, recent (2009 through 2017) adult returns are estimated to average 10,009 adult per year and would average 6,457 adult hatchery returns under the Proposed Project, with an estimated 35 percent reduction in adult hatchery returns relative to recent returns. Based on these reductions, it is possible that between post-dam removal years 3 and 10 (Table

3.3-11) an average of 3,552 fewer fish could return on an annual basis due to reduced hatchery releases.

The elimination of the goal of releasing around 3.5 million Chinook salmon smolts and yearlings annually after eight years (post-dam removal year 7) would be anticipated to result in a reduction in adult hatchery returns to the Klamath River. Most adult returns are age 3 (around 75 percent), with some age 4 (around 23 percent), and a few age 5 (less than 2 percent) (KRTT 2011, 2013, 2015). As a result, progeny of hatchery releases are anticipated to return as adults continuing mostly through post-dam removal year 10 (four-year old returns, progeny of final releases in post-dam removal year 7). The first adult returns from the progeny of naturally spawning fall-run Chinook salmon in newly accessible habitat upstream of the location of Iron Gate Dam would be expected in post-dam removal year 3 (3-year old returns, progeny of post-dam removal year 1; Table 3.3-3). Therefore, between post-dam removal years 3 and 10, both hatchery returns and returns from newly accessible habitat would occur, potentially increasing the rate of reintroduction comparable to the effect of active reintroduction assumed in the EDRRA model. Impacts associated with hatcheries operations in relation to water diversions and minimum bypass flows for fish passage is discussed in Potential Impact 3.3-23 (Iron Gate Hatchery) and Potential Impact 3.3-24 (Fall Creek Hatchery).

The amount of time required for the fall-run Chinook salmon population in the Klamath River to reach capacity under the Proposed Project would be a function of adult returns that volitionally recolonize new habitat, although there is no accurate means to predict how much longer it would take to reach full capacity without the active reintroduction modeled using EDRRA. Recolonization success and rate is a function of fish straying into newly available habitats (Pess 2009). For Chinook salmon, stray rates are around six percent (Hendry et al. 2004), and 95 percent of strays migrate less than 20 miles from their natal area (Quinn and Fresh 1984, Quinn et al. 1991). However, following major changes in environmental conditions (e.g., dam removal, high SSC), salmonid stray rates have been observed to increase. For example, Leider (1989) reported steelhead stray rates increasing from 16 percent to 45 percent during recolonization of streams following the Mt. Saint Helens eruption. The time period of colonization (historical or new habitat) has been reported to occur within five to thirty years, with most falling between one to two decades (Withler 1982, Bryant 1999, Burger et al 2000, Glen 2002, Pess et al. 2003, Milner et al. 2008, Kiffney et al. 2009). Rapid (less than one year) recolonization was observed for fall-run Chinook salmon following fish ladder installation at Landsburg Dam on the Cedar River, Washington (Kiffney et al. 2009) and within months of removal of Condit Dam on the White Salmon River, Washington (Allen et al. 2016). Fall-run Chinook salmon were observed to recolonize habitat upstream of the former location of the Elwha Dam within the first year of dam removal, and within five years of dam removal a majority of returning adults were spawning in newly accessible habitat upstream of the former dam location (Weinheimer et al. 2018).

A ladder was placed on the Landsburg Dam in 2003, and Chinook salmon immediately (i.e., the first fall following ladder installation) accessed areas upstream of the dam, with juveniles of both species being observed during snorkel surveys the following year. By 2011, Chinook salmon occurred throughout nearly all accessible habitat upstream of the dam.

It is likely that following dam removal under the Proposed Project, recolonization of the 80 miles of habitat downstream of Keno Dam would be rapid, with a longer timeframe for habitat in the Upper Klamath River and connected waterbodies (and contingent on fish passage being provided at Keno Impoundment/Lake Ewauna). The EDRRA model prediction is that with dam removal there would be substantially more (median increase greater than 10,000) returning adult Chinook salmon in the Klamath Basin than without dam removal, where the prediction is based solely on access to habitat between Iron Gate and Keno dams.

Median escapements to the Klamath Basin are predicted to be higher (median increase greater than 30,000) with the Proposed Project than under existing conditions. The potential for ocean harvest is also predicted to be greater with the Proposed Project due to increased Chinook salmon adults in ocean. This logically would decrease the probability of low escapement leading to fishery closures under the Proposed Project. Modeling results of Hendrix (2011) indicated uncertainty in Chinook salmon stock recruitment dynamics due to the uncertainty in predicting smolt production based on habitat conditions, as well as uncertainty in escapement and harvest abundance forecasts based on habitat conditions. Despite the uncertainty, the results indicate that the Proposed Project would result in higher relative abundance of Chinook salmon.

In addition to the quantitative EDRRA modeling results, FERC (2007) and Hamilton et al. (2011) synthesized all available information and both concluded that increased habitat access following dam removal would result in an increase in the abundance of fall-run Chinook salmon population in the Klamath Basin.

Further, to help determine if the Proposed Project would advance restoration of the salmonid fisheries of the Klamath Basin, a Chinook Salmon Expert Panel was convened to attempt to answer specific questions that had been formulated by the KHSA (2016) stakeholders to assist with assessing the effects of the KHSA compared with existing conditions (Goodman et al. 2011). The Chinook Salmon Expert Panel concluded that Lower Klamath Project dam removal (and habitat restoration actions associated with the KBRA) would be a major step forward in conserving target fish populations in the Klamath Basin. The Chinook Salmon Expert Panel predicted that, based on the information provided to them, it was possible that Lower Klamath Project dam removal would provide a substantial increase in the abundance of naturally spawned Klamath River Chinook salmon above that expected under existing conditions in the reach between Iron Gate Dam and Keno Dam. In addition, the Chinook Salmon Expert Panel concluded that Lower Klamath Project dam removal offers greater potential than the existing

conditions for Chinook salmon to tolerate climate change and changes in marine survival (Goodman et al. 2011). While the Chinook Salmon Expert Panel agreed that there was also evidence for potential dramatic increases in abundance associated with potential fish passage upstream of Keno Dam as well, they cautioned that achieving substantial gains in Chinook salmon abundance and distribution in the Klamath Basin is contingent upon successfully resolving key factors that would continue to affect the population, including water quality in Upper Klamath Lake and Keno Reservoir, disease, colonization of the Upper Klamath River Basin, harvest and escapement, hatchery interactions, predation by resident fish, climate change, instream flows, and impacts from dam removal. The anticipated influence of the Proposed Project on these factors (among others) within specific reaches is described below.

Upper Klamath River and Connected Waterbodies
As discussed above under 3.3.5.8 *Aquatic Habitat*, under the Proposed Project, removal of the Lower Klamath Project dams would allow fall-run Chinook salmon to regain access to around 360 miles within the upper Klamath River upstream of Upper Klamath Lake (DOI 2007, Hamilton et al. 2005, 2016). The access would expand the Chinook salmon's current habitat to include historical habitat along the mainstem Klamath River, upstream to the Sprague, Williamson, and Wood rivers (Hamilton et al. 2005, 2016). This would be a potential increase in access to 49 significant tributaries in the Upper Klamath Basin, comprising hundreds of miles of additional potentially productive habitat upstream of Iron Gate Dam (DOI 2007), including access to groundwater-fed areas with relatively cold water that would be resistant to climate change-induced water temperature increases (Hamilton et al. 2011).

As discussed under Section 3.3.5.3 *Water Quality*, the Keno Impoundment/Lake Ewuana has the potential to be a habitat barrier during most years for fall-run Chinook due to poor water quality during the late summer, and therefore NMFS and USFWS prescribed fish passage measures for the Keno Impoundment/Lake Ewuana as part of the Klamath Hydroelectric Project relicensing to be used during periods of poor water quality (DOI 2007, NMFS 2007b). If fish passage were not provided, fall-run Chinook salmon would be limited to the additional habitat access in the Hydroelectric Reach, as described in detail below. Over the long term, seasonal dissolved oxygen in the Keno Impoundment/Lake Ewauna would also be expected to improve as TMDL implementation projects continue. While it would be speculative at this point to identify the timing or scope of such improvements, it is reasonable to assume that the multiple water quality improvement projects would work to shorten the season of impairment in the reach (allowing early and/or later migrants to reach upstream spawning habitat) and to reduce the number of years in which Keno Impoundment/Lake Ewauna's poor water quality forms a barrier to migration.

Upper Klamath River – Hydroelectric Reach
The Proposed Project would restore fall-run Chinook salmon access to the Hydroelectric Reach, expanding their distribution to include historical habitat along the mainstem Klamath River and all tributaries upstream at least as far as Spencer Creek; including in Jenny, Shovel, and Fall creeks (Hamilton et al. 2005), totaling around 80 miles of potential habitat within the Hydroelectric Reach, including 21.2 miles of habitat currently inundated by Lower Klamath Project reservoirs (DOI 2007, Cunanan 2009). Historically, Chinook salmon (both fall- and spring-run) spawned and were abundant within this habitat (NMFS 2006a, Hamilton et al. 2016). Prior to construction of Iron Gate Dam, Coots and Wales (1952) observed about 300 Chinook salmon spawning in the Copco No. 2 Bypass Reach at around eight cfs, with additional spawning habitat available at the time of survey.

Adults would be able to access this reach starting in September of dam removal year 2 (Table 2.7-1). By fall of dam removal year 2, elevated SSCs from dam removal would have subsided (USBR 2012). Because of this, fall-run Chinook salmon would not be exposed to the elevated SSCs that would occur during dam removal in this reach. Most of the sediment stored within the river channels currently inundated by Lower Klamath Project reservoirs would likely be eroded by the end of spring of dam-removal year 2. The maximum deposition anticipated is minor (less than 0.5 foot), within pockets of the river reaches between reservoirs, settling into pool and other low-velocity habitats as water velocities decrease. This would constitute a negligible and temporary (less than six months following reservoir drawdown in dam removal year 1) reduction in the quality of habitat and would occur prior to the first adult salmon accessing newly available habitat in post-dam removal year 1.

River channel habitat within the reservoir reaches would be primarily low gradient habitat which is of critical importance for salmon spawning and rearing. For example, FERC (2007) described the Copco No. 2 bypassed reach and reaches inundated by Iron Gate and Copco reservoirs to be low gradient. For these reaches, they estimated that the density of Chinook salmon spawners per mile for mainstem habitat was twice that of high gradient habitat (FERC 2007). These river channels would likely excavate to their pre-dam elevations within six months and revert to and maintain pool-riffle morphology due to restoration of riverine processes, creating holding, spawning, and rearing habitat for anadromous salmonids.

Modeling (USBR 2012) indicates that after dam removal, spawning gravel in all sections of the Hydroelectric Reach would be within the range usable for fall-run Chinook salmon, but the amount of sand in the bed within former reservoir sections could initially inhibit spawning success. The bed material within the reservoirs and from Iron Gate Dam to Cottonwood Creek is expected to have a high content (30 to 50 percent) of sand immediately following reservoir drawdown until a flushing flow moves the sand sized material out of the reach (USBR 2012).

The flushing flow is expected to be at least 6,000 cfs and of several days to weeks to return the bed to a bed dominated by cobble and gravel with a sand content less than 20 percent. After the flushing flow, the bed is expected to maintain fractions of sand, gravel, and cobble which would be expected under natural conditions. Based on the historical record a sufficient flushing flow would likely occur within five years following dam removal (see Section 3.6.5.1 *Flood Hydrology*).

Habitat currently within inundated Lower Klamath Project reservoir that would be exposed following dam removal under the Proposed Project is anticipated to be used during the first spawning migration after dam removal (fall of dam removal year 2). A similar rapid recolonization of formally reservoir inundated habitat was observed at two dam removal sites in southern Oregon. Following removal of Savage Rapids Dam on the Rogue River in 2009, 91 redds from within the bounds of the former reservoir were documented where no redds had existed previously in 2010 (the first fall spawning season following dam removal), and more the following year (ODFW 2011). Following removal of the Gold Ray Dam on the Rogue River in 2010, 37 redds were documented from within the bounds of the former reservoir the fall after dam removal, with over twice that many the following year (ODFW 2011).

The Proposed Project would establish flow and water quality conditions that more closely mimics natural conditions by incorporating more variability in daily flows (described in Section 3.6.5.1 *Flood Hydrology*). The reservoir drawdowns would also allow tributaries and springs such as Fall, Shovel, and Spencer creeks and Big Springs to flow directly into the mainstem Klamath River, creating patches of cooler water that could be used as temperature refugia by fish during summer and fall, as well as providing slightly warmer winter water temperatures conducive to the growth of salmonids (Hamilton et al. 2011).

In addition, as described in detail in Section 3.3.5.5 *Fish Disease and Parasites*, it is unlikely that the disease conditions that currently exist downstream of Iron Gate Dam would develop upstream of Iron Gate Dam under the Proposed Project.

Middle and Lower Klamath River

In the short term in this reach, the Proposed Project would decrease dissolved oxygen and release dam-stored sediment downstream to the Lower Klamath River. In the long term, the Proposed Project would restore a flow and sediment regime that more closely mimics natural conditions in the long term. Suspended sediment effects on fall-run Chinook salmon under the Proposed Project are described in detail in Appendix E.3.2.1 and summarized here.

During the fall and winter of dam removal year 1, under the least impacts on fish, most-likely impacts on fish, or worst impacts on fish scenario, no impact from suspended sediment is anticipated for all adult fall-run Chinook salmon migrating

or spawning within tributaries to the Klamath River, or for juveniles rearing within tributaries (Appendix E, Table E-8). Under the most-likely impacts on fish or worst impacts on fish scenario, complete loss of eggs from the dam removal year 1 brood year deposited in the mainstem in fall of dam removal year 1 is predicted. Based on 556ac surveys from 1999 through 2009 (Magneson and Wright 2010), an average of around 2,100 redds could be affected in the mainstem. As described in detail in Appendix E.3.2.1, based on escapement estimates in the Klamath Basin from 2001 through 2009 (CDFG 2010, unpublished data) on average this would be around eight percent of all anticipated fall-run Chinook salmon redds in the Klamath River Basin in the fall spawning of dam removal year 1.

In dam removal year 2 suspended sediment could be high enough for long enough duration to cause moderate physiological stress for returning adults during the fall under a least impacts on fish scenario, impaired homing under a most-likely impacts on fish scenario, and major physiological stress under the worst impacts on fish scenario (Appendix E.3.2.1). For smolts, in dam removal year 2 suspended sediment is anticipated to have sublethal effects on Type I, Type II, and Type III outmigrants (Appendix E.3.2.1) and would not cause substantial reductions in abundance. The Type I smolts affected by increased SSCs during dam removal year 2 would be the progeny of the same cohort[76] of adult spawners potentially affected by dam removal. However, the Type-II and Type-III progeny of that same cohort of adults that successfully spawn in tributaries during dam removal year 2 would produce smolts that would outmigrate to the ocean a year after the spring pulse of suspended sediment in dam removal year 2 and should not be noticeably affected by the Proposed Project.

In the long term (by post-dam removal year 2), SSC in the Middle and Lower Klamath River are predicted to return to similar levels to existing conditions, and no substantial effect on fall-run Chinook salmon is anticipated.

In the short term, a higher proportion of sand in the mainstem channel bed surface may reduce the quality of spawning habitat in the mainstem Klamath River downstream of Iron Gate Dam. As described in detail in Appendix F, the dam removal year 2 fall-run Chinook salmon cohort could be affected by sediment deposits with higher levels of sand than under existing conditions. After a flushing flow of at least 6,000 cfs, the bed is expected to maintain fractions of sand, gravel, and cobble which would be expected under natural conditions, and suitable for fall-run Chinook salmon. Based on the historical record a sufficient flushing flow would likely occur within five years following dam removal. These effects would be most apparent in successive median or dry years following dam removal, but less apparent in successive wet years (Appendix F). Increased proportion of sand in the spawning substrate could

[76] Cohort is a group of fish born during the same year.

reduce embryo survival-to-emergence (Chapman 1988) for fall-run Chinook salmon spawning during fall of dam removal year 1 (affecting fry that would emerge and smolt during dam removal year 2). Changes in bedload would be limited to the reach from Iron Gate Dam to Cottonwood Creek, a length of eight miles, or 4 percent of the channel length of the mainstem Klamath River downstream from Iron Gate Dam. The most severe effects would also be limited to a small proportion of the total channel length (0.5 miles, or less than one percent of the channel downstream from Iron Gate Dam), as sediment deposition would lessen downstream from Bogus Creek to Cottonwood Creek. At most, around eight percent of fall-run Chinook salmon in the Klamath Basin are expected to spawn in the mainstem downstream of Iron Gate Dam prior to dam removal, with an even smaller percentage expected to spawn within the 8-mile affected reach (described in Appendix E.3.2.1).

In the long term, the river would eventually exhibit enhanced habitat complexity due to increased sediment supply, a more natural flow regime, greater sediment transport rates, and more frequent bed mobilization that would increase spawning habitat availability and quality and improve early rearing habitat downstream from Iron Gate Dam (see Appendix F). Bedload sediment movement and transport are vital to create and maintain functional aquatic habitat. An increased supply of gravel from upstream sources is predicted to improve spawning gravel quality and increase the amount of fall-run Chinook salmon spawning habitat downstream from Iron Gate Dam by decreasing the median substrate size to 1.5 to 2.4 in (USBR 2012), within the observed range for Chinook salmon spawning (0.6 to 2.8 in [Kondolf and Wolman 1993]). Pools would likely return to their pre-sediment release depth within one year (USBR 2012), and the river is predicted to revert to and maintain a pool-riffle morphology providing suitable habitat for fall-run Chinook salmon.

Short-term (less than two months) reductions in dissolved oxygen are anticipated to occur as a result of high organic SSCs following dam removal, as described in detail in Potential Impact 3.2-9. Despite predicted short-term increases in oxygen demand under the Proposed Project, dissolved oxygen concentrations would generally remain above the minimum acceptable level (5 mg/L) for salmonids of all life stages in this reach. Exceptions to this would occur four to eight weeks following drawdown of J.C. Boyle and Iron Gate reservoirs (i.e., in February dam removal year 2), when dissolved oxygen would remain below 5 mg/L for a distance approximately 48–71 miles downstream from Iron Gate Dam (approximately RM 145 to RM 122). Any incubating fall-Chinook salmon eggs in the river during this time are assumed to have already suffered 100 percent mortality caused by increased SSC during this time, and thus the decrease in dissolved oxygen is not anticipated to have an additional effect. No other life-stages are anticipated to occur in the mainstem Klamath River during this time, and thus no additional effects are expected.

By eliminating peaking flows in the Hydroelectric Reach and removing the Lower Klamath Project reservoirs, the Proposed Project would support a flow regime that more closely mimics natural conditions in the Lower Klamath River. Flows under the Proposed Project are intended to benefit fall-run Chinook salmon and are anticipated to have positive consequences for Chinook salmon given their life cycle in the Klamath River.

As discussed in detail in Section 3.2.5.1 *Water Temperature*, dam removal would also cause water temperatures to become warmer earlier in the spring and early summer and cooler earlier in the late summer and fall and have diurnal variations more synchronized with historical migration and spawning periods (Hamilton et al. 2011). Under the Proposed Project, warmer springtime temperatures would result in fall-run Chinook salmon fry emerging earlier (Sykes et al. 2009), encountering favorable temperatures for growth sooner than under existing conditions (Figure 3.3-5), which could support higher growth rates and encourage earlier migration downstream, thereby reducing stress and disease (Bartholow et al. 2005, FERC 2007). A predicted earlier outmigration in response to elevated water temperatures in the spring is also supported by the scientific literature relating to increased growth rates and thermal response of outmigrating salmonids, as summarized by Hoar (1988). In addition, fall-run Chinook salmon spawning in the mainstem during fall would no longer be delayed by water temperatures (reducing prespawn mortality) (Figure 3.3-4), and adult migration would occur in lower water temperatures than under existing conditions (Figure 3.3-5). Overall, these changes would result in water temperatures more favorable for fall-run Chinook salmon in the mainstem Klamath River downstream from Iron Gate Dam.

As described in Section 3.3.5.5 *Fish Disease and Parasites*, the Proposed Project is expected to disrupt many of the existing congruence of factors that lead to high disease parasite concentrations at locations with multiple water quality stressors for fish and resulting high levels of fish disease.

As described in Section 3.3.5.6 *Fish Hatcheries*, operation of the Iron Gate Hatchery and Fall Creek Hatchery, at a combined reduced capacity for eight years following dam removal, would be likely to reduce hatchery Chinook salmon returns available for ocean or in-river harvest compared with existing conditions. However, naturally-spawning adult returns benefiting from dam removal are predicted to occur beginning in post-dam removal year 3 and the larger returns would begin to offset reductions due to lower hatchery capacity during the first eight years following dam removal and, ultimately, to hatchery closure in post-dam removal year 7.

Also, as described in Section 3.3.5.6 *Fish Hatcheries*, the cessation of juvenile fish releases from Iron Gate Hatchery after eight years may also significantly decrease the amount of competition for food resources and habitat space between hatchery-reared and natural origin smolts and yearlings in the Klamath

River. This would result in higher growth rates for natural origin fish (McMichael et al. 1997), and thus larger size at ocean entry beginning in post-dam removal year 8 (first year of no hatchery releases; Table 3.3-11). Smolt size is correlated with increased marine survival for Chinook salmon (Scheuerell et al. 2009, Feldhaus et al. 2016) which, in conjunction with reduced competition with hatchery smolts in the marine environment (Sweeting et al. 2003), is anticipated to result in increased adult returns as soon as post-dam removal year 10 (three-year-old adult returns). In addition, incidences of disease are expected to be reduced by ending hatchery operations after eight years.

Klamath River Estuary and Pacific Ocean Nearshore Environment
Under the Proposed Project, habitat in the Klamath River Estuary and the Pacific Ocean nearshore environment could be affected by sediment releases during dam removal for approximately three months (January through March) under all scenarios. After this time, SSCs would return to levels similar to existing conditions (see Appendix E). SSCs in the Klamath River Estuary would be less than 40 percent of the peak concentrations that are anticipated to occur immediately downstream from Iron Gate Dam. These peaks would still be substantial and would be higher than the extreme values estimated by the sediment transport model for existing conditions (see Section 3.2.5.2 *Suspended Sediments*). However, the increased SSCs predicted to occur in the estuary would not be of sufficient magnitude or duration to result in substantial sublethal or lethal effects on fall-run Chinook salmon individuals (Appendix E.3.2.1). While the magnitude of SSCs released to the Pacific Ocean nearshore environment would be within the range of natural conditions, the duration of elevated SSCs (i.e., weeks) would be greater than would occur under natural (i.e., storm) conditions (i.e., days). Therefore, there also would be elevated SSCs in the Pacific Ocean nearshore environment relative to existing conditions (see Section 3.2.5.2 *Suspended Sediments*). However, no Chinook salmon adults or juveniles are anticipated to occur within the nearshore environment during this period.

Summary
In the short term, reservoir drawdown under the Proposed Project would result in elevated SSCs, low dissolved oxygen, and altered sand and finer bedload sediment transport and deposition, and would adversely impact fall-run Chinook salmon primarily in the Middle Klamath River downstream of Iron Gate Dam. Fall-run Chinook salmon use the mainstem Klamath River for spawning, rearing, and as a migratory corridor. Direct mortality is predicted for a proportion of fall-run Chinook salmon redds. However, the effect of SSCs from the Proposed Project on the fall-run Chinook salmon population, under all scenarios, is not expected to substantially reduce the population because of variable life histories, the timing of SSC pulses to avoid the most vulnerable fall-run Chinook life stages, the comparatively small number of fall-run Chinook salmon that spawn in the mainstem, the large majority of age 0 juveniles that remain in tributaries until later in the spring and summer, and because many of the fry that outmigrate to the mainstem come from lower-Basin tributaries (e.g., Salmon and Trinity rivers)

and thus would be subject only to conditions in the Lower Klamath River, where SSCs resulting from the Proposed Project are expected to be lower due to dilution from tributaries (USBR 2012). Based on no predicted substantial short-term decrease in fall-run Chinook salmon abundance of a year class, or substantial decrease in habitat quality or quantity, there would not be a significant impact to fall-run Chinook salmon under the Proposed Project in the short term.

Although this EIR finds no significant impact on fall-run Chinook salmon In the short term, the KRRC proposes aquatic resource measures AR-1 (Mainstem Spawning) and AR-2 (Juvenile Outmigration) which would further reduce the potential for short-term effects of SSCs on salmonid juveniles, smolts, and eggs, including fall-run Chinook salmon. In addition, although CEQA Guidelines Section 15126.4(a)(3) states that mitigation measures are not required for effects which are not found to be significant, mitigation measures AQR-1 and AQR-2, which would be implemented as a result of significant adverse impacts described for Potential Impact 3.3-1 and Potential Impact 3.3-4, would even further reduce the less than significant short-term effects of the Proposed Project on fall-run Chinook salmon by increasing certainty regarding the effectiveness of the KRRC's proposed aquatic resource measures. Aquatic resource measures are summarized in Section 2.7.8.1 *Aquatic Resource Measures* and detailed in Appendix B: *Definite Plan – Appendix I*. Proposed Aquatic Resource Measure AR-1 includes the development and implementation of a monitoring and adaptive management plan to offset the impacts of Lower Klamath Project dam removal on mainstem spawning. Proposed Aquatic Resource Measure AR-1 actions include a 2-year tributary confluence monitoring effort and addressing sediment and debris obstructions that block volitional upstream passage from the Klamath River into tributaries. Monitoring would occur regularly for the two years following dam removal. Additionally, any 5-year flow event of 10,895 cfs or greater on the Klamath River recorded at the USGS Klamath River Below Iron Gate Dam CA gage (No. 11516530) within the first two years following reservoir drawdown would trigger a monitoring effort. Mitigation Measure AQR-1 Mainstem Spawning (detailed above), developed for this EIR, further specifies that monitoring shall also be conducted following a significant flow event, even if that flow event occurs more than two years following dam removal. Proposed Aquatic Resource Measure AR-1 also includes a spawning habitat evaluation on the Klamath River and tributaries in the Hydroelectric Reach. The spawning habitat actions of AR-1 are focused on offsetting impacts of the Proposed Project on Chinook salmon and steelhead. If spawning habitat conditions following dam removal do not meet target metrics[77] developed to offset the anticipated loss of Chinook salmon and steelhead redds due to the Proposed Project, spawning gravel augmentation would be completed within the mainstem, with additional spawning habitat actions within tributaries. Tributary spawning habitat restoration actions to be completed in Jenny Creek, Shovel Creek, Fall Creek, and/or Spencer Creek

[77] Spawning gravel in the amount of 44,100 yd^2 for fall Chinook salmon and 4,700 yd^2 for steelhead

could include removal of artificial fish passage barriers, or placement of large woody debris to trap and retain spawning gravels. Mitigation Measure AQR-1 Mainstem Spawning (detailed above) further specifies the range of actions that shall be conducted in tributaries to offset impacts to Chinook salmon spawning. Proposed Aquatic Resource Measure AR-1 and Mitigation Measure AQR-1 would reduce the less than significant short-term impacts of SSCs on fall-run Chinook salmon spawning in dam removal year 1 by improving access to tributary habitat where impacts from SSCs in the mainstem can be avoided, and by augmenting spawning gravel ensuring that suitable spawning habitat in mainstem and tributaries is available following dam removal.

Proposed Aquatic Resource Measure AR-2 includes three primary actions: (1) salvaging mainstem overwintering juvenile salmonids prior to reservoir drawdown; (2) maintaining tributary-mainstem connectivity to ensure volitional fish passage between tributaries and the Klamath River; and (3) developing a water quality monitoring network, trigger thresholds, and plan for salvaging and relocating juvenile fish from tributary confluence areas to cold water tributaries or nearby off-channel ponds. Implementation of proposed Aquatic Resource Measure AR-2 would reduce the short-term effects of SSCs to fall-run Chinook salmon juveniles rearing in the mainstem during dam removal by actively transporting juveniles from vulnerable mainstem areas to off-channel ponds protected from the effects of the Proposed Project, thus offsetting water quality impacts to juvenile Chinook salmon. Seining efforts would be focused on coho salmon, but all captured juvenile Chinook salmon would also be relocated into tributary streams adjacent to the salvage locations. Proposed Aquatic Resource Measure AR-2 would also reduce the potential short-term effects of SSCs to fall-run Chinook salmon smolts by maintaining tributary-mainstem connectivity to ensure volitional fish passage between tributaries and the Klamath River. Monitoring would occur regularly for the two years following dam removal. Additionally, any 5-year flow event of 10,895 cfs or greater on the Klamath River recorded at the USGS Klamath River Below Iron Gate Dam CA gage (No. 11516530) within the first two years following reservoir drawdown would trigger a monitoring effort. Mitigation Measure AQR-2 Juvenile Outmigration (detailed below) developed for this EIR, further specifies that monitoring shall also be conducted following a significant flow event, even if that flow event occurs more than two years following dam removal. In addition, proposed Aquatic Resource Measure AR-2 would reduce the less than significant short-term effects of SSCs to migratory Chinook salmon smolts by rescuing and transporting smolts if mainstem SSC are high, and water temperatures within tributaries are too poor to provide safe refuge (a decision to be made in regular consultation with the ATWG).

These actions would effectively reduce the number of fall-run Chinook salmon juveniles and smolts potentially exposed to periods of high SSC in the mainstem following dam removal, and therefore off-set short-term impacts to the proportion of the population experiencing sub-lethal effects or mortality.

In the long term, removal of the Lower Klamath Project dams under the Proposed Project would increase habitat availability, restore a more natural flow regime by eliminating peaking flows in the Hydroelectric Reach and removing the Lower Klamath Project reservoirs, restoring more natural seasonal water temperature variation, improve water quality, and reduce the likelihood of fish disease, all of which would be beneficial for fall-run Chinook salmon. As stated above, dam removal would also restore connectivity to hundreds of miles of potentially usable habitat in the Upper Klamath Basin and would create additional spawning and rearing habitat within the Hydroelectric Reach. It is anticipated that the Proposed Project would increase the abundance, productivity, population spatial structure, and genetic diversity of fall-run Chinook salmon in the Klamath Basin (Hendrix 2011). In general, free-flowing river conditions created by the Proposed Project would likely increase adult migration rate, decrease outmigrant delay, and increase adult escapement (Buchanan et al. 2011b). As discussed in detail above, dam removal would also cause water temperatures to become warmer earlier in the spring and early summer and cooler earlier in the late summer and fall, and have diurnal variations more in sync with historical migration and spawning periods (Hamilton et al. 2011). These changes would result in water temperature more favorable for salmonids in the mainstem. In addition, under the Proposed Project diminished disease conditions and improved water quality in the mainstem Klamath River would likely improve the survival of smolts outmigrating from tributaries downstream from Iron Gate Dam (e.g., Scott and Shasta rivers). Finally, the loss of hatchery production following the closure of Iron Gate Hatchery and Fall Creek Hatchery following eight years of operation is anticipated to be offset by the increase in natural production from habitat upstream of Iron Gate Dam. If fish passage is not provided a Keno Impoundment/Lake Ewuana, restored habitat access to the Hydroelectric Reach and the multiple benefits of the Proposed Project would be beneficial for fall-run Chinook salmon in the long term. If fish passage were provided (per DOI [2007] fish passage prescriptions), an even greater magnitude of restored habitat access to the Upper Klamath River Basin and the multiple benefits of the Proposed Project would be beneficial for fall-run Chinook salmon in the long term.

Significance

No significant impact for fall-run Chinook salmon populations in the short term

Beneficial for fall-run Chinook salmon populations in the long term

Potential Impact 3.3-8 Effects on the spring-run Chinook salmon population due to short-term sediment releases and long-term changes in habitat quality, habitat quantity, and hatchery operations due to dam removal.

As discussed above for fall-run Chinook salmon, a Chinook Salmon Expert Panel was convened to attempt to answer specific questions that had been formulated by the project stakeholders to assist with assessing the effects of the Proposed Project compared with existing conditions (Goodman et al. 2011). While noting

uncertainties based on existing data, the panel concluded that the prospects for the Proposed Project to provide a substantial positive effect for spring-run Chinook salmon were less certain than for fall-run Chinook salmon. The primary concern of the panel was that low abundance and productivity (return per spawner) of spring-run Chinook salmon could limit recolonization of habitats upstream of Iron Gate Dam. A secondary concern was that mainstem water temperatures are predicted to be slightly warmer in the spring (2–4 °C from February to mid-July), which could further constrain upstream movements of spring Chinook salmon during the latter portion of the migration (Goodman et al. 2011). Water temperatures in the mainstem upstream of Iron Gate Dam are discussed in more detail below.

There are a few basic mechanisms by which spring-run Chinook salmon could recolonize newly accessible habitat, including (1) straying of adults returning to the Salmon River, (2) adaptation of fall-run Chinook salmon to an early spring-run Chinook salmon life history, or (3) active reintroduction of spring-run Chinook salmon from another population. There are many examples of fall-run Chinook salmon rapidly recolonizing newly accessible habitat discussed in Potential Impact 3.3-7 above, and spring-run Chinook salmon were observed recolonizing habitat in the White Salmon River, Washington, following removal of Condit Dam (Allen et al. 2016). Following the removal of Condit Dam most of the observed spring-run Chinook salmon spawning was upstream of the location of the former Condit Dam. The current spring-run Chinook salmon abundance in the Salmon River is low (Table 3.3-2), and the rate of recolonization could be slow as a result. However, under the Proposed Project water temperatures and instream flows in the Klamath River upstream of the confluence with the Salmon River are predicted to mimic more natural conditions, which could encourage increased straying into upstream habitat.

The potential for adaptation of fall-run Chinook salmon to a spring-run Chinook salmon life history was assessed by Thompson et al. (2018), and they concluded that based on the genetics of the fall-run Chinook salmon currently downstream of Iron Gate Dam, it was unlikely that this would occur. Active reintroduction of Chinook salmon with genetics suited to adapt to an early spring-run Chinook salmon life history may be successful strategy for recolonization (Thompson et al. 2018). The Proposed Project does not include an active reintroduction plan. Although ODFW drafted an Implementation Plan for the Reintroduction of Anadromous Fishes into the Oregon Portions of the Upper Klamath Basin, implementation of the plan remains uncertain (T. Wise, ODFW, pers. comm., 2018). The draft plan includes active reintroduction of spring-run Chinook salmon into tributaries of the Upper Klamath Lake (T. Wise, ODFW, pers. comm., 2019).

Under the Proposed Project, steelhead, coho, and fall-run Chinook salmon yearlings and smolts would no longer be released from hatcheries in the Klamath River following post-dam removal year 7. Currently there are no releases of

spring-run Chinook salmon from hatcheries into the Klamath River. Therefore, the closure of hatcheries eight years following dam removal is not anticipated to result in a decline in adult returns for spring-run Chinook. Impacts associated with hatcheries operations in relation to water diversions and minimum bypass flows for fish passage is discussed in Potential Impact 3.3-23 (Iron Gate Hatchery) and Potential Impact 3.3-24 (Fall Creek Hatchery).

The expected influence of the Proposed Project within specific reaches is described below.

Upper Klamath River and Connected Waterbodies
The Proposed Project would not result in changes to suspended or bedload sediment, flow-related habitat, or algal toxins in this reach. Under the Proposed Project, dam removal would allow spring-run Chinook salmon to regain access to the Upper Klamath River upstream of J.C. Boyle Reservoir (FERC 2007). The access would expand the Chinook salmon's current habitat to include historical habitat along the mainstem Klamath River and upstream to the Sprague, Williamson, and Wood rivers (Hamilton et al. 2005). This would be a potential increase in access to 49 significant tributaries in the Upper Klamath Basin, comprising hundreds of miles of additional potentially productive habitat (DOI 2007), including access to important thermal refugia within areas influenced by groundwater exchange that are more resistant to climate change (Hamilton et al. 2011). Some of these areas, such as the lower Williamson River, have habitat that would provide substantial holding areas for spring-run Chinook salmon (Hamilton et al. 2011). Other holding areas with suitable temperatures upstream of J.C. Boyle Reservoir include groundwater influenced areas on the west side of Upper Klamath Lake, and the Wood River (Gannett et al. 2007). Warmer winter water temperatures associated with groundwater input to the river would also be conducive to the growth of salmonids (Hamilton et al. 2011).

Poor water quality (e.g., severe hypoxia, temperatures exceeding 77°F, high pH) in the reach from Keno Dam to Link Dam might impede volitional fish passage at any time from late June through mid-November (Sullivan et al. 2009, USGS 2010; both as cited in Hamilton et al. 2011). However, available information indicates that Upper Klamath Lake habitat is presently suitable to support Chinook salmon for at least the period from October through May (Maule et al. 2009). Currently, adult spring-run Chinook migration takes place in approximately April through June. Historically, adult spring-run Chinook salmon migrated upstream of the current location of Iron Gate Dam perhaps as early as February and March (Fortune et al. 1966) and likely held over in large holding pools in the mainstem in tributaries fed by cool water, and in thermal refuge habitat upstream of Upper Klamath Lake (Snyder 1931, CDFG 1990c, Moyle 2002). One benefit of such early migration (similar to the spring-run Chinook salmon migration timing currently observed in the Klamath Basin) would be the avoidance of periods of poor water quality in the vicinity of Keno Impoundment/Lake Ewuana. The restored water temperature regime under the

Proposed Project may restore the natural upstream migration timing of adult spring-run Chinook salmon because of the shift in water temperatures downstream from Iron Gate Dam (Bartholow et al. 2005). Either under the current migration timing or under a shift towards earlier migration, most or all of the spring-run Chinook salmon migrants would be able to pass upstream through the Keno Impoundment/Lake Ewuana area before seasonal water quality reductions would make passage restricted.

Huntington (2006) reasoned that spring-run Chinook salmon likely accounted for the majority of the Upper Klamath Basin's actual salmon production under historical conditions. Huntington (2006) cautioned that while access to the Upper Klamath Basin provides considerable promise of increasing spring-run abundance, the existing potential for Chinook salmon production within the basin upstream of Upper Klamath Lake is clearly much lower than his estimate of historical potential. However, Huntington (2006) did not fully account for the historical (and unknown) production potential of Upper Klamath Lake itself, which could have been considerable, as suggested by a recent experimental reintroduction into Upper Klamath Lake (Maule et al. 2009).

Upper Klamath River – Hydroelectric Reach

The Proposed Project would restore spring-run Chinook salmon access to the Hydroelectric Reach, including include historical habitat along the mainstem Klamath River and all tributaries upstream at least as far as Spencer Creek; including in Jenny, Shovel, and Fall creeks (Hamilton et al. 2005), comprising around 80 miles of potential habitat within the Hydroelectric Reach (DOI 2007, Cunanan 2009). Chinook salmon (both fall- and spring-run) historically spawned and were abundant within this habitat (NMFS 2006a, Hamilton et al. 2016). Adults would be able to access this reach beginning in spring of dam removal year 2 (Table 2.7-1); thus, short-term gains in flow-related habitat or habitat expansion may be limited to later cohorts. Elevated SSCs and bedload movement from dam removal may not have sufficiently dissipated in time for the first potential migrants, but by the second adult migrant season in post-dam removal year 1, would return to background levels similar to those under existing conditions and would not be expected to affect spring-run Chinook salmon using this area. Adult spring-run Chinook salmon do not currently occur upstream of the Salmon River, and would not be expected to be able to use the mainstem Klamath River upstream of Iron Gate Dam until conditions in the Hydroelectric Reach are suitable.

The Proposed Project would establish flow and water quality conditions that more closely mimics natural conditions by eliminating peaking flows, removing Lower Klamath Project reservoirs, and incorporating more variability in daily flows. The removal of the reservoirs would allow Fall, Shovel, and Spencer creeks to flow directly into the mainstem Klamath River, along with Big Springs (in the J.C. Boyle Bypass Reach) and additional springs, which would provide fish with patches of cooler water as refugia during summer and fall, as well as providing

slightly warmer winter water temperatures conducive to the growth of salmonids (Hamilton et al. 2011).

As described in detail in Section 3.3.5.5 *Fish Disease and Parasites*, it is unlikely that the disease conditions that currently exist downstream of Iron Gate Dam would develop upstream of Iron Gate Dam under the Proposed Project.

Middle and Lower Klamath River
The Proposed Project would release dam-stored sediment downstream to the Lower Klamath River Reach in the short term and would establish a flow and sediment regime that more closely mimics natural conditions in the Middle Klamath River in the long term.

Short-term effects of elevated SSCs on spring-run Chinook salmon under the Proposed Project are described in detail in Appendix E.3.2.2 and summarized here. Spring-run Chinook salmon are primarily distributed in the Salmon River and other tributaries downstream with limits their exposure to temporarily elevated concentrations of suspended sediment that would occur in the mainstem Klamath River under the Proposed Project. Under all scenarios, no impact from suspended sediment is anticipated for all spring-run Chinook salmon spawning and rearing, which occurs primarily within tributaries (Table E-9). Suspended sediment is anticipated to have sublethal effects on adult migration, primarily for those adults returning to the Salmon River (around five percent of all spring-run migrants). All outmigrating spring-run Chinook salmon smolts enter the Klamath River at the confluence with the Salmon River, where SSC are predicted to be much lower than further upstream, and where SSCs under existing conditions can be high from tributary contributions of suspended sediment. Therefore, only sublethal effects on outmigrants are predicted (Appendix E, Table E-9), which is similar to existing conditions (Appendix E, Table E-3).

Short- and long-term changes in channel bed elevations and grain size in response to increased bedload supply would be limited to the reach from Iron Gate Dam to Cottonwood Creek, a length of eight miles, or four percent of the mainstem Klamath River channel downstream from Iron Gate Dam (see Appendix F for details). The most severe effects would also be limited to a small proportion of the total channel length (0.5 miles, or less than one percent of the channel downstream from Iron Gate Dam), as sediment deposition would lessen downstream from Bogus Creek to Cottonwood Creek and, thus, would not affect the area currently used by spring-run Chinook salmon. Within one year (i.e., by spring of post-dam removal year 1), SSCs would have returned to existing conditions and the channel would likely have reverted to its previous pool-riffle morphology (Stillwater Sciences 2008).

By eliminating peaking flows in the Hydroelectric Reach and removing the Lower Klamath Project reservoirs, the Proposed Project would support a flow regime

that more closely mimics natural conditions in the Lower Klamath River, mostly upstream of the confluence of Scott Creek. Dam removal would cause water temperatures upstream of the Salmon River confluence to warm earlier in the spring and early summer and cool earlier in the late summer and fall and have diurnal variations more in sync with historical migration and spawning periods (Hamilton et al. 2011). These changes would result in water temperatures that are more favorable for salmonids in the mainstem upstream of the Salmon River confluence (Section 3.3.5.4 *Water Temperature*). Therefore, in the long term it is anticipated that improved mainstem migration conditions may increase migration of spring-run Chinook salmon upstream of the Salmon River towards newly accessible habitat.

Although disease incidence is predicted to decrease (resulting in increased salmonid smolt survival) under the Proposed Project (see Section 3.3.5.5 *Fish Disease*), these benefits would be most noticeable upstream of the confluence with the Salmon River, and thus are anticipated to have less of benefit for spring-run Chinook salmon than other salmonids in comparison with existing conditions.

Klamath River Estuary and Pacific Ocean Nearshore Environment
Under the Proposed Project, habitat in the Klamath River Estuary could be affected by elevated sediment releases during dam removal for about three months (January through March) when spring-run Chinook salmon smolts could be within the estuary (see Section 3.3.5.1 *Suspended Sediment* and Appendix E). After this time, SSCs would return to levels similar to existing conditions. SSCs in the estuary would be less than 40 percent of the peak concentrations that are anticipated to occur immediately downstream from Iron Gate Dam. These peaks would still be substantial, and would be higher than the extreme values estimated by the sediment transport model for existing conditions (see Section 3.3.2.3 *Habitat Attributes Expected to be Affected by the Proposed Project* and Appendix E). However, the increased SSCs predicted to occur in the Klamath River Estuary would not be of sufficient magnitude or duration to result in substantial sublethal or lethal effects on spring-run Chinook salmon individuals (Appendix E.3.2.2). While the magnitude of SSCs released to the Pacific Ocean nearshore environment would be within the range of natural conditions, the duration of elevated SSCs (i.e., weeks) would be greater than would occur under natural (i.e., storm) conditions (i.e., days). Therefore, there also would be elevated SSCs in the Pacific Ocean nearshore environment relative to existing conditions (see Section 3.2.5.2 *Suspended Sediments*). However, no Chinook salmon adults or juveniles are anticipated to occur within the nearshore environment during this period.

Summary
In the short term, reservoir drawdown associated with dam removal under the Proposed Project would alter SSCs and bedload sediment transport and bedload deposition. The overall effect of suspended sediment from the Proposed Project on the spring-run Chinook salmon population is not anticipated to differ

substantially from existing conditions. Suspended sediment conditions experienced by adult migrants would result in minor and only sublethal impacts. No impacts are anticipated for the spawning, incubation, and fry stages because they do not occur in the mainstem. Type I, II, and III outmigrants are expected to experience similar conditions under the Proposed Project as under existing conditions. Based on no predicted substantial short-term decrease in spring-run Chinook salmon abundance of a year class, or substantial decrease in habitat quality or quantity, there would not be a significant impact to spring-run Chinook salmon under the Proposed Project in the short term.

Although this EIR finds no significant impact on spring-run Chinook salmon In the short term, the KRRC proposes Aquatic Resource Measures AR-2 (Juvenile Outmigration) which would further reduce the potential for short-term effects of SSCs on salmonid juveniles and smolts, including spring-run Chinook salmon. In addition, although CEQA Guidelines Section 15126.4(a)(3) states that mitigation measures are not required for effects which are not found to be significant, Mitigation Measure AQR-2, which would be implemented as a result of significant adverse impacts described for Potential Impact 3.3-1 and Potential Impact 3.3-4, would even further reduce the potential for short-term, less than significant effects of the Proposed Project on spring-run Chinook salmon by increasing certainty regarding the effectiveness of the KRRC's proposed aquatic resource measure.

Aquatic resource measures are summarized in Section 2.7.8.1 and detailed in Appendix B: *Definite Plan – Appendix I*. AR-2 includes three primary actions: (1) salvaging mainstem overwintering juvenile salmonids prior to reservoir drawdown; (2) maintaining tributary-mainstem connectivity to ensure volitional fish passage between tributaries and the Klamath River; and (3) developing a water quality monitoring network, trigger thresholds, and plan for salvaging and relocating juvenile fish from tributary confluence areas to cold water tributaries or nearby off-channel ponds. Implementation of AR-2 would reduce the short-term effects of SSCs to outmigrating juvenile spring-run Chinook salmon smolts by rescuing and transporting smolts if mainstem SSC are high, and water quality conditions within tributaries do not allow safe refuge. This action would effectively reduce the number of spring-run Chinook salmon smolts potentially exposed to periods of high SSC in the mainstem following dam removal, and therefore reduce the proportion of the population experiencing sub-lethal effects.

In the long term, removal of the Lower Klamath Project dams under the Proposed Project would increase habitat availability, restore a more natural temperature regime, improve water quality, and reduce the likelihood of fish disease, all of which would be beneficial for spring-run Chinook salmon. Dam removal would restore connectivity to hundreds of miles of potentially usable habitat in the Upper Klamath Basin, including additional habitat within the Hydroelectric Reach. Access to additional habitat would provide a long-term benefit to spring-run Chinook salmon populations. The expansion of habitat opportunities would allow

increased expression of life-history variation and the restoration of an additional population of spring-run Chinook salmon to strengthen resiliency in the Klamath Basin, particularly because passage upstream of Iron Gate Dam would provide access to groundwater-fed thermal refugia during summer and fall, as well as providing slightly warmer winter water temperatures conducive to the growth of salmonids (Hamilton et al. 2011). By providing an unimpeded migration corridor, the Proposed Project would provide the greatest possible benefit related to fish passage, hence, the highest survival and reproductive success (Buchanan et al. 2011b). As discussed in detail above, dam removal would also cause water temperatures to become warmer earlier in the spring and early summer and cooler earlier in the late summer and fall, and have diurnal variations more in sync with historical migration and spawning periods in the mainstem upstream of the confluence with the Salmon River (Hamilton et al. 2011). These changes would result in water temperatures more favorable for spring-run Chinook salmon in the mainstem, supporting any portion of the population that recolonizes Klamath River Basin habitat upstream of the Salmon River. It is anticipated that, as a result of the Proposed Project, the spring-run Chinook salmon population within the Klamath Basin would have an opportunity to increase in abundance, and would have increased productivity, population spatial structure, and genetic diversity. Implementation of the Proposed Project would be beneficial for spring-run Chinook salmon in the long term.

Significance

No significant impact for spring-run Chinook salmon populations in the short term

Beneficial for spring-run Chinook salmon populations in the long term

Potential Impact 3.3-9 Effects on coho salmon populations due to short-term sediment releases and long-term changes in habitat quality, habitat quantity, and hatchery operations due to dam removal.

The Coho Salmon and Steelhead Expert Panel was convened and charged with answering specific questions that had been formulated to assist with assessing the effects of the Proposed Project on coho salmon (Dunne et al. 2011). While noting the constraints of the Coho Salmon and Steelhead Expert Panel to arrive at conclusions within a short time, and without adequate quantitative or synthesized information, the conclusion of the Coho Salmon and Steelhead Expert Panel was that, in the short term, the difference between the Proposed Project and existing conditions is expected to be small. The Coho Salmon and Steelhead Expert Panel stated that larger (moderate) increases in abundance are possible under the Proposed Project if additional restoration actions are implemented, and mortality caused by the pathogen *C. shasta* is reduced. The Coho Salmon and Steelhead Expert Panel predicted a small increase in the population from a modest increase in habitat area usable by coho salmon, small changes in conditions in the mainstem, and positive but un-quantified changes in tributary habitats where most coho spawn and rear. The Coho Salmon and Steelhead Expert Panel also concluded that dam removal would provide greater mitigation to climate change for coho salmon than existing conditions. The Coho

Salmon and Steelhead Expert Panel also noted the potential for increased disease risk and low ocean survival to offset gains in production in the new habitat, although no evidence for either increased disease risk or reduced ocean survival was presented.

Under the Proposed Project, hatchery coho salmon smolts would be released from Fall Creek Hatchery into the Klamath River at current (75,000 smolts annually) production goals for eight years following dam removal. During that eight-year period no change to the coho salmon population resulting from hatchery operations relative to existing conditions is anticipated. Eight years following dam removal, all hatchery coho salmon releases would cease (final releases would occur in dam removal year 7). Based on production goals, ceasing operations after eight years would likely result in a reduction of up to 75,000 coho salmon smolts per year beginning in post-dam removal year 8 (Table 3.3-11). Based on the current low abundance of coho salmon in the upper Klamath River population unit, a conservation focus for the coho salmon hatchery program has been deemed necessary to protect the remaining genetic resources of that population unit (CDFW and PacifiCorp 2014). Assuming smolts are released for the last time in post-dam removal year 7, adults of hatchery progeny would continue to return through post-dam removal year 9 (as age 3 adults). Based on the average coho salmon smolt-to-adult survival ratio of 0.99 percent estimated for current coho salmon Iron Gate Hatchery operations (CDFW and PacifiCorp 2014), a reduction in the release of 75,000 coho salmon smolts following closure of Fall Creek Hatchery could result in a decline of around 743 adult returns on average annually starting in post-dam removal year 10. These adults would return to the Fall Creek Hatchery, but also stray and spawn naturally. Between 2004 and 2011 an average of 46 coho salmon hatchery adults per year strayed into Bogus Creek (CDFW and PacifiCorp 2014). Impacts associated with hatcheries operations in relation to water diversions and minimum bypass flows for fish passage is discussed in Potential Impact 3.3-23 (Iron Gate Hatchery) and Potential Impact 3.3-24 (Fall Creek Hatchery).

As described in Section 3.3.5.6 *Fish Hatcheries* and summarized in CDFW (2014), there are potential adverse hatchery-related effects on the coho salmon population, including straying of hatchery fish into important tributaries such as Bogus Creek (first three years) and Fall Creek (years four through ten) with the potential to reduce the reproductive success of the natural population (Mclean et al. 2003, Chilcote 2003, Araki et al. 2007) and negatively affect the diversity of the Klamath River coho salmon populations via outbreeding depression[78] (Reisenbichler and Rubin 1999). The current Hatchery Genetic Management Plan for Iron Gate Hatchery coho salmon (HGMP, CDFW and PacifiCorp 2014) operates to assist in the basin's coho salmon recovery efforts by conserving a full range of the existing genetic, phenotypic, behavioral, life history, and ecological

[78] Outbreeding depression is progeny that are less adapted to the environment than parents.

diversity of the run. The intent of this program is to use genetic analysis in brood stock selection and rearing and release techniques improve fitness and reduce straying of hatchery fish to natural spawning areas.

Under the Proposed Project, dam removal and the associated habitat improvements are anticipated to result in an increase in coho salmon abundance. The first adults that could potentially access newly available habitat upstream of Iron Gate Dam would be in dam removal year 2 (Table 3.3-11) and produce age 1 smolts benefiting from improved river function (e.g., reduced disease in the Middle Klamath River). Therefore, the first adult returns that could reflect improved conditions would be in post-dam removal year 4 (as age 3 adults). Under existing conditions, CDFW (2014) estimates that greater than 30 percent of the total adult returns to the upper Klamath River are of hatchery origin, including greater than 70 percent of returns to the hatchery, around 34 percent of returns to Bogus Creek, and around 16 percent of returns to tributaries such as the Shasta and Scott rivers. Between post-dam removal years 4 and 10, both hatchery returns and returns from newly accessible habitat, would occur (Table 3.3-11) providing a likelihood of increased abundance and recolonization of the newly accessible habitat.

As described in Section 3.3.5.6 *Fish Hatcheries*, outmigrant smolt mortality from disease would be reduced under the Proposed Project starting in post-dam removal year 8 with the end of Chinook and coho salmon hatchery releases. The cessation of juvenile fish releases may also significantly decrease the amount of competition for food resources and habitat space between hatchery-reared and natural origin smolts in the Klamath River. This would result in higher growth rates for natural origin fish (McMichael et al. 1997), and thus larger size at ocean entry beginning in dam removal year 8. Smolt size is correlated with increased marine survival for coho salmon (Holtby et al. 1990), which in conjunction with reduced competition with hatchery smolts in the marine environment (Sweeting et al. 2003) is anticipated to result in increased adult returns as soon as post-dam removal year 10 (3-year-old adult returns). Although existing data are not available for a quantitative prediction, it is anticipated that benefits from dam removal and cessation of hatchery operations would increase adult returns by more than the loss of hatchery progeny.

Upper Klamath River and Connected Waterbodies

Available data suggests that coho salmon were in both mainstem and tributary reaches of the Klamath River upstream to and including Spencer Creek at RM 232.6 (Figure 3.3-1, NRC 2004, as cited in NMFS 2007a, Hamilton et al. 2005). It is not anticipated that under the Proposed Project coho salmon would begin to occupy habitat within the Upper Klamath River and connected waterbodies, and therefore this reach is not analyzed for effects on coho salmon.

Upper Klamath River – Hydroelectric Reach
The Proposed Project would restore access for the Upper Klamath River Population coho salmon to the Hydroelectric Reach, expanding their distribution to include historical habitat along the mainstem Klamath River and all tributaries upstream at least as far as Spencer Creek; including in Jenny, Shovel, and Fall creeks (Hamilton et al. 2005), comprising around 80 miles of potential habitat within the Hydroelectric Reach (DOI 2007, Cunanan 2009). Coho salmon downstream from Iron Gate Dam belonging to the Upper Klamath River Population Unit would migrate upstream of the dam if access was provided (NMFS 2006a). Over time, access to habitat upstream of Iron Gate Dam would benefit the Upper Klamath River Population Unit by: a) extending the range and distribution of the species thereby increasing the coho salmon's reproductive potential; b) increasing genetic diversity in the coho stocks; and c) reducing the species' vulnerability to the impacts of degradation. These benefits would cumulatively result in an increase in the abundance of the coho salmon population (NMFS 2006a). The National Research Council (NRC) of the National Academy of Sciences reviewed causes of decline and strategies for recovery of endangered and threatened fishes of the Klamath Basin. The NRC concluded that "removal of Iron Gate Dam...could open new habitat, especially by making available tributaries that are now completely blocked to coho" (NRC 2004). Coho salmon recolonization of newly accessible habitat was observed following fish ladder installation at Landsburg Dam on the Cedar River, Washington (Kiffney et al. 2009), and following removal of Condit Dam on the White Salmon River, Washington (Allen et al. 2016). The Landsburg Dam was laddered in 2003, and coho salmon were observed within areas upstream of the dam within the first year. By 2011 salmon (with coho salmon being most abundant) occurred within nearly all of the accessible habitat upstream of the dam. Pess (et al. 2011) predicted that within the habitat upstream of Landsburg Dam juvenile coho salmon would establish a population that outnumbered resident salmonid species (e.g., rainbow trout, cutthroat trout) by 40 percent within five years of colonization, suggesting a strong ability of coho salmon to successfully occupy newly accessible habitat.

By eliminating peaking flows in the Hydroelectric Reach and removing the Lower Klamath Project reservoirs, the Proposed Project would support a flow regime that more closely mimics natural conditions in the Lower Klamath River. The reservoir drawdowns would also allow tributaries and springs such as Fall, Shovel, and Spencer creeks and Big Springs to flow directly into the mainstem Klamath River, creating patches of cooler water that could be used as temperature refugia by fish during summer and fall, as well as providing slightly warmer winter water temperatures conducive to the growth of salmonids (Hamilton et al. 2011). As described in Section 3.3.5.5 *Fish Disease and Parasites*, risk of fish disease and parasites for coho salmon would decrease.

Adults would be able to access the Hydroelectric Reach beginning in fall of dam removal year 2. By this time, elevated SSCs from dam removal would likely have

dissipated, returning to background levels similar to those of existing conditions. Most sediment released from the reservoirs would likely be eroded within the first six months after dam removal (by June of dam removal year 2), returning sections of river currently inundated by the Lower Klamath Project reservoirs and riverine sections between reservoirs to pool-riffle morphology. Within this reach, coho salmon would generally spawn in tributaries and not within the mainstem Klamath River but might rear in and migrate through the Hydroelectric Reach. Dam removal would result in the provision of suitable rearing habitat for juveniles and spawning habitat for the few individual coho that might spawn in the mainstem Klamath River. Access to the cooler waters associated with spring inputs in the Hydroelectric Reach would benefit coho salmon rearing in the mainstem (Hamilton et al. 2011). Removal of the Lower Klamath Project reservoirs would result in more favorable water temperature for coho salmon adult migrants, juveniles, and smolts. As described in detail in Section 3.3.5.5 *Fish Disease and Parasites*, it is unlikely that the disease conditions that currently exist downstream of Iron Gate Dam would develop upstream of Iron Gate Dam under the Proposed Project. Access to this reach and the habitat conditions within it would benefit the Upper Klamath River coho salmon population.

Middle and Lower Klamath River

The Proposed Project would release dam-stored sediment downstream to the Lower Klamath River Reach in the short term and would establish a flow and sediment regime that more closely mimics natural conditions in the long term. Suspended sediment effects on coho salmon under the Proposed Project are described in detail in Appendix E.3.2.3, and summarized here.

There are nine coho salmon population units in the Klamath Basin (see the coho salmon subsection of Section 3.3.2.1 *Aquatic Species*). Only negligible effects from suspended sediment would be expected on the three population units in the Trinity River, and on the Lower Klamath River Population Unit. Effects on the Salmon River Population Unit are anticipated to remain similar to existing condition (SEV ranging from 5.4 to 8.4 with sublethal physiological stress) even under a worst impacts on fish scenario (Appendix E.3.2.3, Table E-10), due to dilution of suspended sediment from tributaries in the Middle Klamath River. Effects on the Upper Klamath River, Mid-Klamath River, Shasta River, and Scott River population units under all scenarios are anticipated to be sublethal on most life-stages (Appendix E.3.2.3). Under all scenarios, the small proportion of coho salmon from the Upper Klamath River Population Unit that spawn in the mainstem, as well as their progeny, would suffer 60 to 80 percent mortality due to the effects of suspended sediment on these life stages. This compares to existing conditions high rate of mortality for this small proportion of mainstem spawners predicted to be from 20 to 60 percent depending on severity of conditions (Appendix E.3.1.3). It is believed by experts in the watershed that progeny of mainstem spawning coho salmon experience reduced survival compared to fish produced from tributary spawners (Simondet 2006), since

rearing and growth conditions within tributaries are more favorable than in the mainstem. Based on spawning surveys conducted from 2001 through 2017 (Magneson and Gough 2006, Hentz and Wickman 2016, Dennis et al. 2017), from 0 to 13 redds could be affected in dam removal year 1 during the Proposed Project. Many of these redds are thought to be from returning hatchery fish (NMFS 2010a), and thus may be only selecting this habitat after failing to locate the hatchery collection site. Based on the range of escapement estimates of Ackerman et al. (2006), 13 redds (the highest number observed) would be much less than one percent of the natural and hatchery returns to the Klamath River Basin. The Upper Klamath River Population Unit would be expected to recover from these losses in the long term, given the benefits to the population.

Coho salmon smolts from the dam removal year 1 cohort are expected to outmigrate to the ocean beginning in late February, although most natural origin smolts outmigrate to the mainstem Klamath River during April and May (Wallace 2004). Coho smolt releases from Iron Gate Hatchery typically occur in the first three weeks of April (CDFW and PacifiCorp 2014). Numerous field and laboratory studies have shown that juvenile salmonids actively avoid exposure to high (> 150 mg/L) SSCs, including altering migratory patterns to seek lower turbidity (Bisson and Bilby 1982, Berg and Northcote 1985, Redding et al. 1987, Servizi and Martens 1992, Bash et al. 2001, Carlson et al. 2001, Kemp et al. 2011, Kjelland et al. 2015). Therefore, it is assumed that coho salmon outmigration during the spring of dam removal year 2 would occur within the period of typical outmigration with the lowest predicted SSC. Once in the mainstem Klamath River, coho salmon smolts move downstream fairly quickly (Stutzer et al. 2006). Under the Proposed Project, SSCs would be slightly higher during spring than under existing conditions, and coho salmon smolts are likely to suffer moderate to major stress and reduced feeding depending on scenario (Appendix E.3.2.3, Table E-10).

Under existing conditions, coho salmon smolts outmigrating from the Upper Klamath River, Scott River, and Shasta River populations currently have high mortality rates (35 to 70 percent) presumably as a result of poor water quality and disease (Beeman et al. 2007, 2008), which, in conjunction with physiological stress and reduced growth resulting from the Proposed Project, could result in higher mortality than under existing conditions in the spring of dam removal year 2.

Based on the results of coho salmon outmigrant trapping by the USFWS (2001) on the mainstem Klamath River compared with trapping in the Trinity River from 1997 to 2000 (USFWS 2011), most (greater than 80 percent) coho smolts originate from the Trinity River and Lower Klamath River populations. For the majority of coho salmon smolts, produced from tributaries downstream from Orleans, effects of the Proposed Project would be similar to existing conditions by late April.

The Proposed Project would also result in the release of coarse sediment, as described in Section 3.11 *Geology, Soils, and Mineral Resources* and Appendix F of this EIR. Impacts associated with the release of coarse sediment are expected to affect the same individuals described for suspended sediment above. For example, coarse sediment is predicted to bury redds constructed in fall of dam removal year 1, which are the same redds expected to suffer from suspended sediment (potentially from 0 to 13 redds). In addition, sediment deposition could aggrade pools or overwhelm other habitat features that coho salmon use for adult holding or juvenile rearing. However, the sediment impact on habitat is anticipated to be short term, and pools would likely return to their pre-sediment release depth within one year (USBR 2012).

Additionally, as described in Potential Impact 3.2-1 and Potential Impact 3.2-2, water quality improvements are anticipated to reduce stress to smolts, improving fitness and survival. As discussed in detail in Section 3.2.5.1 *Water Temperature*, dam removal would cause water temperatures to become warmer earlier in the spring and early summer and cooler earlier in the late summer and fall and have diurnal variations more in sync with historical migration and spawning periods (Hamilton et al. 2011). These changes would result in water temperature more favorable for coho salmon and other salmonids in the mainstem. Cooler water temperatures during fall would benefit upstream migrant adults during fall upstream migration and juvenile redistribution to overwintering habitats by providing a broader window of suitable habitat, starting in dam-removal year 2. A predicted earlier outmigration in response to elevated water temperatures in the spring is also supported by of the scientific literature relating to increased growth rates and thermal response of outmigrating salmonids, as summarized by Hoar (1988). Spring outmigrants could therefore begin an earlier outmigration starting in post-dam-removal year 1, potentially reducing their susceptibility to disease. Coincident with increased with SSCs, in the short term, migrating adults and juveniles rearing or migrating in the mainstem would be exposed to reductions in dissolved oxygen due to the Proposed Project. The risk of sublethal physiological stress and avoidance behavior predicted for migrating adults and juveniles rearing or migrating in the mainstem after dam removal resulting from increased suspended sediment is anticipated to be further exacerbated by reductions in dissolved oxygen.

As described in Section 3.3.5.5 *Fish Disease and Parasites*, the Proposed Project is expected to disrupt many of the existing congruence of factors that lead to high disease parasite concentrations at locations with multiple water quality stressors for fish and resulting high levels of fish disease.

Klamath River Estuary and Pacific Ocean Nearshore Environment
Under the Proposed Project, habitat in the Klamath River Estuary could be affected by elevated sediment during dam removal for about three months (January through March) when a low abundance of coho salmon smolts could be within the estuary during their outmigration to the ocean. After this time, SSCs

would return to levels similar to existing conditions. SSCs in the estuary would be less than 40 percent of the peak concentrations that are anticipated to occur immediately downstream from Iron Gate Dam. These peaks would still be substantial, and would be higher than the extreme values estimated by the sediment transport model for existing conditions (see Section 3.3.5.1 *Suspended Sediment*). However, the increased SSCs predicted to occur in the estuary would not be of sufficient magnitude or duration to result in substantial sublethal or lethal effects on coho salmon individuals (Appendix E.3.2.3). While the magnitude of SSCs released to the Pacific Ocean nearshore environment would be within the range of natural conditions, the duration of elevated SSCs (i.e., weeks) would be greater than would occur under natural (i.e., storm) conditions (i.e., days). Therefore, there also would be elevated SSCs in the Pacific Ocean nearshore environment relative to existing conditions (see Section 3.2.5.2 *Suspended Sediments*). However, no coho salmon adults or juveniles are anticipated to occur within the nearshore environment during this period.

Summary
In the short term, reservoir drawdown associated with dam removal under the Proposed Project could alter SSCs and bedload sediment transport and deposition, causing both lethal and sub-lethal impacts to coho salmon at all life stages. In general, the wide distribution and use of tributaries by both juvenile and adult coho salmon would likely protect the population from the worst short-term impacts of the Proposed Project. A small amount of direct mortality is anticipated for redds from the Upper Klamath Population Unit, and no mortality is anticipated for the other population units under all scenarios. Based on no predicted substantial short-term decrease in coho salmon abundance of a year class, or substantial decrease in habitat quality or quantity, there would not be a significant impact to coho salmon under the Proposed Project in the short term.

Although this EIR finds no significant impact on coho salmon In the short term, the KRRC proposes aquatic resource measures AR-1 (Mainstem Spawning), AR-2 (Juvenile Outmigration), and AR-4 (Iron Gate Hatchery Management) which would further reduce the potential for short-term effects of SSCs on coho salmon eggs, juveniles, and smolts (natural and hatchery production). In addition, although CEQA Guidelines Section 15126.4(a)(3) states that mitigation measures are not required for effects which are not found to be significant, mitigation measures AQR-1 and AQR-2, which would be implemented as a result of significant adverse impacts described for Potential Impact 3.3-1 and Potential Impact 3.3-4, would even further reduce the potential for short-term effects of the Proposed Project on coho salmon by increasing certainty regarding the effectiveness of the KRRC's proposed aquatic resource measures. Aquatic resource measures are summarized in Section 2.7.8.1 *Aquatic Resource Measures* and detailed in Appendix B: *Definite Plan – Appendix I*. Proposed Aquatic Resource Measure AR-1 includes the development and implementation of a monitoring and adaptive management plan to offset the impacts of Lower Klamath Project dam removal on mainstem spawning. Proposed Aquatic

Resource Measure AR-1 actions include a 2-year tributary confluence monitoring effort and addressing sediment and debris obstructions that block volitional upstream passage from the Klamath River into tributaries. Monitoring would occur regularly for the two years following dam removal. Additionally, any 5-year flow event of 10,895 cfs or greater on the Klamath River recorded at the USGS Klamath River Below Iron Gate Dam CA gage (No. 11516530) within the first two years following reservoir drawdown would trigger a monitoring effort. Mitigation Measure AQR-1 Mainstem Spawning (detailed in Potential Impact 3.3-1 above) further specifies that monitoring shall also be conducted following a significant flow event, even if that flow event occurs more than two years following dam removal. Proposed Aquatic Resource Measure AR-1 also includes a spawning habitat evaluation on the Klamath River and tributaries in the Hydroelectric Reach. Most coho salmon spawning occurs in tributaries, and very few coho salmon have been observed spawning in the mainstem Klamath River. Therefore, the spawning habitat actions of Proposed Aquatic Resource Measure AR-1 are focused on offsetting impacts of the Proposed Project on Chinook salmon and steelhead. However, due to the similar spawning habitat requirements of coho salmon to both species, these actions would benefit them as well. If mainstem spawning habitat conditions following dam removal do not meet target metrics[79] developed to offset the anticipated loss of Chinook salmon and steelhead redds due to the Proposed Project, spawning gravel augmentation would be completed within the mainstem, with additional spawning habitat actions within tributaries. Tributary spawning habitat restoration actions to be completed in Jenny Creek, Shovel Creek, Fall Creek, and/or Spencer Creek could include removal of artificial fish passage barriers, or placement of large woody debris to trap and retain spawning gravels. Mitigation Measure AQR-1 Mainstem Spawning (detailed in Potential Impact 3.3-1 above) further specifies the range of actions that shall be conducted in tributaries to offset impacts to coho salmon spawners. Implementation of Proposed Aquatic Resource Measure AR-1 and Mitigation Measure AQR-1 would reduce the short-term potential impacts of SSCs on coho salmon spawning in dam removal year 2 by improving access to tributary habitat where impacts from SSC on habitat in the mainstem can be avoided, and by augmenting spawning gravel ensuring that suitable spawning habitat in mainstem and tributaries is available following dam removal.

Proposed Aquatic Resource Measure AR-2 includes three primary actions: (1) salvaging mainstem overwintering juvenile salmonids prior to reservoir drawdown; (2) maintaining tributary-mainstem connectivity to ensure volitional fish passage between tributaries and the Klamath River; and (3) developing a water quality monitoring network, trigger thresholds, and plan for salvaging and relocating juvenile fish from tributary confluence areas to cold water tributaries or nearby off-channel ponds. Implementation of AR-2 would reduce the short-term effects of SSCs to coho salmon juveniles rearing in the mainstem during dam

[79] Spawning gravel in the amount of 44,100 yd^2 for fall Chinook salmon and 4,700 yd^2 for steelhead

removal by actively transporting up to 500 coho salmon juveniles from vulnerable mainstem areas to off-channel ponds protected from the effects of the Proposed Project, thus offsetting water quality impacts to these coho salmon individuals. Proposed Aquatic Resource Measure AR-2 would also reduce the potential short-term effects of SSCs to migrating coho salmon smolts by maintaining tributary-mainstem connectivity to ensure volitional fish passage between tributaries and the Klamath River. Monitoring would occur regularly for the two years following dam removal. Additionally, any 5-year flow event of 10,895 cfs or greater on the Klamath River recorded at the USGS Klamath River Below Iron Gate Dam CA gage (No. 11516530) within the first two years following reservoir drawdown would trigger a monitoring effort. Mitigation Measure AQR-2 Juvenile Outmigration (detailed in Potential Impact 3.3-1 above) further specifies that monitoring shall also be conducted following a significant flow event, even if that flow event occurs more than two years following dam removal. In addition, proposed Aquatic Resource Measure AR-2 would reduce the potential short-term effects of SSCs to migrating coho salmon smolts by rescuing and transporting smolts if mainstem SSC are high, and water temperatures within tributaries are too poor to provide safe refuge (a decision to be made in regular consultation with the ATWG). These actions would effectively reduce the number of coho salmon juveniles and smolts potentially exposed to periods of high SSC in the mainstem habitat following dam removal, and therefore reduce the proportion of the population experiencing sub-lethal effects or mortality.

The Proposed Project would shift all production of Iron Gate Hatchery coho salmon (75,000 yearling goal) to Fall Creek Hatchery. In the short term, transfer of coho salmon production from Iron Gate Hatchery to Fall Creek Hatchery would have no impact on adult returns. In addition, proposed Aquatic Resource Measure AR-4 proposes that hatchery-reared yearling coho salmon to be released in the spring of dam removal year 2 be held at Iron Gate Hatchery or Fall Creek Hatchery until water quality conditions in the mainstem Klamath River improve to sublethal levels. This would reduce the short-term effects of SSCs to coho salmon smolt released from the hatchery by decreasing the probability that they would be exposed to peak SSC levels, and would increase survival during downstream migration in dam removal year 2.

In the long term, removal of the Lower Klamath Project dams under the Proposed Project would increase habitat availability, restore a more natural flow regime by eliminating peaking flows in the Hydroelectric Reach and removing the Lower Klamath Project reservoirs, restoring more natural seasonal water temperature variation, improve water quality, and reduce the likelihood of fish disease, all of which would be beneficial for coho salmon populations. Substantial declines in abundance resulting from effects of the Proposed Project are not anticipated for more than one-year class (i.e., one generation). Dam removal would restore connectivity to habitat on the mainstem Klamath River up to and including Spencer Creek and would create additional habitat within the Hydroelectric Reach. Dam removal would also cause water temperatures to become warmer

earlier in the spring and early summer, cooler earlier in the late summer and fall, and have diurnal variations more in sync with historical migration and spawning periods (Hamilton et al. 2011). These changes would result in water temperature more favorable for salmonids in the mainstem.

In the long term, increased adult returns resulting from newly accessible habitat upstream of Iron Gate Dam would offset reductions in adult returns due to cessation of hatchery operations eight years following dam removal. It is anticipated that as a result of the Proposed Project, the coho salmon population would experience an increase in abundance, productivity, population spatial structure, and genetic diversity. In general, free flowing river conditions under the Proposed Project would likely increase adult migration efficiency, decrease outmigrant delay, and increase adult escapement (Buchanan et al. 2011b). The Proposed Project would provide multiple benefits to coho salmon from all Klamath River population units in the long term.

Significance

No significant impact for coho salmon populations in the short term

Beneficial for coho salmon populations in the long term

Potential Impact 3.3-10 Effects on the steelhead population due to short-term sediment releases and long-term changes in habitat quality, habitat quantity, and hatchery operations due to dam removal.

The Coho Salmon and Steelhead Expert Panel was convened and charged with answering specific questions that had been formulated to assist with assessing the effects of the Proposed Project on steelhead (Dunne et al. 2011). The conclusion of the Coho Salmon and Steelhead Expert Panel was that the Proposed Project could increase the spatial distribution and abundance of steelhead. This assessment is based on the observations that steelhead would be able to access a substantial extent of new habitat, steelhead are relatively tolerant to warmer water (compared to coho salmon), steelhead are similar to other species (resident redband/rainbow trout) that are currently thriving in upstream habitats, and that while steelhead are currently at lower abundances than historical values, they currently migrate to habitat directly downstream of Iron Gate Dam (e.g., Bogus Creek), and are not yet rare. The Coho Salmon and Steelhead Expert Panel also concluded that dam removal would provide greater mitigation to climate change for steelhead than existing conditions (Dunne et al. 2011). It is likely that steelhead recolonization would occur rapidly, as was observed for similar steelhead populations following fish ladder installation at Landsburg Dam on the Cedar River, Washington (Kiffney et al. 2009), and following removal of Condit Dam on the White Salmon River, Washington (Allen et al. 2016). Steelhead recolonization of habitat upstream of Condit Dam was notable, with steelhead spawning observed in upper basin tributaries within five years of dam removal.

Under the Proposed Project, steelhead, coho, and fall-run Chinook salmon yearlings and smolts would no longer be released from hatcheries in the Klamath River following post-dam removal year 7. Currently there are no releases of steelhead from hatcheries into the Klamath River. Therefore, the closure of hatcheries eight years following dam removal is not anticipated to result in a decline in adult returns for steelhead. Impacts associated with hatcheries operations in relation to water diversions and minimum bypass flows for fish passage is discussed in Potential Impact 3.3-23 (Iron Gate Hatchery) and Potential Impact 3.3-24 (Fall Creek Hatchery).

The impacts of the Proposed Project on steelhead populations within specific reaches are described below.

Upper Klamath River and Connected Waterbodies
Under the Proposed Project, dam removal would allow steelhead to regain access to the Upper Klamath River upstream of J.C. Boyle Reservoir. Under the Proposed Project, the population's distribution would likely expand to include historical habitat along the mainstem Klamath River upstream to the Sprague, Williamson, and Wood rivers (Hamilton et al. 2005). As discussed under Section 3.3.5.3 *Water Quality*, in some years poor water quality in the Keno Impoundment/Lake Ewuana reach may prevent the latest migrants of the summer steelhead run and the earlier migrants from the fall run from accessing upstream spawning habitat in these upper reaches. If no upstream trap and haul is provided at Keno, these fish would be likely to spawn in habitat downstream of Keno Dam in the Hydroelectric Reach (described below), or, in the case of fall-run steelhead, hold below the dam until conditions become passable. However, the majority of the summer steelhead adult migration, much of the fall-run adult steelhead migration, and all of the winter adult steelhead migration is anticipated to occur outside the mid-June to mid-November timeframe in which water quality in the Keno Impoundment/Lake Ewuana reach is typically so poor as to present a migration barrier to adult salmonids. Similarly, juvenile outmigration and run-backs also occur outside this timeframe. Under the Proposed Project, there would be a potential increase in access to 49 significant tributaries in the Upper Klamath Basin, comprising around 360 miles of additional potentially productive habitat (Huntington 2006, DOI 2007, NMFS 2007b).

Upper Klamath River – Hydroelectric Reach
In the long term, the Proposed Project would restore steelhead access to habitat upstream of Iron Gate Dam and below J.C. Boyle, including an estimated 80 miles of habitat within the Hydroelectric Reach (DOI 2007, Cunanan 2009). Reaches currently inundated by reservoirs and reaches between reservoirs would likely return to a pool-riffle morphology, which would benefit steelhead.

In the short term, adults could first access this reach in winter (summer steelhead) or fall (winter steelhead) of dam removal year 2. Because redband/rainbow trout (*Oncorhynchus mykiss sp.*) are already present in all free-

flowing portions of the Hydroelectric Reach and resident *O. mykiss* have similar life history requirements for spawning and rearing habitats as steelhead, it is probable that steelhead will readily use these reaches once the habitats become accessible. Further, Hamilton et al. (2005) summarizes historical evidence of steelhead using tributary streams in the Hydroelectric Reach, including Camp Creek, Spencer Creek, Shovel Creek, Scotch Creek, and Fall Creek. Steelhead could use the Hydroelectric Reach as a migration corridor, as most sediment released from the reservoirs would likely be eroded within the first six months after reservoir drawdown (by June of dam removal year 2) and would not impede upstream movement. By late spring of removal year 2, elevated SSCs resulting from dam removal would likely have returned to low levels unlikely to impact steelhead.

By eliminating peaking flows in the Hydroelectric Reach and removing the Lower Klamath Project reservoirs, the Proposed Project would support a flow regime that more closely mimics natural conditions in the Lower Klamath River. The reservoir drawdowns would also allow tributaries and springs such as Fall, Shovel, and Spencer creeks and Big Springs to flow directly into the mainstem Klamath River, creating patches of cooler water that could be used as temperature refugia by fish during summer and fall, as well as providing slightly warmer winter water temperatures conducive to the growth of salmonids (Hamilton et al. 2011).

Middle and Lower Klamath River

The Proposed Project would release dam-stored sediment downstream to the Lower Klamath River in the short term and restore a flow regime that more closely mimics natural conditions in the long term. Short-term suspended sediment effects on steelhead populations under the Proposed Project are described in detail in Appendix E.3.2.4 and summarized here.

Under all scenarios, sublethal effects from suspended sediment are anticipated for adult migrants, all spawning (which occurs primarily in tributaries), and outmigrating smolts (Appendix E.3.2.4, Table E-11). As detailed in Appendix E.3.2.4, mortality is anticipated for the following steelhead life-stages:

- Half-pounder adult: Mortality ranging from just under 20 percent of those present in the mainstem under a least impacts on fish or most-likely impacts on fish scenario, to just over 20 percent under a worst impacts on fish scenario (data on half pounder adult abundance is lacking). Majority remain in tributaries and would not be affected. Some would enter tributaries if conditions within the mainstem were adverse.
- Juvenile age 0: No mortality under a least impacts on fish or most-likely impacts to fish scenario, up to 20 percent mortality of those present in the mainstem under a worst impacts on fish scenario (up to 843 juveniles or around 3 percent of population basin-wide age 0 production in a worst impacts on fish scenario).

- Juvenile age 1: 0 to 20 percent of those present in the mainstem under a least impacts on fish scenario, or up to 40 percent mortality under the most-likely impacts to fish or worst impacts on fish scenario (up to 6,314 juveniles or around 11 percent of population basin-wide age 1 production).
- Juvenile age 2: 0 to 20 percent of those present in the mainstem under a least impacts on fish scenario, or up to 40 percent mortality under the most-likely impacts to fish or worst impacts on fish scenario (up to 5,303 juveniles or around 10 percent of population basin-wide age 2 production in a worst impacts on fish scenario).

As described in detail in Section 3.11 *Geology, Soils, and Mineral Resources* and Appendix F, dam-released sediment associated with the Proposed Project might aggrade pools or overwhelm other habitat features currently used for adult holding and juvenile rearing upstream of Cottonwood Creek. The effect would be short term (less than one year), as pools would quickly return to their pre-sediment release depth (USBR 2012). Within six months the river would revert to and maintain the pool-riffle morphology that currently exists. In the long term, under the Proposed Project, bedload sediment transport would restore vital aquatic habitat for steelhead.

As discussed in detail above, dam removal would cause water temperatures to warm earlier in the spring and early summer, cool earlier in the late summer and fall, and have diurnal variations more in sync with historical migration and spawning periods. These changes would result in water temperatures that are more favorable for salmonids occurring in the mainstem. Migrating adults and juveniles rearing or migrating in the mainstem after dam removal would be exposed to low dissolved oxygen due to the Proposed Project, but these effects would be short term and of limited spatial extent, and not likely to be of sufficient magnitude to exacerbate effects substantially beyond those anticipated for increased suspended sediment. Long-term effects of the Proposed Project would benefit steelhead using the Lower Klamath River.

The Iron Gate Hatchery does not currently produce steelhead smolts, and no steelhead releases are included under the Proposed Project. Therefore, discontinuing hatchery operations under the Proposed Project would not have a direct effect on the steelhead population, although it would eliminate the potential for additional hatchery production were sufficient numbers of steelhead to enter the hatchery again. As described in Section 3.3.5.6 *Fish Hatcheries*, and 3.3.5.5 *Fish Disease and Parasites*, incidences of disease are expected to be reduced under the Proposed Project through changes to a number of factors underlying disease prevalence. Reducing polychaete habitat would likely reduce the prevalence of *P. minibicornis* infection, although the benefit to the steelhead would not be as great as for coho and Chinook salmon because they are resistant to *C. shasta*.

Klamath River Estuary and Pacific Nearshore Environment
Under the Proposed Project, habitat in the estuary could be affected by elevated sediment releases during dam removal for about three months (January through March) when a low abundance of steelhead juveniles and smolts could be within the Klamath River Estuary. After this time, SSCs would return to levels similar to existing conditions. SSCs in the estuary would be less than 40 percent of the peak concentrations that are anticipated to occur immediately downstream from Iron Gate Dam. These peaks would still be substantial, and would be higher than the extreme values estimated by the sediment transport model for existing conditions (see Section 3.3.5.1 *Suspended Sediment*). However, the increased SSCs predicted to occur in the estuary would not be of sufficient magnitude or duration to result in substantial sublethal or lethal effects on steelhead salmon individuals (Appendix E.3.2.3). While the magnitude of SSCs released to the Pacific Ocean nearshore environment would be within the range of natural conditions, the duration of elevated SSCs (i.e., weeks) would be greater than would occur under natural (i.e., storm) conditions (i.e., days). Therefore, there also would be elevated SSCs in the Pacific Ocean nearshore environment relative to existing conditions (see Section 3.2.5.2 *Suspended Sediments*). However, no steelhead adults or juveniles are anticipated to occur within the nearshore environment during this period.

Summary
In the short term, reservoir drawdown associated with dam removal under the Proposed Project could alter SSCs and affect steelhead. In general, the short term impacts of suspended sediment resulting from the Proposed Project on steelhead are likely to be substantial for any juveniles rearing in the mainstem. However, there are several aspects of steelhead life history in the Klamath River Watershed that would ameliorate these impacts, and only a limited proportion of the rearing juveniles would be affected. The broad spatial distribution of steelhead in the Klamath Basin and their flexible life history suggests that some juveniles that would otherwise be in the mainstem would avoid the most serious effects of the Proposed Project by: (1) remaining in tributaries for extended rearing, (2) rearing farther downstream where SSC should be lower due to dilution (e.g., the progeny of the adults that spawn in the Trinity River Basin or tributaries downstream from the Trinity River), and/or (3) moving out of the mainstem into tributaries and off-channel habitats during winter. In addition, the life-history variability (e.g., regularly smolting at age 0+, 1+, or 2+) observed in steelhead means that not all individuals in any given year class would smolt during spring of dam removal year 2 and be exposed to the effects of the Proposed Project. Those that do not smolt would remain in tributaries and be unaffected by sediment release. Based on no predicted substantial short-term decrease in steelhead abundance of a year class, or substantial decrease in habitat quality or quantity, there would not be a significant impact to steelhead under the Proposed Project in the short term.

Although this EIR finds no significant impact on steelhead In the short term, the KRRC proposes aquatic resource measures AR-1 (Mainstem Spawning) and AR-2 (Juvenile Outmigration) which would further reduce the potential for short-term effects of SSCs on salmonid juveniles and eggs, including steelhead. In addition, although CEQA Guidelines Section 15126.4(a)(3) states that mitigation measures are not required for effects which are not found to be significant, mitigation measures AQR-1 and AQR-2, which would be implemented as a result of significant adverse impacts described for Potential Impact 3.3-1 and Potential Impact 3.3-4, would even further reduce the potential for short-term effects of the Proposed Project on steelhead by increasing certainty regarding the effectiveness of the KRRC's proposed aquatic resource measures. Aquatic resource measures are summarized in Section 2.7.8.1 *Aquatic Resource Measures* and detailed in Appendix B: *Definite Plan – Appendix I*. Proposed Aquatic Resource Measure AR-1 includes the development and implementation of a monitoring and adaptive management plan to offset the impacts of Lower Klamath Project dam removal on mainstem spawning. Proposed Aquatic Resource Measure AR-1 actions include a 2-year tributary confluence monitoring effort and addressing sediment and debris obstructions that block volitional upstream passage from the Klamath River into tributaries. Monitoring would occur regularly for the two years following dam removal. Additionally, any 5-year flow event of 10,895 cfs or greater on the Klamath River recorded at the USGS Klamath River Below Iron Gate Dam CA gage (No. 11516530) within the first two years following reservoir drawdown would trigger a monitoring effort. Mitigation Measure AQR-1 Mainstem Spawning (detailed in Potential Impact 3.3-1) further specifies that monitoring shall also be conducted following a significant flow event, even if that flow event occurs more than two years following dam removal. Proposed Aquatic Resource Measure AR-1 also includes a spawning habitat evaluation on the Klamath River and tributaries in the Hydroelectric Reach. If spawning habitat conditions following dam removal do not meet target metrics[80] developed to offset the anticipated loss of Chinook salmon and steelhead redds due to the Proposed Project, spawning gravel augmentation would be completed within the mainstem, with additional spawning habitat actions within tributaries. Tributary spawning habitat restoration actions to be completed in Jenny Creek, Shovel Creek, Fall Creek, and/or Spencer Creek could include removal of artificial fish passage barriers, or placement of large woody debris to trap and retain spawning gravels. Mitigation Measure AQR-1 Mainstem Spawning (detailed in Potential Impact 3.3-1) further specifies the range of actions that shall be conducted in tributaries to offset impacts to steelhead spawning. Implementation of proposed Aquatic Resource Measure AR-1 and Mitigation Measure AQR-1 would reduce the short-term potential impacts of SSCs on steelhead spawning habitat in dam removal year 2 by improving access to tributary habitat where impacts from SSC on habitat in the mainstem can be avoided, and by augmenting spawning gravel, ensuring that suitable spawning

[80] Spawning gravel in the amount of 44,100 yd^2 for fall Chinook salmon and 4,700 yd^2 for steelhead

habitat in mainstem and tributaries is available following dam removal. Therefore, it is anticipated that steelhead spawning would not be substantially reduced as a result of the Proposed Project.

Proposed Aquatic Resource Measure AR-2 includes three primary actions: (1) salvaging mainstem overwintering juvenile salmonids prior to reservoir drawdown; (2) maintaining tributary-mainstem connectivity to ensure volitional fish passage between tributaries and the Klamath River; and (3) developing a water quality monitoring network, trigger thresholds, and plan for salvaging and relocating juvenile fish from tributary confluence areas to cold water tributaries or nearby off-channel ponds. Implementation of Proposed Aquatic Resource Measure AR-2 would reduce the short-term effects of SSCs on juvenile steelhead rearing in the mainstem during dam removal by actively transporting juveniles from vulnerable mainstem areas to off-channel ponds protected from the effects of the Proposed Project. Seining efforts would be focused on coho salmon juveniles, but other native fish captured during the seining and trapping effort, including juvenile steelhead, would be relocated into tributary streams adjacent to the salvage locations. Proposed Aquatic Resource Measure AR-2 would also reduce the potential short-term effects of SSCs to steelhead smolts by maintaining tributary-mainstem connectivity to ensure volitional fish passage between tributaries and the Klamath River. Monitoring would occur regularly for the two years following dam removal. Additionally, any 5-year flow event of 10,895 cfs or greater on the Klamath River recorded at the USGS Klamath River Below Iron Gate Dam CA gage (No. 11516530) within the first two years following reservoir drawdown would trigger a monitoring effort. Mitigation Measure AQR-2 Juvenile Outmigration (detailed in Potential Impact 3.3-1) further specifies that monitoring shall also be conducted following a significant flow event, even if that flow event occurs more than two years following dam removal. In addition, Proposed Aquatic Resource Measure AR-2 would reduce the potential short-term effects of SSCs to steelhead smolts by rescuing and transporting smolts if mainstem SSCs are high, and water temperatures within tributaries are too poor to provide safe refuge (a decision to be made in regular consultation with the ATWG). These actions would effectively reduce the number of steelhead juveniles and smolts potentially exposed to periods of high SSC in the mainstem following dam removal, and therefore reduce the proportion of the population experiencing impacts.

In the long term, removal of the Lower Klamath Project dams under the Proposed Project would increase habitat availability, restore a more natural flow regime by eliminating peaking flows in the Hydroelectric Reach and removing the Lower Klamath Project reservoirs, restoring more natural seasonal water temperature variation, improve water quality, and reduce the likelihood of fish disease, all of which would be beneficial for steelhead in the long term. Dam removal would restore connectivity to hundreds of miles of historical habitat in the Upper Klamath Basin and would create additional habitat within the Hydroelectric Reach. FERC (2007) concluded that implementing fish passage would help to reduce adverse effects to steelhead associated with lost access to upstream

spawning habitats. Hamilton et al. (2011) also concluded that access to additional habitat in the Upper Klamath Basin would benefit steelhead runs. In general, dam removal would likely result in the restoration of more reproducing populations, increased abundance, higher genetic diversity, the opportunity for variable life histories, and use of new habitats (Hamilton et al. 2011). In general, free flowing conditions would likely increase adult migration rate, decrease outmigrant delay, and increase adult escapement (Buchanan et al. 2011b). As discussed in detail above, dam removal would also cause water temperatures to become warmer earlier in the spring and early summer, cooler earlier in the late summer and fall, and have diurnal variations more in sync with historical migration and spawning periods (Hamilton et al. 2011). These changes would result in water temperature more favorable for salmonids in the mainstem. The multiple benefits of the Proposed Project would be beneficial for steelhead populations in the long term.

Significance

No significant impact for steelhead populations in the short term

Beneficial for steelhead populations in the long term

Potential Impact 3.3-11 Effects on the Pacific lamprey population due to short-term sediment releases and long-term changes in habitat quality and quantity due to dam removal.

The Lamprey Expert Panel (Panel) was convened and charged with answering specific questions that had been formulated to assist with assessing the effects of the Proposed Project on lamprey (Close et al. 2010). The conclusion was that the Proposed Project could increase Pacific lamprey habitat by up to 14 percent with access to habitat upstream of Iron Gate Dam, and even more potential habitat if Pacific lamprey gain access to habitat upstream of Keno Dam. However, the Panel concluded that larval lamprey habitat within much of the newly accessible habitat is of less quality that current larval habitat downstream of Iron Gate Dam, and therefore there might be roughly a total increase of production of outmigrant lamprey (and hence harvest potential) in the range of 1 to 10 percent relative to existing conditions, lower than the percent increase in habitat access. The Panel expects that adult Pacific lamprey would recolonize newly accessible habitat after dam removal, as was observed for Pacific lamprey following fish ladder installation at Landsburg Dam on the Cedar River, Washington (Kiffney et al. 2009), and for Pacific lamprey following removal of Condit Dam on the White Salmon River, Washington (Allen et al. 2016). Larval rearing capacity downstream from Iron Gate Dam is expected to increase after dam removal because a large amount of fine sediment—a major component of larval rearing habitat—would be released through dam removal. The available burrowing habitat for larvae would subsequently decrease over time, but would likely remain higher than under existing conditions because sediment input and transport processes would be restored (Close et al. 2010). In addition, the return to a temperature regime and flows that more closely mimic natural patterns would likely benefit Pacific lamprey, which evolved under those conditions.

Access to habitat would benefit Pacific lamprey by increasing their viability through: (a) extending the range and distribution of the species; (b) providing additional spawning and rearing habitat; (c) increasing the genetic diversity of the species; and (d) increasing the abundance of the Pacific lamprey population (NMFS 2006a). The FERC EIS (2007) concluded that "Removal of Iron Gate Dam provides the greatest potential to expand the range of Pacific lamprey, a species of cultural importance to the tribes, to potential habitat upstream of Iron Gate Dam."

In a 2015 USFWS regional implementation plan for measures to conserve Pacific lamprey in northern California and the Klamath River Basin, Goodman and Reid (2015) conclude that while there remains some uncertainty about the historical extent of Pacific lamprey in the Upper Klamath Watershed, the removal of the dams and restoration of natural hydrologic flow regimes to the Klamath River would have the greatest positive influence on Pacific Lamprey in the Upper Klamath River. The influence of the Proposed Project on Pacific lamprey populations within specific reaches on the Klamath River is described below.

Upper Klamath River and Connected Waterbodies
Pacific lamprey occurred historically at least to Spencer Creek (Hamilton et al. 2005), and there are no predictions that under the Proposed Project Pacific lamprey would occur in the Upper Klamath River and connected waterbodies.

Upper Klamath River – Hydroelectric Reach
Under the Proposed Project, it is anticipated that Pacific lamprey would migrate upstream of the location of Iron Gate Dam (NMFS 2006a). The Proposed Project would provide Pacific lamprey with access to the Hydroelectric Reach and to the mainstem Klamath River and its tributaries upstream at least as far as Spencer Creek, including Jenny, Shovel, and Fall creeks (Hamilton et al. 2011). Most sediment released from the reservoirs would likely be eroded within the first six months after dam removal (by June of dam removal year 2), returning sections of river currently inundated by reservoirs, and riverine sections between reservoirs, to a pool-riffle morphology. After erosion of dam-stored sediment, the Hydroelectric Reach would likely contain gravel suitable for lamprey spawning.

By eliminating peaking flows in the Hydroelectric Reach and removing the Lower Klamath Project reservoirs, the Proposed Project would support a flow regime that more closely mimics natural conditions. Drawing-down the reservoirs would also allow tributaries and springs such as Fall, Shovel, and Spencer creeks and Big Springs to flow directly into the mainstem Klamath River. These changes would result in more favorable water temperatures for native fishes, and improved water quality. These changes would provide a long-term benefit to Pacific lamprey populations that would occur within the Hydroelectric Reach.

Middle and Lower Klamath River

The Proposed Project would release dam-stored organic sediment and reduce dissolved oxygen downstream to the Lower Klamath River in the short term, and improve water quality and restore a flow regime that more closely mimics natural conditions in the long term. Suspended sediment effects on Pacific lamprey populations under the Proposed Project are described in detail in Appendix E.3.2.5, and summarized here.

Under the most-likely impacts to fish scenario or worst impacts on fish scenario, sub-lethal effects from suspended sediment are anticipated for outmigrants, and for Pacific lamprey migrating to or from the Trinity River or tributaries farther downstream (Appendix E.3.2.5, Table E-13). High rates of mortality are predicted for ammocoetes (lamprey larvae) in the mainstem Klamath River during winter and spring of dam removal year 2. However, there is little information on the effects of suspended sediment on Pacific lamprey. This analysis used the effects of suspended sediment on salmonids to predict effects on Pacific lamprey, with the assumption that effects on Pacific lamprey are equivalent or less severe than on salmonids. In general, most life stages of Pacific lamprey appear more resilient to poor water quality conditions (such as suspended sediment) than salmonids (Zaroban et al. 1999), so this is likely a conservative assessment (an overestimate) of potential effects. In addition, Goodman and Hetrick (2017) report that in a 2008 ammocoete survey within the Klamath Basin no Pacific Lamprey were detected in the reach from Iron Gate Dam downstream to the confluence with the Shasta River (RM 179.5), and the densities did not approach levels observed elsewhere in the watershed until the confluence with the Scott River (RM 145.1). Therefore, the proportion of the Pacific lamprey population in the Klamath River potentially exposed to the highest SSCs during dam removal is low. In addition, recent genetic analysis of Pacific lamprey (Goodman and Reid 2012) indicates a high degree of historical gene flow even across expansive distances of the northern Pacific Rim as a result of low fidelity of Pacific lamprey progeny to their natal stream. This suggests that impacts to Pacific lamprey in the Klamath River are unlikely to affect the metapopulation.

As described for salmonid species above, the Proposed Project would affect spawning and incubation in the short term in the area between Iron Gate Dam and Cottonwood Creek by burying gravel in dam-released sediment and increasing the proportion of sand in the bed. This could reduce the quality of spawning habitat In the short term, but also may increase suitability of habitat for rearing ammocoete (Close et al. 2010). After a flushing flow of at least 6,000 cfs, the bed is expected to maintain fractions of sand, gravel, and cobble which would be expected under natural conditions (suitable for Pacific lamprey spawning). Based on the historical record a sufficient flushing flow would likely occur within five years following dam removal.

The Proposed Project would establish a flow regime that more closely mimics natural conditions in the Lower Klamath River Reach. Dam removal would cause water temperatures to have natural diurnal variations. These changes would result in water temperatures that are more similar to those that Pacific lamprey evolved with and would improve water quality. These long-term changes would likely provide a benefit to Pacific lamprey in the Lower Klamath River.

Klamath River Estuary and Pacific Ocean Nearshore Environment
Under the Proposed Project, habitat in the estuary could be affected by sediment releases during dam removal for about three months (January through March) when a low abundance of Pacific lamprey ammocoetes could be within the estuary during outmigration. After this time, SSCs would return to levels similar to existing conditions. SSCs in the Klamath River Estuary would be less than 40 percent of the peak concentrations that are anticipated to occur immediately downstream from Iron Gate Dam. These peaks would still be substantial and would be higher than the extreme values estimated by the sediment transport model for existing conditions (see Section 3.3.5.1 *Suspended Sediment*). However, the increased SSCs predicted to occur in the estuary would not be of sufficient magnitude or duration to result in substantial sublethal or lethal effects on Pacific lamprey individuals (Appendix E.3.2.5). While the magnitude of SSCs released to the Pacific Ocean nearshore environment would be within the range of natural conditions, the duration of elevated SSCs (i.e., weeks) would be greater than would occur under natural (i.e., storm) conditions (i.e., days). Therefore, there also would be elevated SSCs in the Pacific Ocean nearshore environment relative to existing conditions (see Section 3.2.5.2 *Suspended Sediments*). However, few Pacific lamprey adults (and no juveniles) are anticipated to occur within the nearshore environment during this period.

Summary
In the short term, reservoir drawdown associated with dam removal under the Proposed Project would alter SSCs and bedload sediment transport and deposition and could affect Pacific lamprey. The Proposed Project would have short-term effects related to SSCs, bedload sediment transport and deposition, and water quality (particularly dissolved oxygen). As described in detail in Appendix E.3.2.5, Pacific lamprey use the mainstem Klamath River for several aspects of their life history. Because multiple year classes of Pacific lamprey rear in the mainstem Klamath River at any given time, and since adults would migrate upstream over the entire year, including January of dam removal year 2 when effects from the Proposed Project would be most pronounced, effects on Pacific lamprey adults and ammocoetes could be much higher in the mainstem Klamath River than under existing conditions. However, because of their wide spatial distribution and low observed occurrence downstream of Iron Gate Dam, most of the population would likely avoid the most severe suspended sediment pulses resulting from the Proposed Project and a substantial reduction in abundance is not anticipated. In addition, Pacific lamprey are considered to have low fidelity to their natal streams (FERC 2007), and may not enter the mainstem

Klamath River if environmental conditions are unfavorable in dam removal year 2. Migration into the Trinity River and other Lower Klamath River tributaries may also increase during dam removal year 2 because of poor water quality in the mainstem Klamath River. Low fidelity also increases the potential that Pacific lamprey can recolonize mainstem habitat if ammocoetes rearing there suffer high mortality. In addition, the geographic range of the Pacific lamprey population is very large and disperse (Goodman and Reid 2012), and thus the percentage of adult and larval Pacific lamprey that would be affected by the Proposed Project relative to the population as a whole would be minor (although no data are available to estimate percentage of population affected). Based on no predicted substantial short-term decrease in Pacific lamprey abundance of a year class, or substantial decrease in habitat quality or quantity, there would not be a significant impact to the Pacific lamprey population under the Proposed Project in the short term.

Although this EIR finds no significant impact on Pacific lamprey In the short term, the KRRC proposes aquatic resource measures AR-1 (Mainstem Spawning) which would further reduce the potential for short-term effects of SSCs on Pacific lamprey spawners. In addition, although CEQA Guidelines Section 15126.4(a)(3) states that mitigation measures are not required for effects which are not found to be significant, Mitigation Measures AQR-1, which would be implemented as a result of significant adverse impacts described for Potential Impact 3.3-1 and Potential Impact 3.3-4, would even further reduce the potential for short-term effects of the Proposed Project on Pacific lamprey by increasing certainty regarding the effectiveness of the KRRC's proposed aquatic resource measure. Aquatic resource measures are summarized in Section 2.7.8.1 and detailed in Appendix B: *Definite Plan – Appendix I*. Proposed Aquatic Resource Measure AR-1 includes the development and implementation of a monitoring and adaptive management plan to offset the impacts of Lower Klamath Project dam removal on mainstem spawning. Proposed Aquatic Resource Measure AR-1 actions include a 2-year tributary confluence monitoring effort and addressing sediment and debris obstructions that block volitional upstream passage from the Klamath River into tributaries. Implementation of AR-1 would reduce the short-term impacts of SSCs on Pacific lamprey spawning in dam removal years 1 and 2 by improving access to tributary habitat where impacts from SSC in the mainstem can be avoided. Therefore, it is anticipated that fewer Pacific lamprey would spawn in the mainstem prior to and following the Proposed Project, further decreasing the proportion of the population exposed to high SSC.

In the long term, the Proposed Project would provide access to habitat upstream of Iron Gate Dam at least as far as Spencer Creek. It is anticipated that as a result of the Proposed Project the Pacific lamprey population within the Klamath Basin would have an increase in abundance and productivity due to increases in habitat availability, and improved flow regime, water quality, and temperature variation. Based on no predicted substantial long-term decrease in Pacific lamprey abundance of a year class, or substantial decrease in habitat quality or

quantity, there would not be a significant impact to the Pacific lamprey population under the Proposed Project in the long term. Furthermore, implementation of the Proposed Project would be beneficial for Pacific lamprey in the long term.

Significance
No significant impact for Pacific lamprey populations in the short term

Beneficial for Pacific lamprey populations in the long term

Potential Impact 3.3-12 Effects on the green sturgeon population due to short-term sediment releases and long-term changes in habitat quality due to dam removal.
Southern DPS Green Sturgeon may enter the Klamath River Estuary to forage during the summer months. They would not be present when the most severe effects of dam removal are occurring and are not expected to be affected by the Proposed Project. The remainder of this section focuses on the effects of the Proposed Project on the Northern Green Sturgeon DPS. Northern Green Sturgeon are an anadromous species that enter the Klamath River to spawn from March through July (Table 3.3-9). Green sturgeon spawn primarily in the lower 67 miles of the mainstem Klamath River (downstream from Ishi Pishi Falls), in the Trinity River, and occasionally in the lower Salmon River. Since green sturgeon do not occur upstream of Ishi Pishi Falls, they would only be affected by Proposed Project effects that would extend downstream of these falls.

Middle and Lower Klamath River
The Proposed Project would release dam-stored sediment downstream to the Lower Klamath River in the short term. There is not extensive literature on the effects of suspended sediment on green sturgeon. This analysis is based on available information of the effects of SSC on salmonids, with the assumption that effects of suspended sediment on sturgeon are likely less than or equal to those on salmonids. Suspended sediment effects on Northern Green Sturgeon populations under the Proposed Project are described in detail in Appendix E.3.2.6 and summarized here.

As described in Appendix E.3.2.6, green sturgeon in the Klamath River spawn approximately every four years. The result of this life history pattern is that up to 75 percent of the mature adult green sturgeon population (as well as 100 percent of sub-adults) can be assumed to be in the ocean during dam removal year 2 and avoid effects associated with the Proposed Project. For the 25 percent of the adult population that could be in the Klamath River during dam removal year 2, only slightly higher impacts are predicted for adults than under existing conditions under all scenarios (Appendix E.3.2.6, Table E-14), mostly because Northern Green Sturgeon distribution within the mainstem Klamath River is primarily limited to areas downstream from Orleans, where the effects of SSC resulting from the Proposed Project are more diluted from tributary accretion. Green sturgeon females are broadcast spawners that lay thousands of adhesive eggs that settle into the spaces between cobble substrates. Eggs in the

mainstream Klamath River are vulnerable to suspended sediment under existing conditions as a result of the contributions of multiple tributaries in the Middle Klamath River (Appendix E 3.1.6). From 40 to 60 percent mortality is predicted for incubating eggs and larval life stages under all scenarios.

Juvenile green sturgeon typically rear for one year in the Klamath River system (M. Belchik, pers. comm., 2008), but may rear for up to three years before they migrate to the estuary and the ocean, usually during summer and fall. Moderate physiological stress is predicted for rearing juveniles under a least impacts on fish scenario. Under a most-likely impacts to fish or worst impacts on fish scenario major physiological stress is predicted (Appendix E.3.2.6). Around 30 percent of green sturgeon juveniles rear in the Trinity River and would not be exposed to SSC from the Proposed Project.

Bedload sediment effects related to dam-released sediment would not extend as far downstream to Ishi Pishi Falls (USBR 2012) and would not affect Northern Green Sturgeon.

The Proposed Project would improve water quality, and reduce instances of algal toxins. These long-term effects would benefit Northern Green Sturgeon in the Lower Klamath River.

Klamath River Estuary and Pacific Ocean Nearshore Environment
Rearing for more than one year is rarely observed in the mid-Klamath River (M. Belchik, pers. comm., 2008), but juvenile green sturgeon may rear for additional months or years in the estuary before migrating to the ocean. Under the Proposed Project, habitat in the Klamath River Estuary could be affected by elevated suspended sediment during dam removal for about three months during winter, when juvenile green sturgeon could be rearing in the estuary. After this time, SSCs would return to levels similar to existing conditions. SSCs in the estuary would be less than 40 percent of the peak concentrations that are anticipated to occur immediately downstream from Iron Gate Dam. These peaks would still be substantial, and would be higher than the extreme values estimated by the sediment transport model for existing conditions (see Section 3.3.5.1 *Suspended Sediment*). However, the increased SSCs predicted to occur in the estuary would not be of sufficient magnitude or duration to result in substantial sublethal or lethal effects on green sturgeon juveniles (Appendix E.3.2.6). While the magnitude of SSCs released to the Pacific Ocean nearshore environment would be within the range of natural conditions, the duration of elevated SSCs (i.e., weeks) would be greater than would occur under natural (i.e., storm) conditions (i.e., days). Therefore, there also would be elevated SSCs in the Pacific Ocean nearshore environment relative to existing conditions (see Section 3.2.5.2 *Suspended Sediments*). However, few green sturgeon adults or juveniles are anticipated to occur within the nearshore environment during this period.

Summary
In the short term, reservoir drawdown associated with dam removal under the Proposed Project would alter water quality and SSCs and could affect Northern Green Sturgeon. Overall the effects of the Proposed Project are most likely to include physiological stress, inhibited growth, and high mortality for incubating eggs. Northern Green Sturgeon in the Klamath Basin have the following traits likely to enhance the species' resilience to impacts of the Proposed Project:

- Most of the Northern Green Sturgeon population (sub-adult and adult) would be in the ocean during the year of the Proposed Project (dam removal year 2) and would be unaffected (Appendix E.3.2.6).
- Approximately 30 percent of the Northern Green Sturgeon population that spawn and rear in the Trinity River and would be unaffected.
- Much of the spawning and rearing of Northern Green Sturgeon occurs downstream from the Trinity River, where sediment concentrations would be similar to existing conditions.

Northern Green Sturgeon are long-lived (greater than 40 years) and are able to spawn multiple times (approximately 8 times in their lifetime) (Klimley et al. 2007), so effects on the spawning effort of a proportion of adults for one year are anticipated to have little influence on the population as a whole. Because there would be no predicted substantial short-term decrease in green sturgeon abundance of a year class, or substantial decrease in habitat quality or quantity, there would not be a significant impact to the green sturgeon population under the Proposed Project in the short term.

In the long term, suspended sediment levels would return to levels similar to existing conditions, and removal of dams would result in improvements in water quality, temperature variation, and algal toxins which could affect Northern Green Sturgeon. Because there would be no predicted substantial long-term decrease in green sturgeon abundance of a year class, or substantial decrease in habitat quality or quantity, there would not be a significant impact to the green sturgeon population under the Proposed Project in the long term.

Significance
No significant impact for green sturgeon populations in the short term

No significant impact for green sturgeon populations in the long term

Potential Impact 3.3-13 Effects on Lost River and shortnose sucker populations due to short- and long-term changes in habitat quality and quantity due to dam removal.
A Resident Fish Expert Panel (Panel) was convened to compare the potential effects of the Proposed Project and existing conditions on resident fish, including sucker populations (Buchanan et al. 2011a). The Panel noted that the populations of Lost River and shortnose sucker in Upper Klamath lake are currently self-sustaining, whereas the populations in the Hydroelectric Reach

(Iron Gate and Copco reservoirs) are not self-sustaining. The Panel concluded that most factors limiting the production of Lost River and shortnose sucker populations occur in Upper Klamath Lake (e.g., poor water quality, nonnative fish predation and competition, lack of emergent vegetation rearing habitat), upstream of the Area of Analysis for aquatic resources.

Upper Klamath River and Connected Waterbodies
The Proposed Project has no elements that would substantially alter habitat conditions for Lost River and shortnose sucker populations in the Upper Klamath River upstream of Keno/Lake Ewuana. Facilitating the movement of anadromous fish presents a relatively low risk of introducing pathogens to sucker species upstream of Iron Gate Dam (NMFS 2006a). Generally, with the exception of *F. columnaris* and Ich, pathogens associated with anadromous fish do not impact non-salmonids (e.g., suckers) (NMFS 2006a). In the most recent review of effects of interactions between reintroduced anadromous fish and federally listed suckers, the USFWS concludes that indirect effects of removal of the Lower Klamath Project dams is "not likely to adversely affect" listed suckers (Roninger 2012).

Upper Klamath River – Hydroelectric Reach
Lost River and shortnose sucker individuals are found within Lower Klamath Project reservoirs in the Hydroelectric Reach (Desjardins and Markle 2000). The Proposed Project would eliminate reservoir habitat, and as dams within the Hydroelectric Reach were removed, sediment would move downstream. However, the Lost River and shortnose suckers in these reservoirs are considered by the USFWS (2013) as "sink populations", as they are not likely self-sustaining because of low recruitment due to the lack of access to spawning habitats, citing Moyle (2002), and NRC (2004). Buettner et al. (2006) conclude that since little or no reproduction occurs downstream from Keno Dam, and there is no potential for interaction with upstream populations, they are not considered to substantially contribute to the achievement of conservation goals or recovery. This is also consistent with the findings of Hamilton et al. (2011), and NRC (2004).

Middle and Lower Klamath River, Estuary, and Pacific Ocean Nearshore Environment
No Lost River or shortnose suckers have been documented to occur downstream of Iron Gate Dam and therefore these reaches are not considered in the potential impact analysis for this EIR.

Summary
In the short term, reservoir removal associated with dam removal under the Proposed Project could alter habitat availability and affect Lost River and shortnose suckers in Iron Gate and Copco reservoirs. All individual suckers occurring within these reservoirs would likely be lost within dam removal year 2; however, these individuals are not considered to substantially contribute to the

achievement of conservation goals or recovery, since little or no reproduction occurs downstream from Keno Dam (Buettner et al. 2006), and there is no potential for interaction with upstream populations (Hamilton et al. 2011). Although both species are fully protected species under California Fish and Game Code, Assembly Bill Number 2640 (Wood 2018) added Section 2081.11 to the Fish and Game Code to allow the take of both sucker species resulting from impacts attributable to the decommissioning and removal of the Lower Klamath Project facilities, consistent with CDFW take provisions. Based on the best available estimates of Lost River and shortnose sucker abundance in the Lower Klamath Project reservoirs, there are likely fewer than 1,000 adult suckers of both species in all reservoirs combined (USFWS 2012a, Desjardins and Markle 2000), with a combined suitable sucker area of less than 2,500 acres. The populations in Upper Klamath Lake are estimated at 50,000 to 100,000 Lost River sucker (USFWS 2013a), and up to 25,000 shortnose suckers (USFWS 2013b), within around 79,000 acres of suitable habitat in Upper Klamath Lake and connected water bodies. Therefore, a loss of the suckers in Lower Klamath Project reservoirs represents around less than 1.5 percent of the total sucker population, and a loss of less than 3.5 percent of the total suitable sucker habitat. Based on no predicted substantial (< 1.5 percent) short-term decrease in Lost River and shortnose suckers' abundance of a year class, or substantial decrease in habitat quality or quantity (<1.5 percent), the Proposed Project would not cause a significant impact to the Lost River and shortnose sucker populations in the short term.

In the long term, reservoir removal associated with dam removal under the Proposed Project would eliminate habitat availability and affect Lost River and shortnose suckers in Lower Klamath Project reservoirs. All individual suckers occurring within these reservoirs would likely be lost within the short term and would not be replaced in the long term. However, as described above, these individuals are not considered to substantially contribute to the achievement of conservation goals or recovery of the populations (Hamilton et al. 2011). In addition, the return of anadromous species to the Upper Klamath Basin would deliver marine-derived nutrients, potentially bolstering the forage base for Lost River and shortnose suckers. The delivery of marine-derived nutrients by spawning anadromous fish and their resulting decomposing carcasses has been linked with the enrichment of aquatic and terrestrial ecosystems through numerous studies (Cederholm et al. 1999). Marine-derived nutrients are used by stream biota through a variety of pathways and may bolster forage items for native fish species directly, such as through the consumption of eggs, fry, and flesh (Bilby et al. 1996); and indirectly by increasing primary productivity in stream ecosystems, thereby increasing the abundance and biomass of other forage items such as macroinvertebrates (Wipfli et al. 1998). In addition, and as described above, the loss of the sucker population and suitable habitat in the Lower Klamath Project reservoirs is a minor proportion of the total sucker population and suitable habitat area. Based on no predicted substantial long-term decrease in Lost River and shortnose suckers' abundance of a year class,

or substantial decrease in habitat quality or quantity, the Proposed Project would not cause a significant impact to the Lost River and shortnose sucker populations in the long term.

Although this EIR finds no significant impact on Lost River and shortnose suckers in the short-or long-term, the Proposed Project includes aquatic resource measure AR-6 (Suckers) to reduce the short- and long-term effects of reservoir removal. Aquatic resource measures are summarized in Section 2.7.8.1 *Aquatic Resource Measures* and detailed in Appendix B: *Definite Plan – Appendix I*. AR-6 includes two primary actions including reservoir and river sampling to estimate the abundance of suckers in the Hydroelectric Reach and conduct genetic testing for hybridization, and sucker salvage and release into waterbodies isolated from the Upper Klamath Lake Populations. As discussed above, Section 2081.11 was added to the Fish and Game Code to authorize take of Lost River and shortnose suckers, subject to certain conditions. CDFW (2018b) has reviewed AR-6 and preliminarily agreed that the Proposed Project with implementation of AR-6 potentially meets the standards for take authorization under Fish and Game Code, section 2081.11. The proposed actions are anticipated to increase the survival of individual Lost River and shortnose suckers currently inhabiting the Hydroelectric Reach, without increasing exposure of the Upper Klamath Lake population to adults with a high degree of hybridization. The number of translocated fish would not exceed 3,000 fish, which is the capacity of the currently identified recipient waterbody (Tule Lake). Tule Lake currently supports both sucker species and has suitable habitat for translocation site. In addition, Tule Lake is isolated from the sucker population in Upper Klamath Lake, and thus this measure would not risk influencing the sucker populations designated as recovery populations in Upper Klamath Lake.

Significance

No significant impact for Lost River and shortnose sucker populations in the short term

No significant impact for Lost River and shortnose sucker populations in the long term

Potential Impact 3.3-14 Effects on the redband trout population due to short-term sediment releases and long-term changes in habitat quality and quantity due to dam removal.

A Resident Fish Expert Panel (Panel) was convened to compare the potential effects of the Proposed Project and existing conditions on resident fish, including redband trout (Buchanan et al. 2011a). The Panel predicted that following the Proposed Project, the abundance of redband trout in the free-flowing reach between Keno Dam and Iron Gate Dam could increase significantly. In addition, the Panel expects the existing trout and colonizing anadromous steelhead to co-exist (or even for the redband to produce anadromous progeny), as they do in other watersheds, although there may be shifts in abundance related to competition for space and food. The effects of implementing the Proposed

Project on redband trout populations within specific reaches of the Klamath River are described below.

Upper Klamath River and Connected Waterbodies
Under the Proposed Project, redband trout would be able to migrate more successfully from the Hydroelectric Reach to the Upper Klamath Basin (Hamilton et al. 2011) than under existing conditions. Redband trout could be affected by increased predation from reintroduced anadromous salmonids, but this loss might be offset by an increase in available food sources (e.g., eggs, fry, and juveniles of reintroduced salmonids) (Hamilton et al. 2011). Furthermore, anadromous steelhead trout and resident rainbow/redband trout co-existed and intermingled prior to the construction of Copco No. 1 Dam in 1917. There are many examples from nearby river systems in the Pacific Northwest showing that wild anadromous salmon and resident rainbow/redband trout can co-exist and maintain abundant populations without negative consequences. The Deschutes River in Oregon, the Yakima River in Washington, and the river systems in Idaho are examples (NMFS 2006a).

Facilitating the movement of anadromous fish presents a relatively low risk of introducing pathogens to resident fish upstream of Iron Gate Dam (NMFS 2006a).

Upper Klamath River – Hydroelectric Reach
Under existing conditions, redband trout are found within the California portion of the Area of Analysis within the Hydroelectric Reach, including within all riverine areas and reservoirs. Spawning primarily occurs within Shovel and Spencer creeks. Redband trout are currently prevented from migrating between some tributaries and the reservoirs to complete their life cycle because of poorly functioning fishways at J.C. Boyle Dam (DOI 2007, NMFS 2007b). Under the Proposed Project, redband trout would be able to migrate more successfully than under existing conditions (Hamilton et al. 2011). Approximately 4 mi (6.4 km) of habitat has been adversely affected by the dewatered flows in the Bypass Reach, and 17 mi (27.4 km) of habitat has been adversely affected by the daily fluctuating flows in the Peaking Reach (NMFS 2006a). In addition, the NMFS (2006a) finding regarding J.C. Boyle flow operations stated, “Current Project operations, particularly sediment blockage at the J.C. Boyle Dam, the flow regime, and peaking operations, negatively affect the redband trout fishery.”

Under the Proposed Project, the establishment of a flow regime that more closely mimics natural conditions, eliminates hydroelectric peaking and associated negative aquatic impacts, would benefit the redband trout populations in the Hydroelectric Reach. Redband trout throughout this reach of the mainstem would be affected by high SSCs for a period of three to four months during reservoir drawdown associated with the Proposed Project. Redband trout in riverine reaches between the reservoirs in the Hydroelectric Reach would be vulnerable to effects of sediment released during dam removal and bedload

deposition (Newcombe and Jensen 1996, Buchanan et al. 2011a). However, SSCs would be the result of sediment stored only in J.C. Boyle and Copco reservoirs, and would not include the additional sediment stored in Iron Gate Reservoir, reducing the potential effect relative to the effects to aquatic species downstream of Iron Gate Dam (USBR 2012). In addition, a large proportion of the adult redband trout population should be already spawning in Spencer or Shovel creeks during the dam removal. Juvenile redband trout outmigrating from Spencer Creek would be expected to recolonize the mainstem by late spring or summer when water conditions become suitable. Those in the affected area could move to tributaries for refuge. Therefore, there will not be a substantial reduction in the abundance of a year-class of redband trout as a result of the Proposed Project.

The Proposed Project would eliminate reservoir habitat, returning sections of river currently inundated by reservoirs and riverine sections between reservoirs to a pool-riffle morphology. Although most redband trout are anticipated to continue to spawn in tributaries, modeling data indicate that after dam removal, spawning gravel in all sections of the Hydroelectric Reach would be within the range usable for redband trout, but the amount of sand within the bed within former reservoir sections might inhibit spawning success in the short term. Riverine sections between reservoirs would be expected to contain gravel with very little sand, suggesting high-quality spawning habitat would become available within a few years following dam removal. The initial movement of coarse and fine sediment after drawdown would likely create unfavorable conditions for redband trout within the mainstem Klamath River, but these conditions would be short term. Buchanan et al. (2011a) estimate that 43 miles of additional riverine habitat would be available to resident redband trout as a result of the Proposed Project. The adfluvial individuals within this reach would likely adopt a fluvial[81] life history, which is unlikely to affect the sustainability of the population. Overall migratory opportunities would increase for redband trout, increasing resiliency to disturbance over the short and long-term. The Proposed Project would also increase the number of thermal refugia available to redband trout as they would have access to more tributaries, as well as to the cold-water areas near the mouths of tributaries and the many springs in this reach.

Middle and Lower Klamath River

No redband trout occur downstream of Iron Gate Dam, and therefore these reaches are not considered in the potential impact analysis for this EIR. However, in the long term redband trout would have access to habitat in the Middle Klamath River, and they are anticipated to use cold-water tributaries and portion of the mainstem river. The resident trout currently within the Middle Klamath River (rainbow trout) are genetically very similar to the redband trout currently present upstream of Iron Gate Dam; these two populations that are

[81] Fluvial life history is resident trout spawning in tributaries and maturing within a larger mainstem river.

currently isolated would revert to a connected and sustainable population (Buchanan et al. 2011a).

Summary
In the short term, the Proposed Project would have impacts related to SSCs and bedload movement. However, very little sediment is stored in Copco and J.C. Boyle Reservoirs, and only a small proportion of the redband population is expected to be exposed to short-term effects. Based on no predicted substantial short-term decrease in redband trout abundance of a year class, or substantial decrease in habitat quality or quantity, there would not be a significant impact to the redband trout population under the Proposed Project in the short term.

In the long term, dam removal would restore connectivity among the Middle Klamath Basin, the Hydroelectric Reach and its tributaries, and the Upper Klamath Basin, and would rehabilitate and increase availability of riverine habitat within the Hydroelectric Reach. The return of anadromous species to the Upper Klamath Basin would deliver marine-derived nutrients, potentially bolstering the forage base for redband trout. The delivery of marine-derived nutrients by spawning anadromous fish and their resulting decomposing carcasses has been linked with the enrichment of aquatic and terrestrial ecosystems through numerous studies (Cederholm et al. 1999). Marine-derived nutrients are used by stream biota through a variety of pathways and may bolster forage items for native fish species directly, such as through the consumption of eggs, fry, and flesh (Bilby et al. 1996); and indirectly by increasing primary productivity in stream ecosystems, thereby increasing the abundance of biomass of other forage items such as macroinvertebrates (Wipfli et al. 1998). Based on a long-term substantial increase in redband trout habitat quality and quantity, the Proposed Project would be beneficial for redband trout in the long term.

Significance
No significant impact for redband trout population in the short term

Beneficial for redband trout population in the long term

Potential Impact 3.3-15 Effects on the eulachon population due to short-term sediment releases and long-term changes in habitat quality due to dam removal.
The Proposed Project would release dam-stored sediment downstream to the Lower Klamath River and Estuary. SSCs in the estuary would be less than 40 percent of the peak concentrations that are anticipated to occur immediately downstream from Iron Gate Dam. These peaks would still be substantial (>500 mg/L) and would be higher than the extreme values estimated by the sediment transport model for existing conditions. Predicted increases in SSCs under the most-likely impacts to fish scenario are within the range of existing extreme conditions (Appendix E.4). Under a worst impacts on fish scenario SSCs could be higher than typically occur within the estuary (>1,000 mg/L) for a period of

weeks. Adult eulachon entering the Klamath River in the winter and spring of dam removal year 2 may be exposed to high SSCs for a portion of their migration period. Although no analysis of the effects of SSCs on eulachon is available, based on application of the Newcombe and Jensen (1996) approach using studies of the effects on other estuary species, it is predicted that under a most-likely impacts to fish or worst impacts on fish scenario mortality of eulachon adults would occur under the Proposed Project, unless individuals migrate out of the estuary to avoid poor water quality conditions (as has been observed in the Columbia River watershed, NMFS 2010b). Mortality is also predicted for spawning, incubation, and larval life stages under the Proposed Project. However, eulachon have a relatively long period of the year when they could potentially spawn in the Klamath River (January through April; Larson and Belchik 1998), and a relatively short duration of occurrence within freshwater (around one month), increasing the probability that most of the population would migrate and spawn either before or after the largest pulses of SSCs (predicted to be over 1,000 mg/L for the month of January under a worst impacts on fish scenario, Appendix E.4). Therefore, no substantial reduction in the abundance of a year class is predicted. Based on no predicted substantial short-term decrease in eulachon abundance of a year class, or substantial decrease in habitat quality or quantity, there would not be a significant impact to the eulachon population under the Proposed Project in the short term. Within a short duration (< 6 months) SSCs within the Klamath River Estuary are predicted to return to existing levels (Appendix E.4). There is no predicted substantial long-term decrease in eulachon abundance of a year class, or substantial decrease in habitat quality or quantity, and thus there would not be a significant impact to the eulachon population under the Proposed Project in the long term.

Significance

No significant impact for eulachon population in the short term and long term

Potential Impact 3.3-16 Effects on the longfin smelt population due to short-term sediment releases and long-term changes in habitat quality due to dam removal.

The Proposed Project would release dam-stored sediment downstream to the Klamath River Estuary. Longfin smelt entering the Klamath River in the winter and spring of dam removal year 2 may be exposed to high SSCs for a portion of their migration period. Although no analysis of the effects of SSCs on longfin smelt is available, based on application of the Newcombe and Jensen (1996) approach using studies of the effects on other estuary species, it is predicted that under a most-likely impacts to fish or worst impacts on fish scenario mortality would be higher under the Proposed Project than under existing conditions for a period of weeks. However, as described for eulachon above, the protracted migration season for longfin smelt (throughout the year), and relatively short duration of occurrence in the estuary (less than two months), increases the probability that most of the population would migrate and spawn either before or after the largest pulses of SSCs (predicted to be two weeks in duration or less).

Based on no predicted substantial short-term decrease in longfin smelt abundance of a year class, or substantial decrease in habitat quality or quantity, there would not be a significant impact to the longfin smelt population under the Proposed Project in the short term. Within a short duration (< 6 months) SSC within the Klamath River Estuary are predicted to return to existing levels (Appendix E.4), and thus there is no predicted substantial long-term decrease in longfin smelt abundance of a year class, or substantial decrease in habitat quality or quantity, and there would not be a significant impact to the longfin smelt population under the Proposed Project in the long term.

Significance
No significant impact for longfin smelt population in the short term and long term

Potential Impact 3.3-17 Effects on species interactions between introduced resident fish species and native aquatic species due to short- and long-term changes in habitat quality and quantity due to dam removal.
Introduced fish species threaten the diversity and abundance of native fish species through competition for resources, predation, interbreeding with native populations, and causing potential physical changes to the invaded habitat (Moyle 2002). Introduced resident species occur in Lake Ewuana and Upper Klamath Lake, but the Proposed Project would not affect populations in this area.

As described in detail in Section 3.20.2.3 *Lower Klamath Project Reservoir-based Recreation*, the reservoirs currently provide a recreational fishery for non-native fishes including largemouth bass, trout, catfish, crappie, and sunfish (Hamilton et al. 2011). Fishing is popular in Copco No. 1 and Iron Gate reservoirs, especially for yellow perch (Hamilton et al. 2011). Adults yellow perch are opportunistic predators that feed on small fish, potentially including native fish species. Juvenile and adult largemouth bass tend to feed on larger invertebrates and fish as well, potentially including native species. The Proposed Project would eliminate reservoir habitat upstream of Iron Gate Dam, and thus the abundance of introduced resident species would decline substantially or be eradicated (Buchanan et al. 2011a), providing a benefit to native aquatic species.

A few introduced resident species occur in the Middle and Lower Klamath River, but water velocities within riverine habitat are too high for the introduced species that in general are adapted to the lotic conditions in the reservoirs in which they were introduced. Under the Proposed Project, conditions would be expected to become even less suitable for introduced resident species. This effect would be beneficial for native aquatic species in the short and long term.

Significance
Beneficial for the effects of introduced resident fish species on aquatic species in the short term and long term

Potential Impact 3.3-18 Effects on aquatic species from interactions among fish species due to short- and long-term changes in habitat quantity due to dam removal.

The Proposed Project would restore access for anadromous salmon and steelhead to habitat upstream of Iron Gate Dam, as described in detail above. Restoration of access would result in anadromous salmon and steelhead potentially interacting with resident redband trout and bull trout, with the potential for competition and predation. These species evolved together in the Upper Klamath Basin of the Klamath River, and co-existed prior to the construction of dams (Goodman et al. 2011). The return of anadromous species to the Upper Klamath Basin would deliver marine-derived nutrients, potentially bolstering the forage base for bull trout, redband, and other native species. The delivery of marine-derived nutrients by spawning anadromous fish and their resulting decomposing carcasses has been linked with the enrichment of aquatic and terrestrial ecosystems through numerous studies (Cederholm et al. 1999). Marine-derived nutrients are used by stream biota through a variety of pathways and may bolster forage items for native fish species directly, such as through the consumption of eggs, fry, and flesh (Bilby et al. 1996); and indirectly by increasing primary productivity in stream ecosystems, thereby increasing the abundance of biomass of other forage items such as macroinvertebrates (Wipfli et al. 1998).

Anadromous salmonids currently co-exist with resident rainbow trout and resident cutthroat trout downstream from Iron Gate Dam, without any obvious detriment to these native species or the aquatic ecosystem in which they reside. While there is little information on the nature of any competitive interactions between steelhead and resident trout in the Klamath Basin, research does suggest that in some circumstances, resident trout may have a competitive edge over steelhead (NMFS 2006a). Conversely, research has shown that hatchery salmon supplementation can negatively impacted resident trout abundance and salmonid biomass in a Washington watershed (Pearsons and Temple 2010). In addition, non-native *O. mykiss* have been widely planted in the Klamath River since the construction of Iron Gate Dam, with an unknown effect on the genetics of the native population (Pearse et al. 2007). However, there is no data or evidence to suggest that increased interactions (breeding) would have any deleterious effect on the genetics for either population. Competition between steelhead and currently present indigenous species such as redband trout are not assumed to be a major limiting factor since these species historically co-evolved (Hooton and Smith 2008). There are many examples from nearby river systems in the Pacific Northwest that show wild anadromous steelhead and resident rainbow/redband trout can co-exist and maintain abundant populations without adverse consequences. The Deschutes River in Oregon, the Yakima River in Washington, and the river systems in Idaho are examples (NMFS 2006a). As noted by Buchanan et al. (2011a), existing trout and colonizing anadromous steelhead are expected to co-exist in the Klamath Basin, as they do in other watersheds, although there may be shifts in abundance related to

competition for space and food. Overall, there is no predicted substantial short-term or long-term decrease in native aquatic species abundance of a year class, or substantial decrease in habitat quality or quantity, and there would not be a significant impact to the aquatic species populations under the Proposed Project in the short term or long term.

In addition, and as discussed in Potential Impact 3.3-17, conversion of reservoir habitat to riverine habitat is not anticipated to increase interactions among native salmonids and introduced non-native fish species, since water velocities within riverine habitat are too high for the introduced species that in general are adapted to the lotic conditions in the reservoirs in which they were introduced. Under the Proposed Project, conditions would be expected to become even less suitable for introduced resident species such as bass and yellow perch, reducing the potential for interactions among riverine and reservoir species.

Significance

No significant impact for effects to aquatic species from interactions among fish species in the short term and long term

Potential Impact 3.3-19 Effects on freshwater mollusks populations due to short-term sediment releases and long-term changes in habitat quality due to dam removal.

Four species of native freshwater mussels have been observed within the Klamath Basin, including Oregon floater (*A. oregonensis*), California floater (*A. californiensis*), western ridged mussel (*G. angulata*), and western pearlshell mussel (*M. falcata*). Oregon floater and California floater (commonly referred together "floater mussels," or "*Anodata spp*.") occur in the mainstem Klamath River in the Hydroelectric Reach, within Lower Klamath Project reservoirs, in a reach (<15 miles) directly downstream of Iron Gate Dam, and within the Upper Shasta River. *M. falcata* are common in the mainstem Klamath River from Iron Gate Dam downstream to the confluence with the Trinity River, and within Middle Klamath tributaries such as Bogus Creek, and Shasta, Scott, and Salmon rivers. *G. angulata* is more widely distributed and more abundant than the other species and has been observed in high densities from Keno Dam downstream to the confluence with the Trinity River, and within the Shasta and Scott rivers (Davis et al. 2013). Mussel abundance also generally declines with increasing distance downstream from Iron Gate Dam, suggesting the effects of the increasing hydrologic variability of the Klamath River with distance from Iron Gate. Davis et al. (2013) concluded that habitats located further downstream had lower probabilities of supporting mussels due to more variable conditions.

Seven to eight species of fingernail clams and peaclams (Family: Sphaeriidae) also occur in the Hydroelectric Reach and from Iron Gate Dam to Shasta River. This evaluation focuses on freshwater mussels because of their similar distribution to other freshwater mollusks, similar habitat requirements, their

longer lifespan, and lack of information regarding the effects of sediment on clams and other mollusks.

Suspended Sediment Concentrations
Under the Proposed Project, in the Hydroelectric Reach between J.C. Boyle Dam and Copco No.1 SSCs are predicted to exceed 600 mg/L (the minimum SSC level that would be considered detrimental to freshwater mussels), for short periods of time (1–5 days) during spikes in SSCs. SSCs are expected to be higher than under existing conditions and would likely exceed 600 mg/L for two to four months after removing the dams from Copco No 1. Dam downstream to the Klamath River Estuary; however, the highest levels, well in excess of 1,000 mg/L, would occur between Seiad Valley and Iron Gate Dam. Within six months of dam removal SSCs in the mainstem Klamath River are predicted to return to levels observed under existing conditions. Under existing conditions, SSCs in the mainstem Klamath River often exceed 600 mg/L, although these spikes generally occur for a few days as opposed to several months (see also Potential Impact 3.2-3).

Predicted increases in SSC within the Hydroelectric Reach under the Proposed Project are anticipated to result in major physiological stress to *Anodata spp*., and *G. angulata*, including mortality of at least a proportion of the individuals. The most significant impacts would occur downstream from Iron Gate Reservoir, especially to those individual freshwater mussels or freshwater mussel beds upstream of Orleans and closest to Iron Gate Dam. For populations occurring downstream of the confluence with the Salmon River (*M. falcata* and *G. angulata*) dilution from tributaries would limit exposure to SSCs likely to be sublethal. Because freshwater mussels found within the Klamath River can be so long lived (from 10 to more than 100 years, depending on the species) and sexual maturity might not be reached until four years of age or more, even relatively short term (e.g., for more than five consecutive days) SSCs in excess of 600 mg/L, would be expected to be detrimental for freshwater mussel populations within the mainstem Klamath River upstream of the Salmon River confluence, in the short term. This would impact all four-mussel species, most notably *Anodata spp*., due to their limited distribution in the proximity of Iron Gate Dam. *M. falcata* and *G. angulata* are less likely to experience a substantial decline in abundance in the short term, due to their broader distribution downstream of Iron Gate Dam in the mainstem, and strong populations in tributaries.

Freshwater clams can live buried in the substrate and are expected to suffer less impact than freshwater mussels. In addition, they are relatively short-lived (one to three years) and bear young several times throughout the spring and summer which would support rapid recovery within the short term to impacts from suspended sediment.

In the long term (i.e., greater than five years), it is anticipated that mainstem Klamath *M. falcata* and *G. angulata* populations would rebound from suspended sediment impacts, recolonizing through the transport of larvae (glochidia) by host fish from downstream populations less affected by excessive SSCs or from populations within tributaries, such as Bogus, Shasta, Scott, and Salmon rivers. *Anodata spp*. Are anticipated to recover more slowly from suspended sediment impacts, due to a narrower distribution downstream of Iron Gate Dam, and limited distribution within tributaries (i.e., only found in upper Shasta River).

Changes in Bed Elevation

Silt and fine material make up the largest proportion of the volume of sediment stored behind the dams and would be transported downstream primarily as suspended sediment under the Proposed Project. Coarser material (larger than 0.063 mm) would also be transported downstream and would likely be deposited in the river channel, changing riverbed elevations from the existing conditions for approximately eight miles between Iron Gate Dam and Cottonwood Creek. The 182 miles of mainstem downstream from Cottonwood Creek are not predicted to have any substantial aggradation. Therefore, *Anodonta spp*. Populations closest to Iron Gate Dam are likely to be most affected by aggradation of sediments under the Proposed Project, whereas *M. falcata* and *G. angulata* with broad distributions are unlikely to be substantially affected. It is not known how well any of these species could tolerate deposition of sediment and whether they could move upward through deposited material to the surface to breathe and feed. It is reasonable to assume that some percentage of Klamath River freshwater mussels buried under 0.5 to 3.0 feet of new sediment would not survive, especially since these same population would be exposed to the increased SSCs described above. *G. angulata* have a demonstrated ability to withstand burial in sediment and are likely to be the least affected.

As described in Potential Impact 3.11-5, SRH-1D model simulations project up to approximately 1.7 feet of reach-averaged dam-released sediment deposition between Bogus Creek (RM 192.68) and Willow Creek (RM 187.8) in the short term (< 2 years) and up to 0.9 feet between Willow Creek and Cottonwood Creek (RM 185.1). SRH-1D model simulations did not project any significant sediment deposition downstream of Cottonwood Creek. This deposition will occur during and following drawdown, with further remobilization and deposition in association with precipitation-driven flow events following dam removal, typically lasting for several hours and separated by several days or weeks. The results of Vavrinec et al. (2007) suggest that clams may not survive deposition over 0.9 feet in the reach between Bogus Creek (RM 192.68) and Willow Creek (RM 187.8), where *Anodonta spp*. Populations closest to Iron Gate Dam are likely to be most affected (as described above). The results of Vavrinec et al. (2007) further suggest that for clams downstream of Willow Creek there is likely to be high survival following deposition of 0.9 feet or less, especially if there is at least 24 hours between burial events. Therefore, it is predicted that freshwater clams located downstream of Willow Creek (RM 187.8) can survive deposition events

such as those predicted to occur following dam removal (Vavrinec et al. 2007) and are expected to avoid impacts from bed deposition.

Changes in Bed Substrate
Removal of the Lower Klamath Project dams under the Proposed Project would result in the erosion of accumulated reservoir sediments and changes in substrate characteristics within the Klamath River, especially within the current reservoir reaches. The reformation of river channels in the reservoir reaches is expected to occur within six months (Potential Impact 3.11-5) following removal of the dams. The reformation of river channels between Iron Gate Dam and the upstream reaches of J.C. Boyle Reservoir would benefit *M. falcata* and *G. angulata* and clams in the long term by providing more suitable substrates (i.e., large gravel, cobble, and boulder) than currently exists, especially within the current reservoir reaches. However, conversion of reservoirs to riverine habitat is anticipated to have a short- and long-term impact on *Anodonta spp*., which currently occur within reservoirs, and are adapted to low-flow variability habitat.

Changes in Habitat Accessibility
In addition, the Proposed Project would also open access to river reaches upstream of Iron Gate Dam to migratory fish species, which serve as host fish for parasitic freshwater mussel larvae (glochidia). *M. falcata* in particular may benefit from the increased distribution of anadromous salmonids, which are a primary host species for their larvae. As a result, in the long term suitable habitats upstream of Iron Gate Dam might be colonized or recolonized by all four freshwater mussel species, transported as glochidia from downstream reaches by migratory fish species.

Summary
In the short term, *G. angulata* have a demonstrated ability to withstand burial in sediment and are a widespread and abundant mussel species, including within the Hydroelectric Reach, and within key tributaries upstream and downstream of Iron Gate Dam. Therefore, a relatively small proportion of their population would be directly impacted by sediment released during dam removal. Based on no predicted substantial short-term decrease in *G. angulata* abundance of a year class, or substantial decrease in habitat quality or quantity, there would not be a significant impact to the *G. angulata* population under the Proposed Project in the short term.

M. falcata have a broad distribution downstream of Iron Gate Dam in the mainstem, and strong populations in several tributaries in the Middle Klamath River. Therefore, a relatively small proportion of their population would be directly impacted by sediment released during dam removal. Based on no predicted substantial short-term decrease in *M. falcata* abundance of a year class, or substantial decrease in habitat quality or quantity, there would not be a significant impact to the *M. falcata* population under the Proposed Project in the short term.

Although this EIR finds no significant impact on *G. angulata* or *M. falcata* in the short term, the KRRC proposes aquatic resource measure AR-7 (Freshwater Mussels) to reduce the short-term effects of sediment transport during dam removal on freshwater mussels. Aquatic resource measures are summarized in Section 2.7.8.1 *Aquatic Resource Measures* and detailed in Appendix B: *Definite Plan – Updated AR-7, October 2018 Update*. Proposed Aquatic Resource Measure AR-7 includes salvage and relocation plan prior to Lower Klamath Project dam removal and completing a reconnaissance of existing freshwater mussels from Iron Gate Dam to Cottonwood Creek and potential relocation habitat between the upstream extent of J.C. Boyle Reservoir and Keno Dam. Freshwater mussels would be salvaged and relocated in dam removal year 1 prior to the reservoir drawdown. Approximately 15,000 to 20,000 mussels (primarily *G. angulata* and *M. falcata)* are planned for translocation. There are currently multiple large-scale mussel relocation projects occurring nationwide (Zimmerman et al. 2017, USDA Forest Service 2016, Illinois Department of Natural Resources 2016). Initial findings from these and previous studies indicate that with planning, mussel relocation can be successful. USDA Forest Service (2016) has found that 71 percent of the translocated mussels were found a year later and that only two mussels (0.22 percent) were confirmed dead. Fernandez (2013) found that Between 55 percent and 95 percent of the transplanted *M. falcata* mussels could be accounted for in individual streams one to three years after relocation. Therefore, it appears likely that these measures could be successful. Sites considered for translocation include areas downstream from the Trinity River confluence (RM 43.4), and between J.C. Boyle Dam (RM 230.6) and Copco No. 1 Reservoir (RM 209.0). These areas would have less impact from increased SSCs but would not be completely protected from short-term effects.

Anodonta spp. Would likely be impacted by the Proposed Project due to their close proximity to Iron Gate Dam, and their preference for the stable that currently exist in Lower Klamath Project reservoirs and downstream of Iron Gate Dam. *Anodonta spp*. Likely only occurs downstream of Iron Gate Dam under existing conditions as a result of the altered hydrograph (Davis et al. 2013). Under natural conditions *Anodonta spp*. Would be unlikely to occur in the Middle and Lower Klamath River. Based on their limited distribution in the mainstem Klamath River, Lower Klamath Project reservoirs, and in the Upper Shasta River, the abundance of the *Anodonta spp*. Year class present during dam removal year 2 would likely decline substantially within the first six months of dam removal as a result of elevated SSCs resulting from reservoir drawdown. In addition, their habitat would likely decline substantially in quality in the short term. Based on the predicted substantial short-term decrease in *Anodonta spp* abundance of a year class, and the substantial decrease in habitat quality, there would be a significant impact to the *Anodonta spp* population under the Proposed Project in the short term.

Aquatic resource measure AR-7 is unlikely to offset the projected impacts to *Anodonta spp*. The areas downstream of the Trinity River confluence identified in aquatic resource measure AR-7 as relocation areas do not currently support *Anodonta spp*. And are unlikely to in the future (Davis et al. 2013). The reach between J.C. Boyle Dam and Copco No. 1 Reservoir does not currently support *Anodonta spp.* Therefore, translocation efforts described in proposed Aquatic Resource Measure AR-7 are anticipated to be potentially successful for *G. angulata* and *M. falcata* (based on suitable habitat in translocation sites), but is unlikely to be successful for *Anodonta spp.* With this aquatic resource measure, there would likely still be a substantial reduction in the abundance of *Anodonta spp.* Species in the short term, and impacts would be significant with for *Anodonta spp.* In the short term. For development of proposed Aquatic Resource Measure AR-7, the KRRC explored several approaches to salvaging and relocating *Anodonta spp*. Prior to dam removal, as described Appendix B: *Definite Plan – Updated AR-7, October 2018 Update*. However, options such as translocating mussels to tributaries, or other reaches upstream of Iron Gate Dam were rejected after surveys suggesting that most locations would not provide suitable habitat, and the concern of risking healthy and abundant mussels populations in tributaries by translocating mussels from the mainstem reach with unknown disease risk. Therefore, the short-term significant impact on *Anodonta spp*. Due to the Proposed Project cannot be avoided or substantially decreased through feasible mitigation.

Freshwater clams can live buried in the substrate and are expected to suffer less impact than freshwater mussels. In addition, they are relatively short-lived (one to three years) and bear young several times throughout the spring and summer which would support rapid recovery within the short term to impacts from suspended sediment. Based on no predicted substantial short-term decrease in freshwater clam abundance of a year class, or substantial decrease in habitat quality or quantity, there would not be a significant impact to the freshwater clam populations under the Proposed Project in the short term.

In the long term, dam removal would restore connectivity among the Lower Klamath Basin, the Hydroelectric Reach and its tributaries, and the Upper Klamath Basin, and would rehabilitate and increase availability of riverine habitat within the Hydroelectric Reach for *M. falcata* and *G. angulata*. Based on no predicted substantial long-term decrease in *M. falcata* and *G. angulata* abundance of a year class, or substantial decrease in habitat quality or quantity, there would not be a significant impact to the *M. falcata* and *G. angulata* populations under the Proposed Project in the short term.

Conditions would also improve in the long term in the Hydroelectric Reach for *Anodonta spp.* With reduced flow variability downstream of J.C. Boyle Dam, potentially creating conditions more similar to the reach downstream of Keno Dam, where *Anodonta spp*. Are currently found (Byron and Tupen 2017). This additional habitat is unlikely to offset the long-term habitat lost from increased

flow variability within Lower Klamath Project reservoirs and downstream of Iron Gate Dam. The current populations of *Anodonta spp*. In the Lower Klamath Project reservoirs and downstream of Iron Gate Dam are artifacts of an altered hydrology and geomorphology. The reversion of these conditions to more natural river environment (e.g., natural flow regime and increased sediment scour) would no longer support *Anodonta spp*., and the suitable habitat supporting their populations would be revert to natural spring-fed stable flow conditions, such as the Upper Shasta River. Based on predicted substantial long-term decrease in *Anodonta spp.* Abundance of a year class, and substantial decrease in habitat quality and quantity, there would be a significant impact to the *Anodonta spp.* Population under the Proposed Project in the long term. Because reversion of the Klamath River within and downstream of the Lower Klamath Project to more natural river conditions would be an inevitable consequence of the Proposed Project, the long-term significant impact on *Anodonta spp*. Due to the Proposed Project cannot be avoided or substantially decreased through feasible mitigation.

Based on no predicted substantial long-term decrease in freshwater clam abundance of a year class, or substantial decrease in habitat quality or quantity, there would not be a significant impact to the freshwater clam populations under the Proposed Project in the long term.

Significance

No significant impact for *M. falcata* and *G. angulata* in the short or long term

Significant and unavoidable impact for *Anodonta spp.* In the short and long term

No significant impact for freshwater clams in the short or long term

Potential Impact 3.3-20 Effects on fish species from alterations to benthic macroinvertebrates due to short-term sediment releases and long-term changes in habitat quality due to dam removal.

Benthic macroinvertebrates (BMI) are small aquatic animals and the aquatic larval stages of insects. BMI are the primary food source for most freshwater fish species, and therefore, changes in abundance, distribution, or community structure can affect fish populations. A diminished food supply can limit growth of salmonids, and this is especially true at higher temperatures because as water warms, a fish's metabolic rate increases, and it needs more food to sustain growth. Growth is critical to juvenile salmonids because a larger size fish often has a survival advantage during the overwintering period, smolt outmigration, and ocean residence.

In the short term, the Proposed Project could alter SSCs and bedload sediment transport and deposition and thereby negatively affect benthic macroinvertebrates. Increases in suspended sediment and increased bedload deposition following dam removal under the Proposed Project are anticipated to

result in a reduction in abundance of BMIs within the first few months of dam removal year 2 in the reach from Iron Gate Dam to confluence with the Salmon River, and SSC increases may decrease growth rates of fish rearing and feeding in the mainstem Klamath River downstream of Iron Gate Dam to around the Salmon River confluence. Short-term reductions in the abundance and diversity of BMIs has been observed following disturbance due to suspended sediment (Reid and Anderson 2000, Orr et al. 2008). During the period of greatest impact (winter of sediment release dam removal years 1 and 2), food availability related to BMI production would likely decrease in the reach downstream of Iron Gate Dam around the confluence with the Salmon River. However, within this reach a reduction in feeding by fish species is already predicted to occur in response to increased SSCs, which is a sub-lethal effect from which fish populations are anticipated to recover. In addition, salmonids typically reduce feeding during winter in response to lower water temperature and decreased metabolic demand (Bustard and Narver 1975).

While a large proportion of the BMI population in the Hydroelectric Reach and in the mainstem Klamath River downstream from Iron Gate Dam would be reduced in the short term, their populations would be expected to recover quickly because of the many sources for recolonization and their rapid dispersion through drift or aerial movement of adults. Full recovery of BMI communities is typically observed within a year following disturbance (Tsui and McCart 1981, Anderson et al. 1998). The constant “flushing” action of the Klamath River is anticipated to speed BMI recovery from negative impacts resulting from sediment deposition. Tullos et al. (2014) found that BMI communities downstream of the Brownsville (Calapooia River, Oregon) and Savage Rapids (Rogue River, Oregon) dams resembled upstream control sites within a year after dam removal. Foley et al. (2017) summarizes the effects of multiple dam removal studies and found that researcher reported that following dam removal downstream BMI abundance tends to increase and species assemblages transition to resemble sites upstream of the former dam, noting that some BMI species can double their population size in days to weeks, and quickly (within months) recover once the initial sediment pulse has passed. There, the effects of reduced BMI populations on food availability for fish species is anticipated to be of insufficient magnitude or duration to substantially effect fish species in the short term. Based on no predicted substantial short-term decrease in fish abundance of a year class, or substantial decrease in habitat quality or quantity supporting a fish species, there would not be a significant impact to fish populations under the Proposed Project in the short term from effects to BMIs.

In the long term, the Proposed Project would restore connectivity among the Lower Klamath Basin, the Hydroelectric Reach and its tributaries, and the Upper Klamath Basin, and would rehabilitate and increase availability of riverine habitat within the Hydroelectric Reach. The reformation of river channels in the reservoir reaches upstream of Iron Gate Dam, and the reversion to unimpeded sediment transport downstream of Iron Gate Dam under the Proposed Project, would

benefit BMIs by providing more suitable substrates (e.g., gravel) than currently exist. Thus, suitable habitats formed upstream of Iron Gate Dam might be opened to additional colonization by BMIs through rapid dispersal by drift from upstream populations within current riverine reaches and/or dispersion of adult life stages. In addition, recolonization would occur rapidly from established BMI populations within the many tributary rivers and streams of the Klamath River. BMI populations would be expected to recover quickly and provide food availability to fish from short-term impacts because of the many sources for recolonization and their rapid dispersion through drift or aerial movement of adults.

Under the Proposed Project, peaking operations would no longer kill, through stranding, large numbers of aquatic invertebrates that are the primary prey food for resident trout in the reach between J.C. Boyle Powerhouse and Copco No. 1 Reservoir (NMFS 2006a). Based on increased habitat availability and improved habitat quality, the effect of the Proposed Project on BMI as a food source for fish species would be beneficial in the long term. Based on no predicted substantial long-term decrease in fish abundance of a year class, or substantial decrease in habitat quality or quantity supporting a fish species, there would not be a significant impact to fish populations under the Proposed Project in the long term from effects to BMIs.

Significance

No significant impact for effects of alterations to benthic macroinvertebrates on fish species in the short term

Beneficial for effects of alterations to benthic macroinvertebrates on fish species in the long term

Potential Impact 3.3-21 Effects on aquatic resources due to short-term noise disturbance and water quality alterations from construction and deconstruction activities.

This analysis relates to the potential impact to aquatic resources from various construction and deconstruction activities associated with the Proposed Project, outside of the release of reservoir sediments discussed more thoroughly above, and the relocation of the City of Yreka's water supply pipeline, discussed below as Potential Impact 3.3-23.

Disturbance to the river channel during construction related to the Proposed Project could affect aquatic species. The Proposed Project would require demolition of the dams and their associated structures, removal of power generation facilities and transmission lines, installation of cofferdams, road upgrading, hauling, reservoir restoration, recreation site modifications (existing and/or new), and other activities (as described in Section 2.7.1 *Dam and Powerhouse Deconstruction*). These actions would include the use of heavy equipment, and blasting as necessary, and have the potential to disturb aquatic

species. Activities at the Lower Klamath Project dams would affect the riverine and introduced resident species in the Hydroelectric Reach. At Iron Gate Dam and Iron Gate Hatchery, anadromous species could also be affected. These potential effects could include shockwaves associated with breaking down the dam structures using explosives or heavy equipment, potential crushing of aquatic species from operation of heavy equipment in the river, sedimentation, and release of oil, gasoline, or other toxic substances from construction sites.

Several deconstruction activities are schedule to occur prior to reservoir drawdown, including road improvements (e.g., bridge upgrades), temporary road crossings, Iron Gate modifications, Fall Creek Hatchery modifications, etc. In-water demolition of the dams and their associated structures, power generation facilities, and other activities, are scheduled to occur nearly simultaneously within the first nine months of reservoir drawdown during dam removal year 2 (see Table 2.7-1), and during the peak SSCs associated with reservoir drawdown in dam removal year 2. The aquatic resources impacts of this reservoir drawdown SSC peak are discussed earlier in this section. It is anticipated that this release of sediment during initial drawdown would result in the nearly immediate displacement of most mobile aquatic species from the mainstem into tributaries or farther downstream prior to the prolonged deconstruction or in-water work activities (e.g., cofferdam installation or removal). Native aquatic species (e.g., redband trout) that occur in the Hydroelectric Reach would have less potential refuge in the mainstem from deconstruction impacts, but would have access to key tributaries as refigure, including Jenny, Fall, and Shovel creeks. For non-mobile aquatic resources, like mussels, the impacts are anticipated to be well within the range of what is discussed for reservoir sediment release, as it is assumed that construction and deconstruction-related impacts would be of small magnitude, short duration, and low intensity when compared to those that would occur as a result of release of sediments stored behind the dams.

For aquatic species that occur within reservoirs, the effect of deconstruction is already subsumed by the impact of conversion of reservoir to riverine habitat, as described in multiple potential impacts above. For example, the reservoir habitat that supports Lost River and shortnose suckers (Potential Impact 3.3-13) would be removed, as addressed by the Aquatic Resource Measure AR-6 to salvage and relocate suckers prior to reservoir drawdown, or impacts associated with deconstruction.

To minimize potential construction impacts from crushing, sediment release, toxins, noise, etc., construction areas would be isolated from the river where possible. The Klamath River would be bypassed around the construction area while the isolated portion of the dam is removed. After a work area is isolated, fish rescue and relocation efforts, to remove any native fish trapped in the work area, would be conducted. Fish would be relocated to an area of suitable habitat within the Klamath River.

In addition, proposed soil erosion and sedimentation control and stormwater pollution prevention (Section 2.7.8.7 *Water Quality Monitoring and Construction BMPs*) measures would minimize effects of construction related toxins, soil erosion, and associated water quality effects on aquatic species downstream from the work area, during and after construction. Further, the State Water Board has issued a draft water quality certification which sets forth multiple conditions to monitor the effects of deconstruction on water quality (e.g., suspended sediment, dissolved oxygen, toxicity, etc.), and to protect aquatic resources through proper disposal of materials. Based on no predicted substantial short- or long-term decrease in aquatic species abundance of a year class, or substantial decrease in habitat quality or quantity, there would not be a significant impact to aquatic resources under the Proposed Project in the short term or long term from deconstruction effects.

Significance

No significant impact for aquatic resources from deconstruction in the short term or long term

Potential Impact 3.3-22 Effects on aquatic species due to short-term noise disturbance and water quality alterations from deconstruction activities and long-term fish screen upgrades or permanent fish passage barrier from the relocation of the City of Yreka Water Supply Pipeline.

The existing water supply pipeline for the City of Yreka passes under the upstream end of Iron Gate Reservoir and would have to be relocated prior to decommissioning the Iron Gate Dam to prevent damage from deconstruction activities or increased water velocities and pipeline exposure once the reservoir has been drawn down. Additionally, the water supply intake screens located in Fall Creek may need to be replaced or upgraded to meet regulatory criteria. Native species currently residing in Iron Gate Reservoir that could be affected from the construction-impacts of removal of the existing pipeline and the installing of a new one in the short term would include redband trout, cutthroat trout, chub species, sucker species, and sculpin species. In the long-term anadromous fish accessing habitat upstream of Iron Gate Dam could also be affected by improved screens at the water supply intakes. If the existing fish screens for the water supply intakes do not meet current regulatory agency screen criteria for anadromous fish, improved screened intakes presumably would meet criteria. The KRRC recently has proposed to include a permanent fish passage barrier at the Fall Creek Hatchery, located approximately 200 to 300 feet downstream of both Dams A and B (KRRC 2019b), such that there would be no need for updates to the City of Yreka's Dam A or B existing diversion intake structures. As described in Section *2.7.8.7 Water Quality Monitoring and Construction BMPs,* standard construction best management practices would reduce the likelihood and extent of aquatic impacts to a less-than-significant level for water quality purposes. These levels are set for protection of aquatic resources. Therefore, based on no predicted substantial short- or long-term decrease in aquatic species abundance of a year class, or substantial decrease

in habitat quality or quantity, there would not be a significant impact to aquatic resources under the Proposed Project in the short term or long term from the relocation of the City of Yreka water supply pipeline and intake screens.

Significance

No significant impact to aquatic resources from the relocation of the City of Yreka water supply pipeline and intake screens in the short or long-term

Potential Impact 3.3-23 Effects on anadromous salmonid populations due to short-term and long-term Bogus Creek flow diversions for the Iron Gate Hatchery.

Under the Proposed Project, up to 8.75 cfs of water would be diverted from Bogus Creek to operate Iron Gate Hatchery for eight years (dam removal year 2 through post-dam removal year 7), as described in Section 2.7.6 *Hatchery Operations*. This diversion would replace the current water supply from Iron Gate Reservoir. Specific diversion rates from Bogus Creek would be as follows:

- 6.50 cfs October through November
- 8.75 cfs in December
- 3.50 cfs January through March
- 8.25 cfs April through May
- 0.00 cfs June through September

To reduce the potential adverse effects of diverting water from Bogus Creek on naturally spawning and rearing salmon, the KRRC proposes to construct the pump station for the hatchery water supply would be constructed as far downstream toward the Klamath River confluence as practicable (within 1,000 feet, Figure 2.7-10). This would result in up to a 1,000-foot reach in lower Bogus Creek that would experience lower fall, winter, and spring flows than under existing conditions (Figure 2.7-11). As further discussed below, CDFW and NMFS have proposed monitoring and adaptation of operations to minimize habitat impacts.

Based on adult migrant monitoring (Knechtle and Chesney 2011, 2016a, 2017), fall-run Chinook salmon are observed to return to Bogus Creek to spawn from mid-September to early November, coho salmon adults return from late October to early January, and steelhead from November through March. Therefore, flow diversions of 6.5 cfs during October and November, and 8.75 cfs in December could affect upstream migration of adult salmonids into Bogus Creek through the lower reach. The volume of flow required for adult salmonids to migrate upstream through lower Bogus Creek has not been directly assessed. Depending on stream gradient, channel width, and other geomorphic conditions, flows below the diversion may continue to be sufficient for upstream passage, or they could result in conditions that restrict passage at times, particularly in early October prior to increased precipitation. The geomorphic conditions that

determine passage are subject to change as precipitation events alter the streambed.

Based on two years of recent migration observations in Bogus Creek (Knechtle and Chesney 2016a, 2017) during the low flow years of 2015 and 2016, fall-run Chinook salmon were observed migrating at flows as low as 4.5 cfs in September 2016, and 8 fish were observed migrating at flows between 4.5 and 5 cfs. During the fall-run Chinook salmon migration peak in 2015 and 2016, flows were between 10 and 20 cfs. Based on this data, flows greater than around 4.5 cfs enabled at least some upstream migration in the past. If this flow was sufficient for Chinook salmon, it would also be sufficient for coho salmon and steelhead, which have less restrictive passage requirements. Long-term flow monitoring data are not available for Bogus Creek. However, the available data from 2013–2016 includes severe and extreme drought conditions and are therefore likely appropriate to observe minimum flows to support passage. Based on four years of available data (Figure 2.7-14), proposed water diversions could result in flow reductions during the adult migratory period of around 10 to 40 percent in the affected reach during fall-run Chinook salmon migration, potentially resulting in flows less than 4.5 cfs in at least some years, for at least a few days. By the time coho salmon and steelhead are migrating flows are high enough to provide greater than 4.5 cfs, based on the data available. Based on available data it appears that under the Proposed Project insufficient flows for Chinook salmon passage could result in delays for up five days in some years. Delay of migration for even one day has been observed to increase disease risk by increasing the density of holding adults and increasing mortality of adults prior to spawning (McLaughlin et al. 2012, Connor et al. 2018). Temporary increasing in crowding may be similar to what is observed under existing conditions during periods of low rainfall but could be exacerbated by decreasing flows in lower Bogus Creek. These impacts are anticipated to effect a small proportion of migrants during the 14-week fall-run Chinook salmon migration period (Table 3.3-3). In addition, any redds that are deposited along channel margins (shallow water areas) downstream of the diversion may be susceptible to stranding when diversion rates increase (e.g., primarily December, as well as March), although the affected reach is relatively short (< 1,000 feet). Rearing fish (mobile) are unlikely to be affected by the relatively low magnitude of flow fluctuations.

The proposal for Iron Gate Hatchery operation includes protection for fish passage in Bogus Creek (Appendix B: *Definite Plan – Section 7.8.3*, NMFS and CDFW 2018). To minimize effects of Bogus Creek diversions on fish habitat, NMFS and CDFW would coordinate with KRRC to ensure that at least 50 percent of the flow would remain in Bogus Creek at the point of diversion, conduct an assessment to determine that the habitat below the diversion provides connectivity for fish spawning and rearing habitat, identify appropriate flow levels or percentages of diversion permitted each month, and establish reporting specifications (Appendix B: *Definite Plan – Section 7.8.3*, NMFS and CDFW 2018).

Based on the potential for low flows (i.e., less than 4.5 cfs) in the Bypass Reach during the salmonid migration periods in some years (which could result in delayed migration and increased crowding), the uncertainty in the migration flow levels in Bogus Creek, and the uncertainty in the commitment to ensure flows to protect anadromous salmon volitional migration, the flow diversions from Bogus Creek could decrease the abundance of multiple (up to eight) year classes of anadromous salmonids produced from spawning activity in Bogus Creek. However, it is anticipated that this would only occur infrequently during some dry water years, and only a small portion of the fall-run migration would potentially be affected. Based on the less than substantial decrease in abundance of a year class and habitat quality that could occur under the Proposed Project in the short- and long-term, the effect of reduced instream flows in Bogus Creek under the Proposed Project would not be significant in the short- and long-term.

Although CEQA Guidelines Section 15126.4(a)(3) states that mitigation measures are not required for effects which are not found to be significant, Mitigation Measure AQR-3 would even further reduce the potential for short- and long-term effects of reduced instream flows in lower Bogus Creek under the Proposed Project on anadromous salmon by increasing certainty that fish passage conditions are projected. Mitigation Measure AQR-3 below includes additional components beyond those listed as part of the Proposed Project which would further reduce the potential short-term impacts on migrating anadromous salmonids resulting from hatchery operations. With Mitigation Measure AQR-3, the potential effect of instream flow diversions is further reduced.

Mitigation Measure AQR-3 – Bogus Creek Flow Diversions.
Implementation of Iron Gate Hatchery operations plan (Described in Appendix B: *Definite Plan – Section 7.8.3*) shall include a minimum flow in Bogus Creek of 4.5 cfs, unless a study is conducted that determines an alternative minimum flow is required to provide volitional fish migration for Chinook salmon, coho salmon, and steelhead. If the hatchery diversions cause a flow within Bogus Creek downstream of the bypass that is less than 4.5 cfs (or the minimum flow identified for each species during their migration period), then hatchery operations shall be adjusted, in coordination with NMFS and CDFW, to reduce the percentage of flow diverted from Bogus Creek to be protective of anadromous fish passage.

Significance
No significant impact with mitigation on Chinook salmon, coho salmon, or steelhead in the short term or long term

Potential Impact 3.3-24 Effects on anadromous salmonid populations due to short-term and long-term Fall Creek flow diversions for the Fall Creek Hatchery.
Under the Proposed Project, up to 9.24 cfs of water would be diverted from Fall Creek to operate Fall Creek Hatchery for eight years (through post-dam removal

year 7), as described in Section 2.7.6 *Hatchery Operations*. Specific diversion rates from Fall Creek would be as follows:

- 8.48 cfs in October
- 9.24 cfs in November
- 6.32 cfs in December
- 5.77 cfs in January
- 1.47 cfs in February
- 1.76 cfs in March
- 1.84 cfs in April
- 1.08 cfs in May
- 0.58 cfs in June
- 1.01 cfs in July
- 1.48 cfs in August
- 2.29 cfs in September

In addition, the City of Yreka maintains a water right to divert up to 15 cfs from Fall Creek for municipal purposes (City of Yreka 2012). The primary water intake for this water pipeline is located along the PacifiCorp Fall Creek powerhouse return canal at Dam A (Figure 2.7-17), which is upstream of the proposed Fall Creek Hatchery water diversion. Under the Proposed Project no fish passage would be possible past the existing Dam A or Dam B on Fall Creek (Figure 2.7-8; Appendix B: *Definite Plan – Section 7.8.3*), approximately one mile upstream from the projected confluence of Fall Creek with the Klamath River. The KRRC recently has proposed to include a permanent fish passage barrier at the Fall Creek Hatchery, located approximately 200 to 300 feet downstream of both Dams A and B (KRRC 2019. Depending on final site selection, discharge from the hatchery would re-enter Fall Creek from between 0.08 and 0.36 miles upstream from the confluence with the Klamath River. Therefore, most of the one mile of spawning and rearing habitat for salmonids in Fall Creek, from Dam A and Dam B to the confluence with the Klamath River, would be subject to reduced flows as a result of Fall Creek Hatchery water diversions.

Based on historical records and current assessments of habitat suitability, Fall Creek likely has the potential to provide around one mile of spawning and rearing habitat for fall-run and spring-run Chinook salmon, coho salmon, steelhead, and Pacific lamprey following the removal of the fish passage barrier of Iron Gate Dam (NMFS 2006a, Hamilton et al. 2005, 2011).

The City of Yreka is required to bypass a minimum flow of 15 cfs or the natural flow of Fall Creek, whenever the natural flow is less than 15 cfs. Under existing conditions Yreka uses less than the 15 cfs allocation, but the City has used the full allocation in the past, and for this analysis it is assumed that the City of Yreka would use their full water right of up to 15 cfs. The Fall Creek Hatchery diversion and return flow points would occur between the City of Yreka water supply intake

and the City's compliance point for the Fall Creek minimum flow, which is at the Fall Creek USGS gage (USGS No. 11512000). Between the Fall Creek Hatchery diversion and return flow points, the flow remaining in Fall Creek after the diversions for the City of Yreka and the Fall Creek Hatchery would usually be greater than 15.0 cfs, but it could occasionally be slightly less than 15.0 cfs in late summer to early fall (i.e., mid-July to mid-September) when natural Fall Creek flows reach a minimum. Fall Creek Hatchery diversion flows during the late summer would be 1.01 to 2.29 cfs, potentially reducing flows within the hatchery diversion affected reach to less than 15 cfs in dry water years with particularly low flows. However, this slight reduction during late summer is not anticipated to have a substantial effect on habitat availability or fish passage, due to the volume of instream flows remaining in the reach. During periods of the year when hatchery diversions would be higher (e.g., October through January), typically flows greater than 20 cfs would occur in this section of Fall Creek (Figure 2.7-13), which based on the habitat and channel morphology in Fall Creek is anticipated to provide suitable migratory, rearing, and spawning conditions. Any redds that are deposited downstream of the diversion along channel margins (shallower water) during fall may be susceptible to stranding (i.e., reduced egg-to-emergence survival) when diversion rates increase (e.g., primarily October and November). Rearing fish (mobile) are unlikely to be affected by the relatively low magnitude of flow fluctuations.

Under the Proposed Project anadromous salmonids would have increased habitat access upstream of Iron Dam, including within around one mile of habitat within Fall Creek that is currently inaccessible. Overall, a relatively small diversion of water from Fall Creek relative to existing creek flows would occur under the Proposed Project. In addition, the proportion of anadromous salmonids anticipated to use the habitat in Fall Creek is relatively minor in comparison with the totality of newly accessible habitat upstream of Iron Gate Dam under the Proposed Project. Therefore, based on no predicted substantial short- or long-term decrease in anadromous salmonid population abundance of a year class, or substantial decrease in habitat quality or quantity, there would not be a significant impact to anadromous salmonids under the Proposed Project in the short term or long term from Fall Creek Hatchery flow diversions.

Significance

No significant impact on Chinook salmon, coho salmon, or steelhead in the short term or long term

3.3.6 References

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3.4 Phytoplankton and Periphyton

Volume I Section 3.4.2.1 Phytoplankton and Periphyton – Environmental Setting – Phytoplankton, paragraph 3 on page 3-392 through paragraph 1 on page 3-393:

In addition to dissolved oxygen, pH, and at times ammonia, high concentrations of blue-green algae species, such as *Anabaena flos-aquae* and *Microcystis aeruginosa*, can produce nuisance levels of algal toxins (e.g., anatoxin-a and microcystin) that are harmful to fish, mammals, and humans (see also Section 3.2.2.7 *Chlorophyll-a and Algal Toxins*).

In a lake or reservoir environment, diatoms and green algae typically dominate in spring then decrease due to zooplankton grazing and the onset of water column stratification, which results in the diatoms and green algae settling out of the water column below the lake or reservoir surface layer (epilimnion). Cyanobacteria [blue-green algae] dominance in a lake or reservoir environment increases during late summer and early fall when water temperatures are warm and thermal stratification occurs, because their ability to control their buoyancy provides cyanobacteria [blue-green algae] with a

competitive advantage over diatoms and green algae (Raymond 2008, 2009, 2010; Moisander et al. 2009; Asarian and Kann 2011; McDonald and Lehman 2013; Paerl and Otten 2015; Visser et al. 2016; Paerl et al. 2018). In the late fall, the phytoplankton community composition shifts back to being dominated by diatoms, as thermal stratification breaks down and cyanobacteria abundance declines (Raymond 2008, 2009, 2010).

The stable lacustrine[101] environment created by Copco No. 1 and Iron Gate dams, coupled with high nutrient availability and high water temperatures in summer and fall months, provides ideal conditions for ~~phytoplankton growth, especially~~ the growth of blue-green algae species (Figure 3.4-2 and Figure 3.4-3). While cyanobacteria [blue-green algae] can be found in a variety of lake, reservoir, river, and estuarine environments, the cyanobacteria [blue-green algae] species *Anabaena flos-aquae* and *Microcystis aeruginosa* thrive in warm, high nutrient, and stable water column conditions (Konopka and Brock 1978; Kann 2006; Asarian and Kann 2011) because ~~, where~~ they can outcompete other beneficial algae species such as diatoms and green algae under these environmental conditions (Visser et al. 2016). ~~While they do not thrive in fast-moving water, diatoms~~ and green algae do not regulate their buoyancy, ~~and thus~~ so they rely on mixing in the water column (e.g., from wind, convection, or slow currents) to remain suspended near the water surface where light is available for photosynthesis. During spring conditions, reservoirs are often vertically mixed such that diatoms and green algae generally are able to remain suspended in the water column and dominate the phytoplankton community. During summer and fall, water temperatures are warmer, the water column is more stable, and thermal stratification limits vertical mixing, so ~~In reservoirs with warm water and a stable water column,~~ diatoms and green algae tend to settle out of the water column away from sunlight. Cyanobacteria [blue-green algae] cells contain gas sacs (vesicles[102]), so they can control their buoyancy and remain near the water surface to obtain light for photosynthesis (Walsby et al. 1997). The ability to control their density and position in the water column gives blue-green algae better access to light and they can shade phytoplankton (e.g., diatoms or green algae) lower in the water column. Additionally, cyanobacteria [blue-green algae] can also change their buoyancy to vertically migrate within the reservoir water column to access nutrients below the thermocline when nitrogen or phosphorous are limited in the upper surface layer (i.e., epilimnion) of the reservoir (Moisander et al. 2009; Paerl and Otten 2015; Paerl et al. 2018). Thus, blue-green algae are able to outcompete diatoms and/or green algae under lower mixing conditions in reservoirs. *Microcystis aeruginosa* can dominate the phytoplankton community in calm, stable lacustrine conditions, when their ability to float exceeds the rate of turbulent mixing in the water column (Huisman et al. 2004). However, blue-green algae abundance in the phytoplankton community decreases compared to diatoms and green algae when water column mixing in a water body increases (McDonald and Lehman 2013; Visser et al. 2016). In late fall when thermal stratification breaks down and reservoirs become vertically

mixed again, the phytoplankton community shifts from primarily cyanobacteria to diatoms.

Volume I Section 3.4.2.1 Phytoplankton and Periphyton – Environmental Setting – Phytoplankton – Anabaena flos-aquae, paragraph 1, footnote 104 on page 3-397:

Cyanobacteria in the genus *Anabaena* have been recently recategorized, with all planktonic species in the genus *Anabaena* renamed *Dolichospermum* and all benthic species remaining in the genus *Anabaena*. As such, *Anabaena flos-aquae* was recently renamed *Dolichospermum flos-aquae.* However, this EIR continues to use the *Anabaena* name for both planktonic and benthic species since it was more frequently used in the literature cited and it is still commonly used in descriptions of this species.

Volume I Section 3.4.2.2 Phytoplankton and Periphyton – Environmental Setting – Periphyton, paragraph 3 on page 3-403:

Monitoring at multiple locations along the Middle and Lower Klamath River indicates that dissolved oxygen and pH patterns over a 24-hour period are driven primarily by photosynthesis and respiration of periphyton in the absence of a reservoir phytoplankton bloom that is subsequently transported downstream into the river (Ward and Armstrong 2010~~,~~; Asarian et al. 2015; Genzoli and Hall 2016). The repeatable and consistent diel cycling of dissolved oxygen is characteristic of a stream metabolism that is dominated by periphyton photosynthesis and respiration (Odum 1956). However, free-floating algae transported through the system likely exert some influence on the dissolved oxygen signal in the Klamath River, as does the oxygen demand from decaying organic matter (e.g., bacteria, algae, plant litter) exported from upstream Klamath River reservoirs (PacifiCorp 2006; FERC 2007). Estimates of the stream metabolism in the Klamath River at Seiad Valley, Weitchpec, and Turwar during 2012 indicate periphyton and other benthic organisms are responsible for approximately 89 percent of the variations in dissolved oxygen per square meter per day (i.e., stream metabolism) when phytoplankton blooms are not occurring in the reservoirs or being subsequently transported downstream into the river (Genzoli and Hall 2016). Phytoplankton blooms in the reservoirs during September through mid-October 2012 and the transport of suspended phytoplankton into the Middle and Lower Klamath River shifted the stream metabolism from being primarily due to periphyton and other benthic organisms to a mixture of periphyton, other benthic organisms, and phytoplankton. During phytoplankton bloom conditions, the relative contribution of phytoplankton to stream metabolism increased to 55 percent at some river sites (Genzoli and Hall 2016).

Volume I Section 3.4.2.3 Phytoplankton and Periphyton– Environmental Setting – Hydroelectric Reach – Phytoplankton, paragraph 1 on page 3-412:

Additionally, the genetic and toxin analyses show that the *Microcystis aeruginosa* populations in Copco No. 1 and Iron Gate reservoirs are genetically distinct, providing evidence that blooms in Iron Gate Reservoir are internally derived and not due to transport of Microcystis aeruginosa populations from Copco No. 1 Reservoir or further upstream (Otten et al. 2015).

Genetic analyses of *Microcystis aeruginosa* cells from Copco No. 1 Reservoir, Iron Gate Reservoir, and Klamath River sites indicate that while there are five strains of *Microcystis aeruginosa* (i.e., operational taxonomic units [OTUs]) in the Klamath Basin, there is a high abundance of the microcystin-producing gene in only one *Microcystis aeruginosa* I (Otten et al. 2015, Otten and Dreher 2017). Data indicate that microcystin protects cyanobacteria [blue-green algae] cells from high oxidative stress that would occur during periods of high light intensity, so the toxigenic *Microcystis aeruginosa* I in the Klamath Basin may have a competitive growth advantage over the other nontoxic *Microcystis aeruginosa* OTUs during summer and fall periods with high light intensity. In experiments containing both toxic and non-toxic strains of *Microcystis aeruginosa*, warmer temperatures and oxidative stress favor dominance of toxic strains of *Microcystis aeruginosa* (Paerl and Otten 2013). In Copco No. 1 Reservoir between 2007 and 2015, the toxigenic *Microcystis aeruginosa* I dominated throughout 2009 to 2012 and 2015 and comprised the majority for two or more months in 2007, 2008, and 2013, but it had very low prevalence (i.e., less than 10 percent) throughout 2014. In Iron Gate Reservoir between 2008 and 2015, the toxigenic *Microcystis aeruginosa* I dominated during most of the year from 2009 to mid-2013 and 2015, but it did not comprise the majority of the *Microcystis aeruginosa* population in the reservoir during 2008 and 2014. Differences between the timing and type of *Microcystis aeruginosa* OTUs that dominate in Copco No. 1 and Iron Gate reservoirs further indicate that the populations are internally derived in each reservoir. However, the consistent dominance of the toxigenic *Microcystis aeruginosa* I from 2009 to mid-2013, followed by low prevalence in 2014 in Copco No. 1 and Iron Gate reservoirs, also suggests that a regional environmental condition is influencing populations in both reservoirs. While seasonal and inter-annual variations in Klamath River flows and water quality conditions in the reservoirs between 2009 to 2015 did not correlate with changes in toxigenic *Microcystis aeruginosa* I abundance, episodic wildfire smoke in 2008, mid-2013, and part of 2014 did coincide with declines in in toxigenic *Microcystis aeruginosa* I abundance and increases in nontoxic *Microcystis aeruginosa* OTUs. Decreases in light intensity during wildfire smoke periods may have reduced the competitive advantage microcystin provides to the toxigenic *Microcystis aeruginosa* I, resulting in the observed shifts in the reservoir *Microcystis aeruginosa* populations from dominance by toxigenic OTUs to nontoxic OTUs (Otten and Dreher 2017).

The documented presence of algal toxins in water and fish tissue in the Hydroelectric Reach corresponds with spatial and temporal patterns in the distribution of blue-green algae blooms within the reach.

Volume I Section 3.4.2.3 Phytoplankton and Periphyton – Environmental Setting – Hydroelectric Reach – Phytoplankton, paragraph 2 on page 3-412:

The reservoirs create ideal growing conditions for toxigenic blue-green algae (calm, stable lacustrine conditions with bioavailable nutrients), regularly resulting in high microcystin concentrations from approximately July through October (Kann and Corum 2006, 2009; Asarian and Kann 2011; Otten et al. 2015; Watercourse Engineering, Inc. 2016; Otten 2017; Otten and Dreher 2017).

Volume I Section 3.4.2.3 Phytoplankton and Periphyton – Environmental Setting – Hydroelectric Reach – Periphyton, paragraph 2 on page 3-413:

Nuisance blooms of periphyton have not been documented in the riverine portions of the Hydroelectric Reach. In the J.C. Boyle Peaking Reach, it has been noted that periphyton tends to be absent from the margins of the river that are alternately dried and wetted during peaking operations (~~E. Asarian, pers. comm., 2011~~ Karuk Tribe 2006), due to turbid water conditions that limit light availability for photosynthesis, high water velocities that limit establishment and growth of periphyton, and the variable flow regime that causes the cycles of drying and rewetting, as described by PacifiCorp (2005).

Volume I Section 3.4.5.1 Phytoplankton and Periphyton – Potential Impacts and Mitigation – Phytoplankton – Potential Impact 3.4-2 – Middle and Lower Klamath River, paragraph 1 on page 3-431:

Long-term increases in annual total nutrient levels would occur in the Middle and Lower Klamath River due to the lack of continued interception of nutrients by the Lower Klamath Project dams (Potential Impact 3.2-8). However, possible summer and fall increases in nutrient concentrations following Lower Klamath Project dam removal (see Section 3.2.5.3 *Nutrients*), particularly directly downstream from Iron Gate Dam, would not substantially contribute to blue-green algae blooms downstream from the dam, due to the lack of the suitable habitat conditions required for extensive phytoplankton growth in the Klamath River (see discussion above under the Hydroelectric Reach). ~~Some phytoplankton growth may still occur after dam removal in calm, slow-moving habitats along shorelines and protected coves and backwaters during low-flow periods in the Middle and Lower Klamath River, but these habitats already support growth of blue-green algae, including *Microcystis aeruginosa*, that results in occasional exceedances of 2016 CCHAB secondary thresholds and WHO guidelines (Falconer et al. 1999; Kann et al. 2010; State Water Board et al. 2010, updated 2016; Genzoli and Kann 2016, 2017).~~ The water velocity and constant mixing in the Middle and Lower Klamath River generally creates an environment

that is not supportive of phytoplankton growth (Genzoli and Kann 2017). While higher concentrations of phytoplankton cells and algal toxins have been measured in calm, slow-moving habitats along shorelines, protected coves, and backwaters along the Klamath River than in the faster-moving open channel river habitats (Kann et al. 2010; Genzoli and Kann 2017), growth and/or reproduction of phytoplankton cells within these habitats have not been documented. Measurements of blue-green algae (e.g., *Microcystis aeruginosa*) and algal toxins (e.g., microcystin) along shoreline habitats occasionally exceed 2016 CCHAB secondary thresholds and WHO guidelines under existing conditions, but these high concentrations of blue-green algae cells and associated algal toxins are generally attributed to entrapment and accumulation of cells and toxins transported downstream from the reservoirs rather than growth and/or reproduction within these slow-moving shoreline habitats (Falconer et al. 1999; Kann et al. 2010; State Water Board et al. 2010, updated 2016; Genzoli and Kann 2016, 2017). Furthermore, longitudinal decreases in the measured *Microcystis aeruginosa* cell densities and microcystin downstream of Iron Gate Dam in both slow-moving shoreline and open channel habitats suggest *Microcystis aeruginosa* cells and microcystin are being transported downstream into these shoreline habitats and phytoplankton growth is limited in these slow-moving shoreline habitats (Genzoli and Kann 2017). However, these calm, slow-moving shoreline, protected cove, and backwater habitats during low-flow periods in the Middle and Lower Klamath River would potentially provide suitable slow-moving phytoplankton habitat, so some blue-green algae growth may still occur after dam removal in the Middle and Lower Klamath River. While total nutrient transport into the Middle and Lower Klamath River after dam removal would slightly increase under the Proposed Project, *Microcystis aeruginosa* cell density and microcystin concentrations in Middle and Lower Klamath River after dam removal are expected to decrease because ~~due to~~ the reduced transport of *Microcystis aeruginosa* and microcystin from the Hydroelectric Reach into the Middle and Lower Klamath River under the Proposed Project would be greater than potential growth of phytoplankton, including blue-green algae, within slow-moving habitats in the Middle and Lower Klamath River. Therefore, the slight increase in nutrient availability is not expected to support nuisance phytoplankton growth or blooms that exceed current levels.

Volume I Section 3.4.5.2 Phytoplankton and Periphyton – Potential Impacts and Mitigation – Periphyton – Potential Impact 3.4-4, paragraph 2 on page 3-436:

However, the overall effect of the Proposed Project would likely ~~be to~~ increase periphyton in the ~~margins of low gradient~~ portions of Copco No. 1 and Iron Gate reservoir footprints with suitable habitat for periphyton growth due to the creation of new, previously uncolonized low gradient river channels. Periphyton growth would be most likely to occur along the channel margins with shallower water depths, more light availability, warmer water temperatures, and lower probability of seasonal sediment transport and scour, but periphyton growth could also occur elsewhere in the channel wherever suitable habitat conditions exist. While

there is considerable uncertainty, there is the potential under the Proposed Project that nuisance periphyton species could be part of the periphyton assemblages that grow in the ~~margins of these~~ new low gradient river channels. The nuisance periphyton species would potentially provide habitat for the polychaete worm (*Manayunkia speciosa*) that is the intermediate host of the fish parasites *Ceratomyxa shasta* and *Parvicapsula minibicornis*~~, so~~. Thus, if there is a ~~the~~ short-term ~~and~~ or ~~the~~ long-term increase in growth of nuisance periphyton species due to increases in available habitat, especially along channel margin areas ~~of the Hydroelectric Reach~~ within the Copco No. 1 and Iron Gate reservoir footprints of the Hydroelectric Reach, ~~also would~~ it could potentially result in a new or further impairment of designated beneficial uses~~, and~~. It would therefore be a significant impact.

3.4.6 References

Volume I Section 3.4.6 Phytoplankton and Periphyton – References, pages 3-440 through 3-451, includes the following revisions:

Kann, J., L. Bowater, and S. Corum. 2010. Middle Klamath River toxic cyanobacteria trends, 2009. Technical Memorandum. Prepared by Aquatic Ecosystem Sciences, LLC, Ashland, Oregon and the Karuk Tribe Department of Natural Resources for the Karuk Tribe Department of Natural Resources, Orleans, California.

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Other references cited as part of text included in the Section 3.4 list of revisions:

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3.5 Terrestrial Resources

3.5.2 Environmental Setting

3.5.2.1 Vegetation Communities

Historical Vegetation

Volume I Section 3.5.2.1 Terrestrial Resources – Environmental Setting – Vegetation Communities – Historical Vegetation, paragraph 4 on page 3-467 through page 3-472:

When the reservoirs were built, topography limited the establishment of Montane Riparian habitat. But However, in many places the creation of the reservoir created a flat bench that facilitated Palustrine habitat establishment (PacifiCorp 2004a). Currently, there are 11.14.8 acres of Montane Riparian and 25.29.4 acres of Palustrine habitat within 300 feet of the reservoir footprint ofadjacent to Copco No. 1 and Copco No. 2 reservoirs and 4.710.2 acres of Montane Riparian and 27.119.6 acres of Palustrine habitat within 300 feet of the reservoir footprint ofadjacent to Iron Gate Reservoir (Table 3.5-2;Figures 3.5-4 and 3.5-5; KRRC 2019aPacifiCorp 2005).

Table 3.5-2. Comparison of Historical (EDAW 2000) and Current (PacifiCorp 2005KRRC 2019a) Wet Habitat Types at Copco Nos. 1 and 2 and Iron Gate Reservoirs.

CHWR Vegetation Cover Types	Copco Nos. 1 and 2 (ac)	Iron Gate Reservoir (ac)	Total ac
Historical (reservoir footprint) [1]			
Montane Riparian (MRI)	66.2	30.1	**96.3**
Palustrine (PAL)[2]	23.7	2.6	**26.3**
Current (within 300 feet of the reservoir footprint)			
Montane Riparian (MRI)	11.14.8	4.710.2	**15.815.0**
Palustrine (PAL)[2]	25.29.4	27.19.6	**52.319.0**

[1] No historical data is available outside of the reservoir footprint.

[2] Not a CWHR type; based on the Cowardin classification for wetlands and deepwater habits (Cowardin et al. 1979).

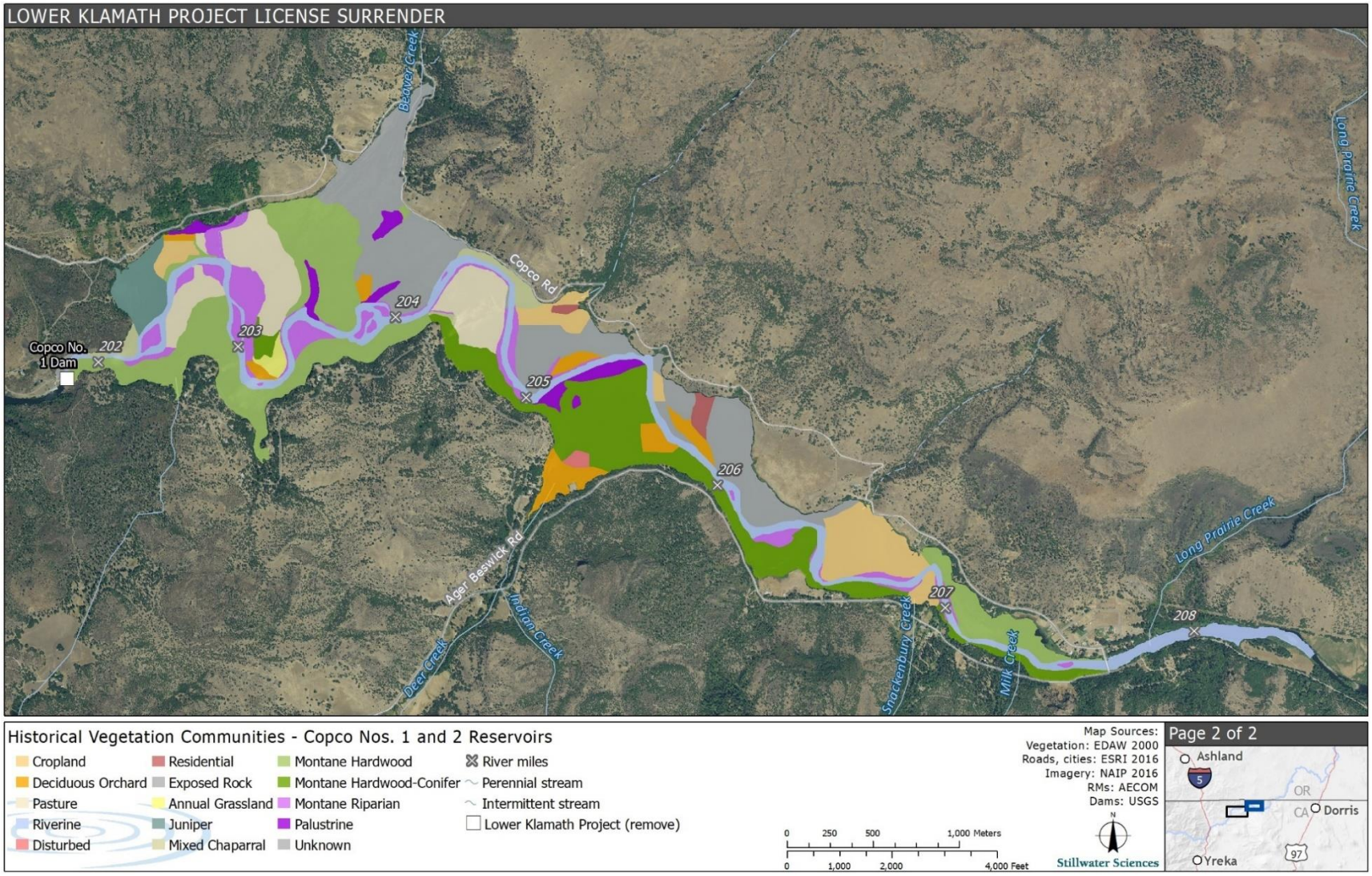


Figure 3.5-2. Historical Vegetation Types in Copco No. 1 and Copco No. 2 Reservoirs.

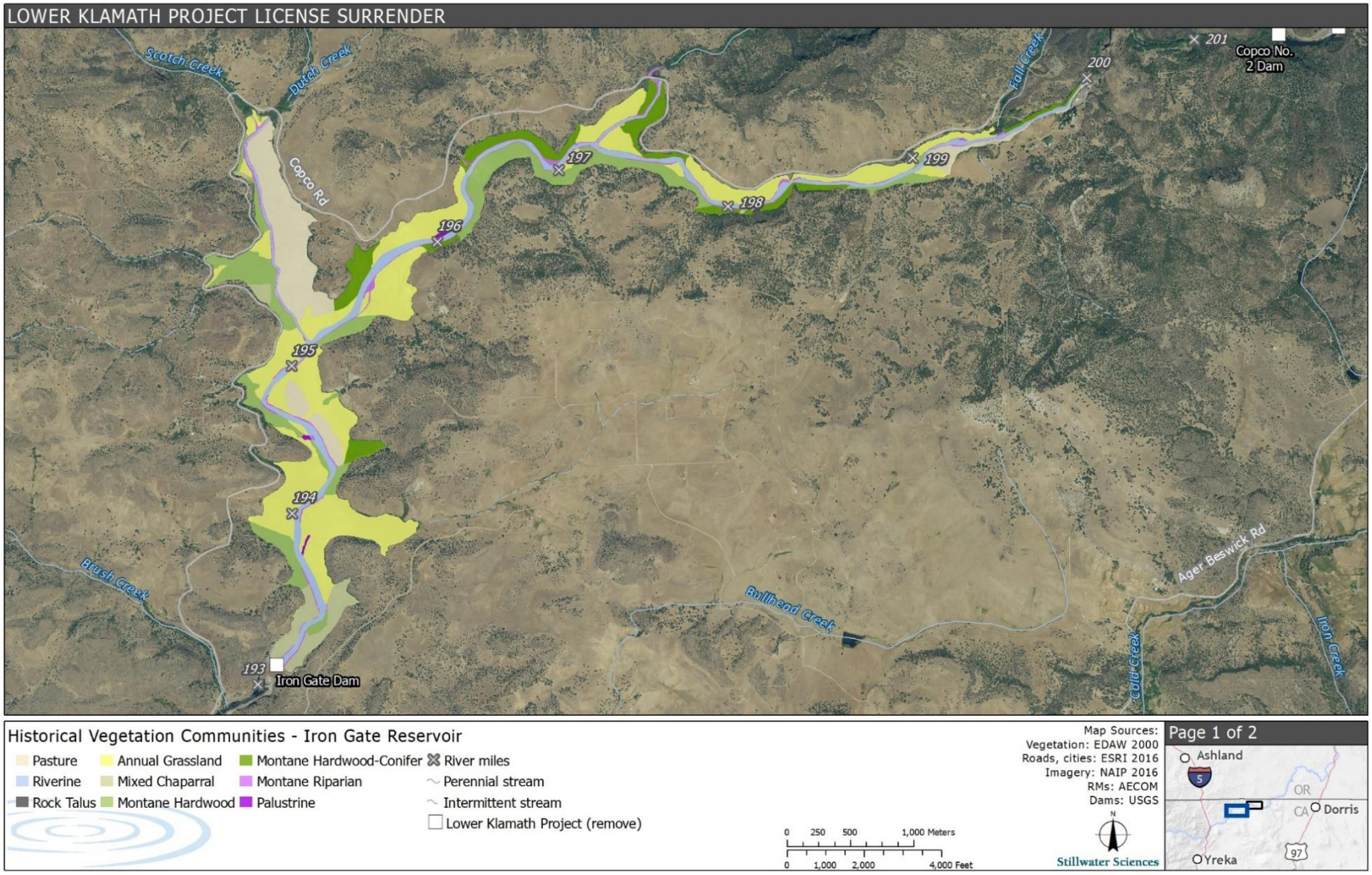


Figure 3.5-3. Historical Vegetation Types in Iron Gate Reservoir.

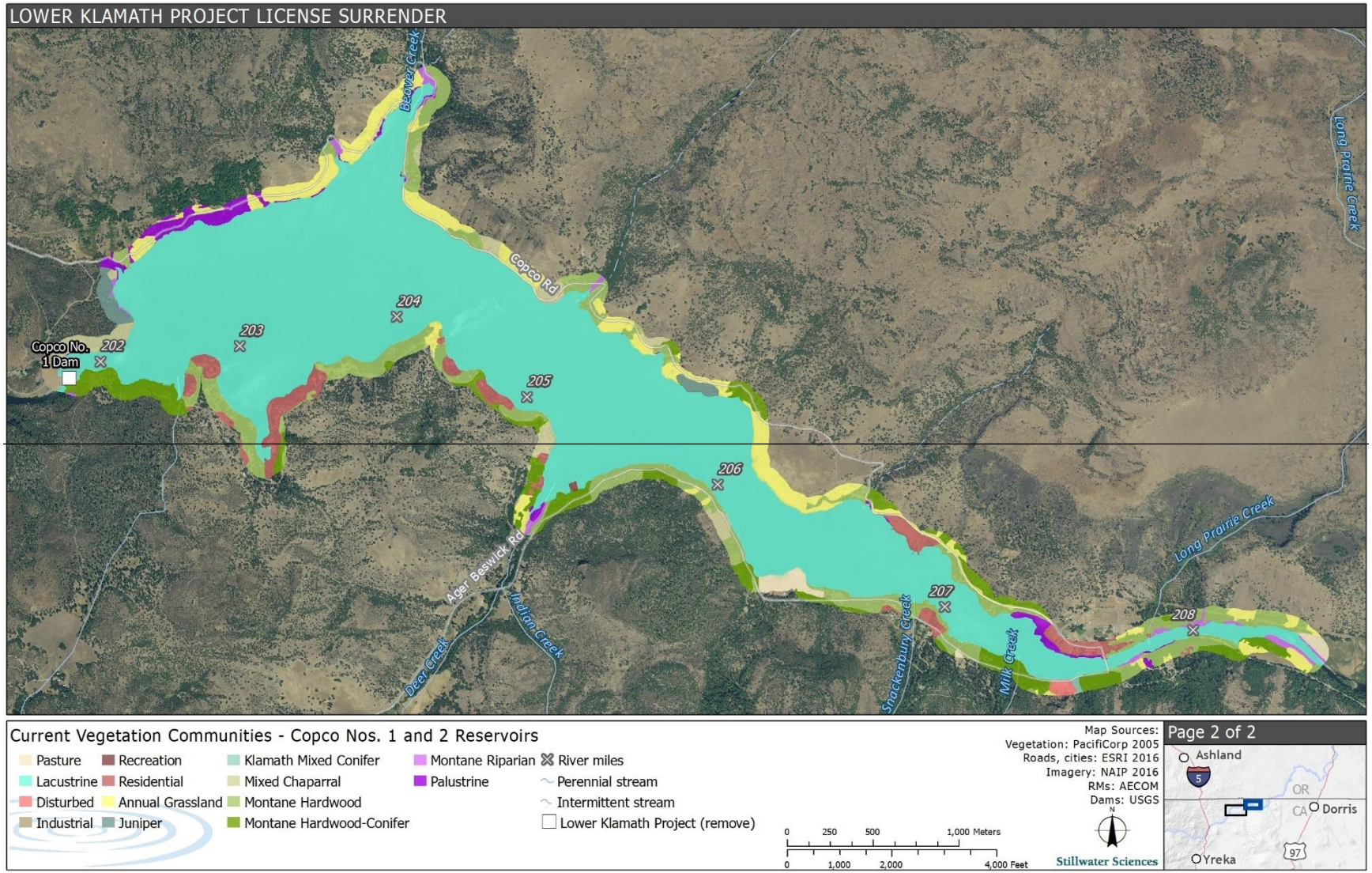
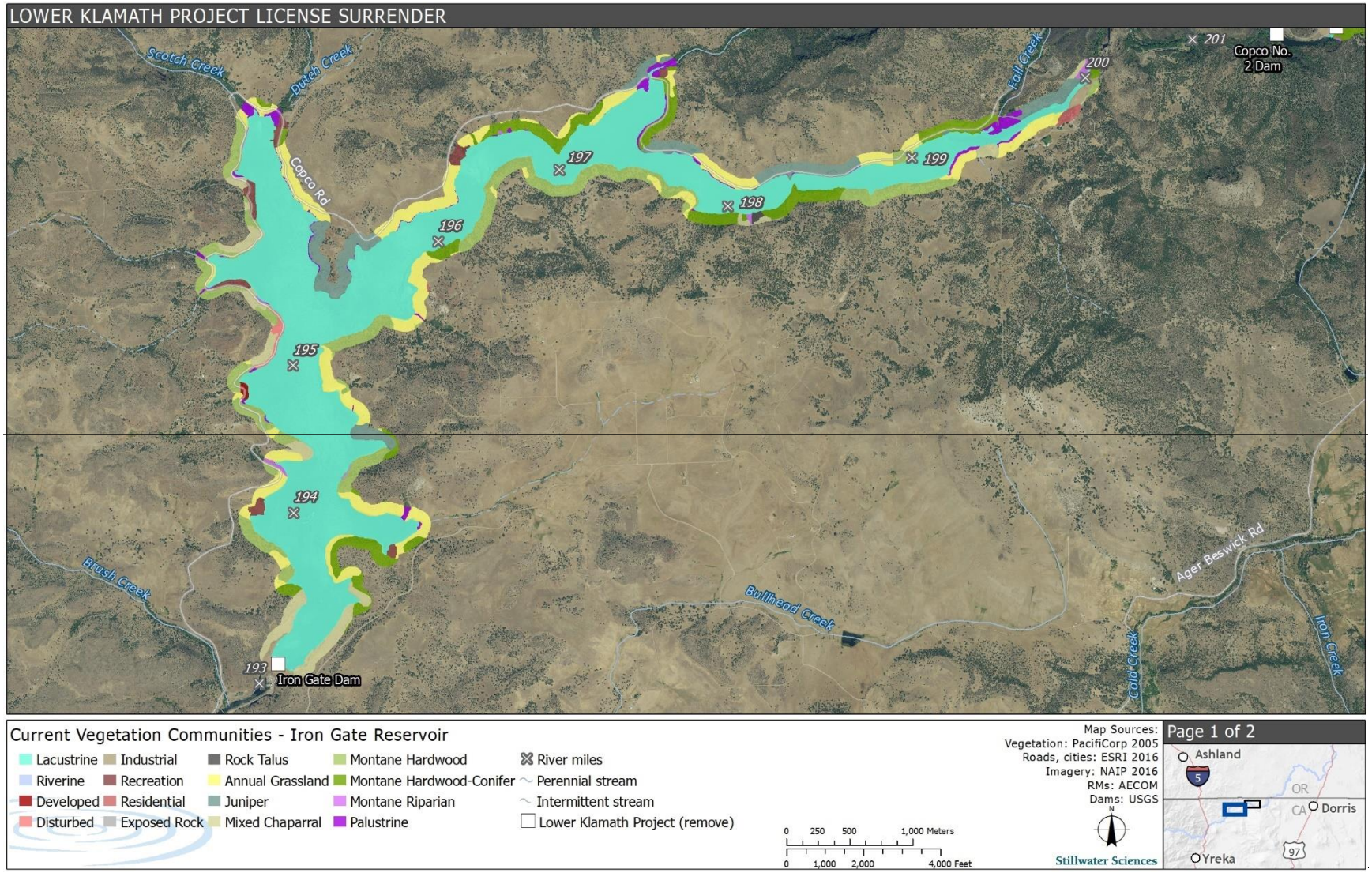


Figure 3.5-4. Current Vegetation Types within a 300-foot Buffer of Copco No. 1 and Copco No.2 Reservoirs.



~~Figure 3.5-5.~~ ~~Current Vegetation Types within a 300-foot Buffer of Iron Gate Reservoir.~~

3.5.2.2 Invasive Plant Species

3.5.2.3 Culturally Significant Plant Species

3.5.2.4 Non-special-status Wildlife

Volume I Section 3.5.2.4 Terrestrial Resources – Environmental Setting – Non-special-status Wildlife, paragraph 1 bullet 3 on page 3-475:

- Non-special-status-birds—mountain quail, double-crested cormorant, herons (great blue, black-crowned night), great egret, bufflehead, osprey, hawks (sharp-shinned, Cooper's), great-horned owl, terns (Forster's, Caspian), woodpeckers (acorn, pileated, Lewis'), black phoebe, black-capped chickadee, pygmy nuthatch, blue-gray gnatcatcher, western bluebird, and Swainson's thrush, (species documented only in J.C. Boyle Peaking Reach include, prairie falcon, flammulated owl, and merlin). Surveys conducted by KRRC in ~~May~~ 2018 also documented several osprey nests on platforms located on top of electrical poles in the Iron Gate Reservoir area ~~(CDM Smith 2018c)~~, Cooper's hawk and great blue heron observed throughout the Iron Gate Reservoir, Copco No. 1, and J.C. Boyle Reservoir areas, with an active great blue heron nesting colony observed near Copco No. 2 penstock, and cliff swallow nests were documented in the Copco Diversion Tunnel (CDM Smith 2018c, KRRC 2019b); and

Volume I Section 3.5.2.4 Terrestrial Resources – Environmental Setting – Non-special-status Wildlife, new paragraph 2 on page 3-475:

The reservoirs and riparian areas provide foraging habitat for many of these species, such as the non-native bullfrog, egrets, buffleheads, and river otters, by providing habitats that support fish, invertebrates, and reptiles for these species to eat. Migratory birds use these reservoirs seasonally during their migrations and/or for overwintering, by supporting nesting, foraging, and/or loafing (resting on the water) habitat. Surveys conducted by KRRC in 2017 and 2018 documented several osprey nests on platforms located on top of electrical poles in areas surrounding Iron Gate Reservoir, Copco No. 1 Reservoir, Copco No. 2 Reservoir, and along the Klamath River (CDM Smith 2018c, KRRC 2019b), and it is likely that osprey use the reservoirs for foraging on fish. The reservoirs also provide foraging habitat for bat species that primarily prey on aquatic emergent insects, and Project structures have been documented to support habitat for bat species (Yuma myotis) (KRRC 2019b). Project structures may also support roosting for non-special-status bat species that may forage on aquatic emerging insects or terrestrial insects in more upland habitats.

3.5.2.5 Special-status Species

Special-status Wildlife

Volume I Section 3.5.2.5 Terrestrial Resources – Environmental Setting – Special-status Species – Special-status Wildlife new paragraphs 3 and 4 on page 3-500:

Reservoir and surrounding habitats support special-status species (Table 3.5-5). Western pond turtles have been documented at Iron Gate Reservoir and Copco No. 1 Reservoir. The reservoirs and adjacent habitats also support migratory bird species (e.g., American white pelican, Barrow's goldeneye, common loon, black tern, black swift, Vaux's swift, olive-sided flycatcher, willow flycatcher, yellow warbler, and yellow-breasted chat) and year-round species (bald eagle, greater sandhill crane). The reservoirs and riparian areas provide foraging habitat for these species, by providing habitats that support fish, invertebrates, and reptiles for these birds to eat. Migratory birds use these reservoirs seasonally during their migrations and/or for overwintering, by supporting nesting, foraging, and/or loafing (resting on the water) habitat. The reservoirs provide foraging habitat for bat species (e.g., Yuma myotis) that primarily prey on aquatic emergent insects. Project structures have been documented to support habitat for Yuma myotis (KRRC 2019b), and surrounding habitats, including project structures, may also support roosting for other special-status bat species (Western mastiff bat, Townsends's western big-eared bat, spotted bat, pallid bat, fringed myotis, and long-eared myotis) that may forage on terrestrial insects in more upland habitats.

The special-status species discussed above and listed in Table 3.5-5 are not exclusive to the Lower Klamath Project reservoirs, as they have also been documented in adjacent areas. For example, all of the special-status bird species listed above have been either documented in habitats along the Klamath River upstream of Copco No. 1 Reservoir and downstream of Iron Gate Dam, at Lower Klamath National Wildlife and Tule Lake National wildlife refuges, or at other nearby creeks, lakes, and reservoirs including Emigrant Creek, Emigrant Lake, Howard Prairie Lake City Park, and Hyatt Reservoir north of Iron Gate Reservoir (ebird 2019).

Volume I Section 3.5.2.5 Terrestrial Resources – Environmental Setting – Special-status Species – Special-status Wildlife, Table 3.5-5 Suitable Habitat and Occurrence Information for Special-status Wildlife Species, row 2 (Western pond turtle) column 4 (Available Habitat and Occurrence Information within the Primary Area of Analysis) bullet 3 on page 3-504:

2018 surveys documented 42 at Copco No. 1 Reservoir and 8 at Iron Gate Reservoir (KRRC 2019b). ~~Documented basking during May 2018 wildlife surveys in the reservoirs 9 in Iron Gate Reservoir and between 31-36 in Copco No. 1 Reservoir (K. Stenberg, Principal, CDM Smith, pers. comm., July 2018).~~

Volume I Section 3.5.2.5 Terrestrial Resources – Environmental Setting – Special-status Species – Special-status Wildlife, Table 3.5-5 Suitable Habitat and Occurrence Information for Special-status Wildlife Species, row 5 (Common loon) column 4 (Available Habitat and Occurrence Information within the Primary Area of Analysis) new bullet 2 on page 3-505:

Documented during 2018 surveys throughout Copco No. 1 Reservoir and in Keaton Cove (KRRC 2019b).

Volume I Section 3.5.2.5 Terrestrial Resources – Environmental Setting – Special-status Species – Special-status Wildlife, Table 3.5-5 Suitable Habitat and Occurrence Information for Special-status Wildlife Species, row 4 (Golden eagle) column 4 (Available Habitat and Occurrence Information within the Primary Area of Analysis) new bullet 4 on page 3-506:

Documented along the northern Iron Gate Reservoir shoreline and just downstream of the dam (KRRC 2019b).

Volume I Section 3.5.2.5 Terrestrial Resources – Environmental Setting – Special-status Species – Special-status Wildlife, Table 3.5-5 Suitable Habitat and Occurrence Information for Special-status Wildlife Species, row 5 (American peregrine falcon) column 4 (Available Habitat and Occurrence Information within the Primary Area of Analysis) new bullet 3 on page 3-506:

An active nest was observed on the northeastern side of Iron Gate Reservoir in a rocky outcrop above Copco Road (KRRC 2019b).

Volume I Section 3.5.2.5 Terrestrial Resources – Environmental Setting – Special-status Species – Special-status Wildlife, Table 3.5-5 Suitable Habitat and Occurrence Information for Special-status Wildlife Species, row 4 (Yellow warbler) column 4 (Available Habitat and Occurrence Information within the Primary Area of Analysis) bullet 3 on page 3-509:

~~Observed around Copco No. 1. Reservoir and most frequent in riparian woodlands and hillside seep areas and also at Iron Gate Reservoir, including Bogus Creek fish hatchery, Brush Creek, Camp Creek, and Jenny Creek (CDM Smith 2018c).~~ Observed a single willow flycatcher at two locations–(1) along the northern shoreline of Copco No. 1 Reservoir, just south of the confluence with Beaver Creek and (2) at the confluence of Jenny Creek and Iron Gate Reservoir (KRRC 2019b).

Volume I Section 3.5.2.5 Terrestrial Resources – Environmental Setting – Special-status Species – Special-status Wildlife, Table 3.5-5 Suitable Habitat and Occurrence Information for Special-status Wildlife Species, row 4 (Townsend's western big-eared bat) column 4 (Available Habitat and Occurrence Information within the Primary Area of Analysis) new bullet 4 on page 3-510:

Acoustic surveys in the summer of 2018 documented Townsend's western big-eared bat outside the diversion tunnel outlets of Copco No. 1 and Copco No. 2 powerhouses; however, it was noted that it was not confirmed that the bats came from the diversion tunnel outlets (KRRC 2019b).

Volume I Section 3.5.2.5 Terrestrial Resources – Environmental Setting – Special-status Species – Special-status Wildlife, Table 3.5-5 Suitable Habitat and Occurrence Information for Special-status Wildlife Species, row 4 (Yuma myotis) column 4 (Available Habitat and Occurrence Information within the Primary Area of Analysis) new bullet 3 on page 3-512:

Documented during 2017 and 2018 surveys at 5 vacant houses at Copco No. 1 and Copco No. 2, with 200–300 individuals roosting at 'Vacant House #21601' (KRRC 2019b). Also documented at Copco No. 1 Powerhouse, the Diversion Tunnel Outlet, Copco No. 2 Powerhouse, and the Cookhouse (KRRC 2019b). At Iron Gate, species documented at a 'Barn/Garage at Iron Gate Village' and at Residence 2, with several hundred bats observed at the Diversion Tunnel Outlet, Penstock Intake Structure, and Communication Building/Powerhouse (KRRC 2019b).

Volume I Section 3.5.2.5 Terrestrial Resources – Environmental Setting – Special-status Species – Special-status Wildlife, Table 3.5-5 Suitable Habitat and Occurrence Information for Special-status Wildlife Species, row 2 (Western yellow-billed cuckoo) column 4 (Available Habitat and Occurrence Information within the Primary Area of Analysis) bullet 2 on page 3-514:

In coordination with state agencies, it has been noted that breeding habitat is unlikely in the area, and as a result Project impacts are not anticipated.

3.5.3 Significance Criteria

Volume I Section 3.5.3 Terrestrial Resources – Significance Criteria, paragraph 4 on page 3-514:

Criteria for determining significant impacts on terrestrial resources are based upon Appendix G of the CEQA Guidelines (California Code of Regulations title 14, section 15000 et seq.) and professional judgment informed by best available data. Effects on terrestrial resources are considered significant if the Proposed Project would:

- Result in population-level impacts on state species of special concern, USDA Forest Service sensitive wildlife species on USDA Forest Service lands, or BLM sensitive species on BLM lands.
- Result in any of the following to the other types of special-status species112: not listed above: direct mortality or physical harm to individuals; degradation of habitat or a change in habitat conditions that

would result in physiological impairment or that may affect the ability to perform essential behaviors such as migration, feeding, or reproducing; or abandonment of active bird nests or hibernacula or maternity bat roosts due to noise or structure removal (i.e., buildings, vegetation).

- Result in substantial removal or degradation of any riparian habitat ~~or rare natural community~~.
- Result in ~~substantial~~ modifications of federally protected wetlands as defined by Section 404 of the Clean Water Act through direct removal, filling, hydrological interruption, or other means.

3.5.4 Impact Analysis Approach

Volume I Section 3.5.4 Terrestrial Resources – Impact Analysis Approach, paragraph 1 on page 3-516:

Evaluation of the Proposed Project considered both short- and long-term effects on terrestrial resources. Short-term effects were defined as impacts that have the potential to occur within two years of ~~the action~~dam removal and long-term effects were defined as impacts that have the potential to occur two years or more after ~~the activity~~dam removal is completed. The analysis considered the timing of ~~the action~~the proposed activities as identified in Appendix H of the Definite Plan (e.g., pre-dam removal period [one to two years prior to drawdown], reservoir drawdown period [January to March, year of drawdown], dam removal period [spring, summer, and fall immediately after drawdown], post-dam removal period [after dam removal is complete], plant establishment period [Year 1; post-dam removal year 1], and maintenance and monitoring period [Years 2 to 5; post-dam removal years 2-5]). Short-term impacts on nesting birds were evaluated as a result of construction-related noise greater than ambient conditions, and species-specific noise impacts on northern spotted owl were assessed for a 1-mile buffer around all dams to account for the loudest noise disturbance distance associated with blasting, 0.5-mile buffer around all reservoirs to account for the loudest noise disturbance distance associated with helicopter use, and 0.25-mile buffer around all other areas within the Limits of Work to account for noise disturbance associated with heavy equipment. These northern spotted owl noise disturbance distances were developed in coordination with the Arcata USFWS office based on an estimation of auditory and visual disturbance effects (USFWS 2006).

3.5.5 Potential Impacts and Mitigation

3.5.5.1 Vegetation Communities

Volume I Section 3.5.5.1 Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities – Potential Impact 3.5-1 Construction-related impacts on wetland and riparian vegetation communities, paragraph 1 on page 3-518 through paragraph 4 on page 3-519:

Potential Impact 3.5-1 Construction-related impacts on wetland and riparian vegetation communities.

Disturbances associated with construction areas, disposal sites, and haul roads where clearing, grading, and staging of equipment would occur could have short-term impacts on sensitive habitats, including wetlands and riparian habitats along reservoirs and river reaches. Additionally, removal of the dams and powerhouses could have short-term impacts on wetlands and riparian habitats. Heavy machinery traversing wetland and riparian areas could change local topography and impact wetland and riparian vegetation and could introduce increased levels of dust and runoff pollution to wetland and riparian areas that could degrade plant community conditions. Several of the bridges required for access to and from the dam sites would be replaced or upgraded prior to reservoir drawdown (see Potential Impact 3.22-2). Adjacent riparian vegetation under or adjacent to the existing or new bridges could be impacted during these activities. Additionally, removal of recreation sites could result in impacts on wetland and riparian vegetation (e.g., the Palustrine Forested Wetland at Iron Gate Reservoir). Wetland and riparian vegetation are likely to be present in the areas where construction activities are planned to occur; without surveys to document these habitats and measures to adequately protect them, these habitats would be likely to be degraded or removed and thus construction-related activities would result in a significant short-term impact.

~~Based on existing data for the Primary Area of Analysis for terrestrial resources (Section 3.5.2.1 *Vegetation Communities*), wetland and riparian habitats (Estuarine, Montane Riparian, Palustrine, and Wet Meadow) account for approximately five percent of the total acreage.~~ The Proposed Project identifies a number of pre-construction measures to reduce impacts on wetland and riparian habitats (Estuarine, Montane Riparian, Palustrine, and Wet Meadow) ~~these habitats. First,~~ including a wetland delineation that ~~would be~~has been conducted within the limits of construction around the dams and facilities, access and haul roads, and disposal sites in accordance with the 1987 USACE Wetland Delineation Manual (USACE 1987) and applicable Regional Supplements (i.e., Western Mountains, Valleys, and Coast Region [USACE 2010] and Arid West [USACE 2008]). The wetland delineation was conducted in 2019. Results indicate that there are approximately 34 acres of wetlands and approximately 73 acres of riparian vegetation within the Primary Area of Analysis for terrestrial resources (KRRC 2019a). Further, the delineation indicates that the following construction areas would be adjacent to wetland and/or riparian vegetation that could be fenced and avoided:

- All staging areas
- Copco No. 2 Powerhouse
- Some portions of the Fall Creek Hatchery retrofit (i.e., riparian vegetation at the upper settling pond location; Figure 2.7-15)
- Iron Gate Hatchery retrofit footprint (Figure 2.7-13)
- Daggett Road Bridge replacement footprint

- Overlook Point Recreation Site
- Mirror Cove Recreation Site
- Juniper Point Recreation Site
- Camp Creek Recreation Site
- Wanaka Springs Recreation Site

For these areas ~~The~~ results of the wetland delineation would be incorporated into the Proposed Project design to avoid and minimize direct impacts on wetlands to the maximum extent feasible, and wetland areas adjacent to the construction Limits of Work would be fenced to prevent inadvertent entry. There could be impacts on wetlands and riparian vegetation at the locations listed above if the fencing does not include an appropriate buffer (i.e., a prescribed distance from the edge of the wetland in which construction activities are prohibited); however, with implementation of Mitigation Measure TER-1, short ~~and long-term~~ impacts on wetlands and riparian vegetation ~~communities~~ would be reduced to less than significant at the locations listed above.

Additionally, the Proposed Project includes construction best management practices (Appendix B: *Definite Plan – Appendix J*) to reduce potential impacts on water quality in wetlands and riparian vegetation at the locations listed above ~~and other survey waters~~ during construction. The combination of these measures and implementation of Mitigation Measure WQ-1, as described in Potential Impact 3.2-4, and HZ-1 as described in Potential Impact 3.21-1, would reduce potential impacts on wetlands and riparian vegetation to less than significant at the locations listed above.

The results of the 2019 wetland delineation indicate that the following construction areas overlap wetland and riparian vegetation and suggest that some fraction (i.e., less than 0.5 acre per site) of the existing wetland and/or riparian vegetation cannot be fenced and avoided:

- Some portions of the Fall Creek Hatchery retrofit (i.e., riparian at the primary location of Fall Creek Hatchery and wetlands at the lower settling pond location)
- City of Yreka water supply line replacement footprint
- Camp Creek, Scotch Creek culvert replacement footprints
- Dry Creek Bridge replacement/strengthening/temporary crossing footprint
- Fall Creek Bridge replacement/strengthening/temporary crossing footprint
- Lakeview Road Bridge replacement/strengthening/temporary crossing footprint
- Culvert replacement at unknown creek northwest of Raymond Gulch footprint
- Culvert replacement at Raymond Gulch footprint
- Jenny Creek Bridge replacement footprint

- Culvert replacement at unknown creek on the north west end of Copco Village footprint
- Flood improvements downstream of Iron Gate Dam

Additionally, the Proposed Project contemplates flood improvements for multiple parcels downstream of Iron Gate Dam (Section 2.7.8.4 *Downstream Flood Control*); the 2019 wetland delineation did not extend to these parcels so the analysis conservatively assumes there may be short-term impacts to wetlands and/or riparian vegetation in these parcels.

The Reservoir Area Management Plan (Appendix B: *Definite Plan – Appendix H*) includes details for the installation of native plants and aerial, barge, or hand seeding in appropriate areas to re-vegetate all areas disturbed during construction, including reservoir areas~~, demolition and disposal sites, staging, access and haul roads, and turn-arounds,~~ Revegetation efforts for the reservoir footprints would begin during the reservoir drawdown period [January to March, year of drawdown; dam removal year 2] and would continue through the post-dam removal period [after dam removal is complete], such that by the end of the plant establishment period [post-dam removal year 1] (i.e., within two years of dam removal) approximately 38 acres of wetlands and 144 acres of riparian vegetation would be created within the reservoir footprints and would achieve at least 70 percent cover by post-dam removal year 1. Demolition and disposal sites, staging, access and haul roads, and turn-arounds would be re-vegetated following construction activities. Under the State Water Board's wetland policy, higher compensation ratios than 1:1 replacement may be required by the permitting agency to compensate for temporal loss (i.e., when there is a time lag between the loss and replacement of aquatic resource functions). The amount of wetland and riparian habitat created through dam removal and revegetation efforts would far exceed the acreage of any existing, fully established wetlands and/or riparian vegetation for which a small portion of wetlands and/or riparian vegetation would not be avoided during construction activities. Thus, under the Proposed Project there would be no substantial removal or degradation of riparian vegetation or substantial modifications of federally protected wetlands, and there would be no significant short-term impact. ~~With a goal of no net loss of wetland or riparian habitat acreage and functions. Wetlands established in restored areas would be monitored for five years or until the performance criteria (as defined in Appendix B: *Definite Plan – Appendix H*, Section 6.1.4) have been met. To minimize the introduction of invasive plant species into construction areas, construction vehicles and equipment would be cleaned with compressed water or air within a designated containment area to remove pathogens, invasive plant seeds, or plant parts, and disposed of in appropriate disposal facilities. The Reservoir Area Management Plan (Appendix B: *Definite Plan – Appendix H*) also includes a five-year monitoring plan with metrics to evaluate success of minimizing invasive exotic vegetation (i.e., percent relative cover by medium and low priority invasive plants [as defined in the Reservoir Area Management Plan] shall be less than the average at designated reference locations as follows: 25~~

~~percent in Year 1; 40 percent in Year 2; 55 percent in Year 3; 70 percent in Year 4; 90 percent in Year 5; and no high-priority invasive plants [as defined in the Reservoir Area Management Plan] shall be present in the Limits of Work at any time during the five-year monitoring).~~

Mitigation Measure TER-1 Establish a 20-foot buffer around delineated wetlands.
The KRRC shall establish a minimum of a 20-foot buffer around all delineated wetlands potentially affected by construction impacts to ensure there will not be any significant environmental impacts to wetlands by deterring heavy machinery from traversing the wetland and preventing runoff pollution from directly entering the wetland where doing so would not result in a significant environmental impact. The buffer may be adjusted (e.g., made larger or smaller) based on site-specific conditions, as determined by a qualified biologist acceptable to USACE, as necessary to ensure adequate protection of the delineated wetlands. The State Water Board has the authority to include this mitigation measure in its water quality certification for the project, and the measure is therefore feasible and used in this analysis to make a significance determination.

With the implementation of these measures, potential short-term impacts on wetlands and riparian areas from construction would be less than significant.

Significance
No significant impact in the short term with mitigation

Volume I Section 3.5.5.1 Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities – Potential Impact 3.5-2 Short-term and long-term impacts on wetland and riparian vegetation communities along existing reservoir shorelines due to reservoir drawdown, paragraph 5 on page 3-519 through paragraph 2 on page 3-520:

Potential Impact 3.5-2 Short-term and long-term impacts on wetland and riparian vegetation communities along existing reservoir shorelines due to reservoir drawdown.
Under the Proposed Project, there would be reduction of existing wet habitat at Copco No. 1, Copco No. 2, and Iron Gate reservoirs (currently ~~15.8~~ 15.0 acres of Montane Riparian and ~~52.3~~ 19.0 acres of Palustrine habitat, Table 3.5-2) due to reservoir drawdown~~, as detailed below:~~.

- ~~Copco No. 1 Reservoir: The shoreline of Copco No. 1 Reservoir currently supports Palustrine Scrub-shrub Wetland where tributary channels enter the reservoir, and Palustrine Forested Wetland occurs along the northwest shore. Small patches of Palustrine Emergent Wetland also currently exist along the shoreline. These communities would be lost due to reservoir drawdown.~~

- ~~Copco No. 2 Reservoir: The southern slope of Copco No. 2 Dam currently supports a Palustrine Scrub-shrub Wetland and Palustrine Forested Wetland. Reservoir drawdown would reduce the extent of these wet habitats. These features are not anticipated to be entirely lost because Copco No. 2 Reservoir is relatively small and, therefore, the features will be in close in proximity to the newly exposed river channel.~~
- ~~Copco No. 2 penstock: Currently, Copco No. 2 penstock leaks water that supports small, local patches of Palustrine Emergent Wetland. Dam and penstock removal would result in the loss of this vegetation.~~
- ~~Iron Gate Reservoir: Vegetation along the shores of Iron Gate Reservoir includes some Montane Riparian and Palustrine habitat including Palustrine Forested Wetland in the day use and campground areas, and Palustrine Emergent Wetland and Palustrine Scrub-shrub Wetland along Jenny, Scotch, and Camp creeks where tributaries join the reservoir. Reservoir drawdown would reduce the extent of these wet habitats.~~

Degradation or removal of wetland and riparian habitat in these areas ~~listed above~~ would be a significant short-term and long-term impact.

The Proposed Project includes several actions to encourage rapid revegetation with native riparian species in the reservoir footprints as defined in the Reservoir Area Management Plan (Appendix B: *Definite Plan – Appendix H*) that would ensure no net loss of wetland or riparian habitat acreage and functions. Six locations in Copco No. 1 Reservoir and three locations in Iron Gate Reservoir would be targeted for restoration (Figures 2.7-11 and 2.7-12); these areas would undergo barge-mounted pressure washing/sediment jetting during reservoir drawdown and subsequently would be excavated to the historical floodplain elevation to help create wetlands, floodplain areas, and off-channel habitat features. A~~s depicted in Figures 2.7-11 and 2.7-12, a~~pproximately ~~50~~ 144 acres of riparian ~~bank would be targeted for revegetation~~vegetation and approximately ~~100~~38 acres of wetlands~~, floodplain, and off-channel habitat features~~ would be targeted for restoration (KRRC 2019a). The resulting acreage of restored riparian and wetland vegetation will vary depending on field conditions including the presence of cultural resources and human remains, changes in the topography following drawdown that affect the extent of restorable areas, and changes in topography that affect access; however, given that the proposed acreage to be restored (~~150~~ 182 acres) is well above the total acreage that would be potentially impacted (~~68 acres~~approximately 15 acres of riparian vegetation and 19 acres of wetlands), there would be ~~the policy of~~ no net loss of wetlands under the Proposed Project~~is anticipated to be achieved~~.

Volume I Section 3.5.5.1 Terrestrial Resources – Potential Impacts and Mitigation – Vegetation Communities, paragraph 5 on page 3-521 through paragraph 3 on page 3-523:

Potential Impact 3.5-3 Short-term and long-term impacts on wetland habitat downstream of the Lower Klamath Project dams due to erosion or sediment deposition.

In the reach from Iron Gate Dam to Cottonwood Creek, modeling results indicate that dam-released sediment would deposit during and following drawdown (USBR 2010)~~may temporarily deposit in pools and other slack water areas (e.g., eddies), at tributary confluences, and potentially along channel margins~~, where it could have a short-term negative impact on wetland habitat ~~due to temporary burial . However, the wetland habitat impacts would be localized, and~~ Research suggests that post dam removal the median estimate for the initiation of bed mobilization in this reach would be a flow with a return period of approximately two years, and full bed mobilization is predicted to occur approximately every 10 years (USBR 2012; also see Volume I Section 3.11.2.4 *Geology, Soils, and Mineral Resources – Environmental Setting – Sediment Load* and modifications in Volume III Attachment 1, and Potential Impact 3.11-5 in Volume I Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* and modifications in Volume III Attachment 1). Farther downstream, from Cottonwood Creek to Indian Creek, no significant sediment deposition is predicted, but transient fine sediment deposition may occur in slack water areas. ~~Because~~ In all of the Klamath River reaches, the post-dam removal ~~transient~~ sediment deposits would be ~~highly~~ erodible during subsequent flow events, thus ~~the impacts~~ would ~~also~~ be ~~short-term~~ transitory.~~(i.e., likely one year or less except during dry years).~~

Wetland habitat impacts would be localized. Between Iron Gate Dam and Bogus Creek, only one small wetland (0.04 ac) was delineated during 2019 surveys (KRRC 2019a). This wetland is positioned upslope of the channel and significant sediment deposition is not expected at this location.

Based on existing data for the Primary Area of Analysis for terrestrial resources (Section 3.5.2.1 *Terrestrial Resources – Existing Conditions – Vegetation Communities*), no wetland habitat (Palustrine or Wet Meadow) is documented adjacent to the riparian corridor between Bogus Creek and Cottonwood Creek, where most of the sedimentation is expected to occur. Therefore, there will be no net loss of wetlands due to sedimentation and~~ Given that the impacts related to dam-released sediment are likely to be temporary (less than a year) and given that there would not be a substantial modification of federally protected wetlands,~~ there would be a less than significant impact on wetland habitat downstream of the Lower Klamath Project dams.

Significance

No significant impact in the short term and long term

Potential Impact 3.5-4 Effects on riparian habitat downstream of the Lower Klamath Project dams due to short-term and long-term erosion or sediment deposition.

Commenters in the Proposed Project public scoping process expressed concerns regarding erosion and sediment deposition immediately downstream of Iron Gate Dam. Downstream of the Lower Klamath Project dams, river flow rates would not increase substantially above median historical rates. Therefore, rates of bank erosion are not expected to increase significantly (see Section 3.11.5 *Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation* Potential Impact 3.11-6).

With respect to ~~short-term~~ sediment deposition downstream of the Lower Klamath Project dams, dam-released sediment deposition and subsequent sediment remobilization~~supply~~ would likely extend from Iron Gate Dam to approximately Cottonwood Creek (RM 185.1) (USBR 2012), where reach-averaged deposition of gravel and sediment is projected to be up to 1.7 feet ~~one foot~~ between ~~Iron Gate Dam and~~ Bogus Creek (RM 192.68) and Willow Creek (RM 187.8) and up to ~~0.8~~ 0.9 feet between ~~Bogus Creek and~~ Willow Creek and Cottonwood Creek (RM 185.1)~~7.8~~, although short-term (< 2-year) deposition may be less (see Potential Impact 3.11-5). ~~If rain and snowmelt levels are high during drawdown, relatively less sedimentation would occur in downstream reaches, as there would be higher flows in the system to flush out sediments (Stillwater Sciences 2008).~~ In the short term, ~~reach-averaged~~ sedimentation, which is significant in the reach from Iron Gate Dam to Cottonwood Creek (see Potential Impact 3.11-5),~~levels of up to one foot are~~ is not expected to substantially negatively impact riparian vegetation~~ downstream of Iron Gate Dam~~, as vegetation growing within or along the river channel margins is generally adapted to this scale of perturbation due to seasonal and inter-annual sedimentation dynamics typical of river systems. Willow and cottonwood species grow rapidly and can bend, break and re-sprout following sediment deposition (Braatne et al. 1996; Shafroth et al. 2002). Similarly, branches and stems broken off and redeposited with sediment can sprout and grow vigorously on newly deposited alluvium, giving these species a relative advantage over non-sprouting upland or non-native species (Braatne et al. 1996, Rood et al. 2003). Thus, there would be a less than significant effect on riparian vegetation downstream of Iron Gate Dam due to short-term sediment deposition caused by dam removal.

Moreover, sedimentation has the potential to create new surfaces for riparian plants to colonize in the long-term. The degree of sedimentation and ability of plants to colonize would depend~~ing~~ on the sequence of water years following dam removal. U~~; u~~nder certain scenarios (e.g., wet water year followed by dry water years whereby a lot of sediment is moved and vegetation has time to colonize), this may result in beneficial effects on riparian habitat especially in areas where there is currently less extensive sediment deposits due to upstream sediment trapping in reservoirs (i.e., from Iron Gate to Cottonwood Creek) (Shafroth et al. 2002). Under such scenarios the riparian vegetation would be

able to quickly re-establish through colonization. This colonization occurs following disturbance (i.e., deposition-related to removal of the dam) during peak flows that creates substrate for seedlings, followed by declining spring and summer flows that occur during the seed dispersal period. Under this natural process, it is anticipated that new riparian vegetation would become established within three to five years (Riparian Habitat Joint Venture 2009).

In the long term, no permanent loss of riparian habitat due to erosion or sediment deposition is anticipated to occur in any river reach downstream of the Lower Klamath Project dams, and new surfaces for colonization would be created. This would be a beneficial effect.

Significance
No significant impact in the short term

Beneficial in the long term

3.5.5.2 Culturally Significant Species

Volume I Section 3.5.5.2 Terrestrial Resources – Potential Impacts and Mitigation – Culturally Significant Species – Potential Impact 3.5-6 Short- and long-term impacts on culturally significant species in riparian and wetland habitats, paragraph 1 through 4 on page 3-524:

Potential Impact 3.5-6 Short- and long-term impacts on culturally significant species in riparian and wetland habitats.
Many of the species identified by the Native American Tribes in the Klamath River region as culturally significant ~~occur in~~are associated with riparian and wetland habitats. Those species that are documented to occur within the Primary Area of Analysis (KRRC 2019a) include the following:

- alder (*Alnus* spp.);
- cottonwood (*Populus* spp.);
- blackberries (*Rubus* spp.) including salmonberry (*Rubus spectabilis*);
- willows (Salix spp.);
- hardstem bulrush (*Schoenoplectus acutus* var. *occidentalis*);
- bur reed (*Sparganium* spp.);
- cattails (*Typha* spp.) including broad-leaved cattail (*Typha latifolia*);
- wild grape (*Vitis californica*).

Absent restoration and mitigation measures, Project activities including construction as well as reservoir drawdown could~~would~~ result in population-level impacts to culturally significant plant species or substantial degradation or removal of wetland and riparian habitat~~;~~. Existing data do not confirm whether all of the listed culturally significant species are widely available. ~~t~~Therefore, the EIR conservatively finds there c~~w~~ould be a significant short-term and long-term

impact on culturally significant species associated with riparian and wetland habitats.

The Proposed Project includes a number of measures to reduce impacts on ~~several actions to survey for~~ wetland~~s~~ and riparian vegetation, including surveys to document the extent of wetland and riparian vegetation and fencing to avoid impacts where feasible (Appendix B: *Definite Plan – Appendix J*). In addition, Mitigation Measure TER-1 (see Potential Impact 3.5-1) includes wetland buffers to prevent intrusion in wetland habitats, and Mitigation Measure WQ-1 (see Potential Impact 3.2-4), and HZ-1 (see Potential Impact 3.21-1) include measures to prevent runoff pollution from directly entering wetland and riparian areas and avoid substantial degradation~~, deter heavy machinery from traversing the wetland, prevent runoff pollution from directly entering the wetland, and avoid substantial degradation in these areas~~.

The Proposed Project also includes actions to ~~and~~ encourage rapid revegetation with native wetland and riparian species in the reservoir footprints as defined in the Reservoir Area Management Plan (Appendix B: *Definite Plan – Appendix H)* ~~that would ensure no net loss of wetland or riparian habitat acreage and functions~~. The revegetation mixes listed in the Reservoir Area Management Plan (Appendix B: *Definite Plan – Appendix H*) include all of the culturally significant species associated with riparian and wetland habitats that are documented to occur within the Primary Area of Analysis. ~~Will be developed based on updated inventories of existing wetland and riparian vegetation around the reservoir perimeters; therefore, culturally significant species will be documented and incorporated as part of the revegetation effort.~~

~~In addition, Mitigation Measure TER-1 (see Potential Impact 3.5-1) includes wetland buffers to prevent intrusion in wetland habitats, deter heavy machinery from traversing the wetland, prevent runoff pollution from directly entering the wetland, and avoid substantial degradation in these areas.~~ As discussed in Potential Impact 3.5-1, approximately 38 acres of wetlands and 144 acres of riparian vegetation would be created within the reservoir footprints and would achieve at least 70 percent cover by post-dam removal year 1. Therefore, in the long term, there would be no significant impact to culturally significant species.

In combination, avoidance measures, the implementation of Mitigation Measure TER-1, WQ-1 and HAZ-1, and revegetation measures~~.These measures~~ would ensure that impacts on culturally significant species in the short term would be less than significant.

Significance

No significant impact with mitigation in the short term

No significant impact in the long term

3.5.5.3 Special-status Species and Rare Natural Communities

Volume I Section 3.5.5.3 Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities – Potential Impact 3.5-7 Short-term impacts on special-status plants and rare natural communities from construction-related activities, paragraph 5 on page 3-524 through new paragraphs 2 and 3 on page 3-525:

Potential Impact 3.5-7 Short-term impacts on special-status plants and rare natural communities from construction-related activities.
Construction activities including road, bridge, hatchery modifications, ~~and~~ culvert improvements (Section 3.22.2.3 *Road Conditions*), and recreation site modifications, could result in direct mortality or damage to special-status plant species or indirect damage by degrading special-status plant habitat (e.g., introducing invasive plant species) or rare natural communities. Special-status plant species with the potential to occur in the Primary Area of Analysis for terrestrial resources are provided in Table 3.5-4 and rare natural communities with the potential to occur in the Primary Area of Analysis for terrestrial resources are provided in Appendix H. Construction activities would require heavy machinery to move through construction areas, staging areas, and haul roads where these species could occur. Contact with construction vehicles could result in direct mortality or damage to these species or their habitat. Special-status plants and rare natural communities may be present in the areas where construction activities may be performed; without surveys to document these species and habitats and measures to adequately protect them, they would be removed and/or habitat would be degraded; therefore, this would be a significant short-term impact.

As part of the Proposed Project, comprehensive floristic surveys ~~would be~~have been conducted for special status-plants within the construction Limits of Work where ground-disturbing activities would occur plus an established buffer (i.e., a 100-meter buffer around disposal sites and a 10-meter buffer along access and haul roads) following the CDFW guidelines (CDFG 2009; Appendix B: *Definite Plan – Appendix J*). The following species were documented (CDM Smith 2018e, CDM Smith 2018b, KRRC 2019c, and KRRC 2019d):

- Greene's mariposa-lily (*Calochortus greenei*): in the vicinity of the Iron Gate Reservoir; at the Iron Gate disposal site; near both Copco No. 1 and Copco No. 2 Dams; along utility corridors between the Copco No. 1 and Copco No. 2 Dams; along utility corridors in the vicinity of Iron Gate Reservoir; and at the Fall Creek Diversion (near the demolition area).
- bristly sedge (*Carex comosa*): eastern side of the J.C. Boyle Reservoir just south of the Hwy 66 Bridge; and throughout the wetland complex along the eastern shore of the J.C. Boyle Reservoir.
- Egg Lake monkey-flower *(Mimulus pygmaeus):* within the limits of work at the Fall Creek Diversion.

- Bolander's sunflower (*Helianthus bolanderi*): at the Iron Gate disposal site; along utility corridors along the north side of Iron Gate Reservoir; between Iron Gate Reservoir and Copco Lake; and along the east side of the J.C. Boyle Reservoir.
- coast iris (*Iris longipetala*): along the northwestern shoreline of the J.C. Boyle Reservoir.
- purple-flowered Washington lily (*Lilium washingtonianum* ssp. *Purpurascens*): near the Fall Creek diversion; and along Copco Road along the north side of Copco Lake.
- Detling's silverpuffs (*Microseris laciniata* ssp. D*etlingi)*: at Iron Gate disposal site; along utility corridors along the southeast side of the Iron Gate Reservoir; and south of the Copco No. 2 bypass reach.
- Greene's four o'clock (*Mirabilis greenei*): along the northeast side of the Iron Gate Reservoir; along utility corridors along the eastern end of Iron Gate Reservoir; and along the northern side of the Klamath River in several locations downstream of Copco No. 2 Dam including near the intersection of Copco Road and Daggett Road.
- western yampah (*Perideridia erythrorhiza*): north of the J.C. Boyle Dam.
- strapleaf willow (*Salix ligulifolia)*: along the river just below the J.C. Boyle Dam.
- fleshy sage (*Salvia dorrii* var. *incana*): near culvert along southeast side of the Iron Gate Reservoir; along northeast side of Iron Gate Reservoir; and along utility corridor along the north side of Iron Gate Reservoir.

~~And the vegetation maps would be updated to reflect existing conditions including any rare natural communities that may present. The Proposed Project includes avoidance and minimization measures as well as provisions for the establishment of wetland and riparian areas and other sensitive vegetation communities within the project area to result in no net loss of habitat acreage (CDFG 2009; Appendix B: *Definite Plan – Appendix J*); therefore, impacts to rare natural communities would be less than significant.~~

~~If any special-status plants are documented, t~~Where feasible, the Proposed Project ~~design~~ would ~~be modified if possible to avoid~~ preserve any documented special-status plants in place (Appendix B: *Definite Plan – Appendix J*). If ~~Where~~ avoidance is not feasible, a combination of relocation, propagation, and establishment of new populations in designated conservation areas would be implemented, as determined in coordination with the resource agencies and invasive plant species would be controlled by implementing measures such as routine washing of construction vehicles and equipment (Appendix B: *Definite Plan – Appendix J*). There may be significant impacts on special-status plants where avoidance is infeasible and if replanting does not succeed in re-establishment of new populations at a 1:1 ratio such that there is no net loss of individuals. If implemented as part of the Final Restoration Plan, Recommended Terrestrial Measure 1 would reduce impacts to less than significant. KRRC

proposes that KRRC and the appropriate state or local agency would work together to develop recommended terms and conditions that should be adopted by FERC as conditions of approval for the Lower Klamath Project. This is consistent with FERC's preference for licensees to be 'good citizens' of the communities in which projects are located and thus to comply, where possible, with state and local requirements. Overseeing development and implementation of terms and conditions relating to protection of terrestrial special-status plants and/or rare natural communities does not fall within the scope of the State Water Board's water quality certification authority. While the State Water Board anticipates that implementation of the entire Final Restoration Plan, including the aforementioned additional details and any modifications developed through the FERC process that provide the same or better level of protection for special-status plants, would reduce impacts to less than significant. However, because the State Water Board cannot ensure implementation of the terrestrial aspects of the Final Restoration Plan, it is analyzing the impact in this Draft EIR as significant and unavoidable.

Additionally, vegetation maps have been updated to reflect existing conditions including any rare natural communities that are present. The following rare natural communities were documented (KRRC 2019b):

- Oregon ash groves: on the western shore of Iron Gate Reservoir; along Copco No. 2 Penstock; on the north and south shore of Copco Lake.
- Bigleaf maple forest: on the north side of Copco Lake.
- Oregon white oak woodland: north of the disposal site at Iron Gate Dam; on the east and west shores of Iron Gate Reservoir; on the north and south shores of Copco No. 2 Bypass; along the north and south shore of Copco Lake; along the east and west shore of Klamath River between Copco Lake and JC Boyle Reservoir; along the northern shore of JC Boyle Reservoir.
- Bitterbrush scrub: at the southern end of Copco Lake; along the east and west shore of Klamath River between Copco Lake and JC Boyle Reservoir; on the east and west shore of JC Boyle Reservoir.
- Chokecherry thicket: at the upstream end of Iron Gate Reservoir along the northern shore and inland; along the north west shore of Klamath River between Copco Lake and JC Boyle Reservoir.
- Shining willow grove: along the western shore of Iron Gate reservoir; on the north and south shore of Iron Gate Reservoir.
- Geyer willow thicket: on the east and west shores of Iron Gate Reservoir; along the north shore of Copco Lake.

The Proposed Project includes avoidance and minimization measures as well as provisions for the establishment of wetland and riparian areas and other sensitive vegetation communities to result in no net loss of habitat acreage. These restored areas will be monitored for up to five years and assessed based on performance criteria that is approved by the regulatory agencies (CDFG 2009;

Appendix B: *Definite Plan – Appendix J*). Therefore, impacts to rare natural communities would be less than significant.

Recommended Terrestrial Measure 1 – Establish Mitigation Ratios for Special-Status Plants.
The Final Restoration Plan shall include a minimum 1:1 mitigation ratio and a Plant Mitigation and Monitoring Plan shall be developed for any special-status species that would be impacted by the Proposed Project. These features of Recommended Terrestrial Measure 1 would be implemented such that any impact to special-status plants would be less than significant.

Significance
No significant impact on rare natural communities in the short term
Significant and unavoidable impacts on special-status plants in the short term

Volume I Section 3.5.5.3 Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities – Potential Impact 3.5-10 Short-term impacts on special-status amphibian, reptiles, and mammals from construction activities, paragraph 1 on page 3-529:

While the Proposed Project avoidance and minimization measures would reduce the potential for short-term construction-related impacts on wildlife species within the Primary Area of Analysis, several of the aforementioned components need more specificity to ensure that short-term construction activities would not result in significant impacts on special-status species amphibians, ~~and~~ reptiles, and mammals or substantially interfere with movement and/or migration of these species, or that any remaining potentially significant impacts are mitigated to the extent feasible.

Volume I Section 3.5.5.3 Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities – Potential Impact 3.5-10 Short-term impacts on special-status amphibian, reptiles, and mammals from construction activities, paragraph 4 on page 3-529:

Overseeing development and implementation of terms and conditions relating to protection of terrestrial wildlife species does not fall within the scope of the State Water Board's water quality certification authority unless the species has a particular nexus with water – for example, it is a wetland or riparian species or primarily eats fish. In this case, there are mitigation measures pertaining to amphibian, ~~and~~ reptiles, and bald eagle that the State Water Board can ensure through the water quality certification. Mitigation measures are also applied for federally listed and federally protected species (gray wolf, bald eagle, and golden eagle). Therefore, these mitigation measures (TER-2, ~~and~~ TER-3, TER-6, and TER-7) are considered as part of the impact analysis and determination of significance.

Volume I Section 3.5.5.3 Terrestrial Resources – Potential Impacts and Mitigation –Special-status Species and Rare Natural Communities – Mitigation Measure TER-2 – Amphibian and Reptile Management, paragraph 2 on page 3-530:

These features of TER-2 will be implemented to reduce the impacts to less than significant ~~such that there is no significant impact~~ on special-status amphibians and reptiles.

Volume I Section 3.5.5.3 Terrestrial Resources – Potential Impacts and Mitigation –Special-status Species and Rare Natural Communities – Mitigation Measure TER-3 – Western Pond Turtle Pre-construction Surveys, paragraph 5 on page 3-530:

These features of TER-3 will be implemented to reduce the impacts to less than significant ~~such that there is no significant impact~~ on western pond turtles.

Volume I Section 3.5.5.3 Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities – Mitigation Measure TER-3 – Western Pond Turtle Pre-construction Surveys, Table 3.5-6 Summary of Proposed Project Components and Recommended Terrestrial Measures on page 3-531:

Table 3.5-6. Summary of Proposed Project Components and Recommended Terrestrial Measures.

Proposed Project Avoidance and Minimization Measure Component	Recommended Terrestrial Measure
Biological monitoring and the development of a detailed Construction Monitoring Plan[114] in coordination with the resource agencies	**Recommended Terrestrial Measure 3** further requires agency approval of on-site biologists and identifies monitoring and reporting requirements to incorporate in the Construction Monitoring Plan.
Mandatory biological resource awareness training for all construction personnel	**Recommended Terrestrial Measure 4** requires additional items, including consideration of exotic and noxious species and appropriate decontamination measures as part of the training, identifies the reoccurrence interval of the training, and stipulates that the training shall be interpreted for non-English speaking workers.

Proposed Project Avoidance and Minimization Measure Component	Recommended Terrestrial Measure
Requirements for construction personnel including disposing of trash, maintain construction related-traffic in construction boundaries, no feeding of wildlife, no pets, no firearms, maintaining equipment in staging areas, reporting on state-listed or federally-listed species	**Recommended Terrestrial Measure 5** includes the additional requirements that (1) all food-related trash items would be disposed of in closed wildlife-proof containers to reduce the potential for special-status wildlife to enter the Limits of Work, and; (2) equipment would be power washed prior to arriving at the site to reduce potential for non-native species to enter the Limits of Work and compete with special-status species or spread to nearby habitats.
Requirements for wildlife exclusion and entrapment	**Recommended Terrestrial Measure 6** in addition to providing a requirement for wildlife exclusion and entrapment, this provides an additional requirement for fencing to be checked daily during active construction to ensure that it remains intact.
Surveys to identify special-status amphibian and reptile habitat and quantity affected, mammal sign, including den sites or burrows, will be noted.	**Recommended Terrestrial Measure 7** includes special-status species identified in Table 3.5-5 to be included for habitat assessments, and if present, for inclusion in pre-construction surveys. **Recommended Terrestrial Measure 7** also requires that an on-site biologist preform daily pre-construction wildlife surveys prior to initiating construction activities.
~~Identifying wolves during general wildlife surveys~~	~~**Recommended Terrestrial Measure 8** includes further means to monitor the CDFW gray wolf activity map, and if wolf activity identified on the map overlaps with the Lower Klamath Project, or if a wolf is observed during any Proposed Project survey or monitoring effort, CDFW would be consulted to further evaluate site-specific measures depending on the time of year and information about the individuals in the area.~~

Footnote 114: No specific details were provided in the Construction Monitoring Plan other than the plan would be developed in coordination with resource agencies (Appendix B: *Appendix J – Terrestrial Resource Measures*).

Volume I Section 3.5.5.3 Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities – Recommended Terrestrial Measure 7 – General Special-status Wildlife Surveys and Pre-construction Surveys, paragraph 1 on page 3-535:

Recommended Terrestrial Measure 7 – General Special-status Wildlife Surveys and Pre-construction Surveys.
A general special-status wildlife survey shall be conducted within 24 months of initial habitat modification associated with construction activities (e.g., grubbing, structure modification) within the Limits of Work to assess the presence of any special-status species and potential for habitat to be present that could support special-status species identified in Table 3.5-5. Surveys shall be conducted by a qualified biologist; such approval shall occur in a timely fashion. If suitable habitat is present, and there is potential for special-status species to be present, a biologist shall further assess if these special-status species are present in the Limits of Work by conducting general visual observation surveys or protocol-level surveys. Surveys for nesting birds are discussed in Recommended Terrestrial Measure 9, willow flycatcher in Recommended Terrestrial Measure 10, bald and golden eagle in Mitigation Measure TER-7 ~~Recommended Terrestrial Measure 11~~, bats in Recommended Terrestrial Measure 12; surveys to be consistent with the Amphibian and Reptile Management Plan discussed in Mitigation Measure TER-2.

Volume I Section 3.5.5.3 Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities, paragraph 3 on page 3-535:

Mitigation Measure TER-6 ~~Recommended Terrestrial Measure 8~~ – Gray Wolf.
~~Every~~ Consistent with the direction of the USFWS, every six months, the location of gray wolves shall be assessed using the CDFW gray wolf activity map (CDFW 2018a) and direct communication with the CDFW wolf biologist. If the Lower Klamath Project overlaps with known wolf activity as identified in the CDFW wolf activity map or if a wolf is documented during any Proposed Project surveys or monitoring, CDFW shall be contacted to further determine if activities pose any potential impacts on gray wolves, particularly with respect to potential modification or disruption of key pup-rearing areas such as dens and rendezvous sites. Depending on the time of year and information about the pack or individuals in the area, CDFW may identify additional measures including denning surveys, reduced driving speeds, limited operating periods, disturbance buffers, reduced speed and signage on haul roads, modification of haul roads to avoid key areas, and monitoring. Consistent with USFWS guidance, limiting operating periods (for loud, continuous noise, or smoke) will be implemented within one mile of den or rendezvous sites during the critical breeding and pup-rearing period or within a mile of potential areas that could support denning and rendezvous sites, as based on habitat conditions such as perennial water

availability, dry and wet meadows, and distance to roads). Tracking of gray wolf activities shall be reported every six months to applicable agencies.

Volume I Section 3.5.5.3 Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities, paragraphs 4 and 5 on page 3-535:

Significance
No significant impact with mitigation for amphibians and reptiles and gray wolf

Significant and unavoidable for bats and American badger ~~mammals~~

Volume I Section 3.5.5.3 Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities – Recommended Terrestrial Measure 9 – Nesting Birds, bullet 5 on page 3-539:

If an active raptor or special-status bird nest is observed, a restriction buffer shall be established. This shall include consideration of noise effects and line-of-sight considerations. (Bald and golden eagle species-specific recommended measures are discussed below in Potential Impact 3.5-13 and Mitigation Measure TER-7 ~~Recommended Terrestrial Measure 11~~)

Volume I Section 3.5.5.3 Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities, paragraph 1 on page 3-545:

Implementation of the ~~recommended~~ bald and golden eagle mitigation measure below, developed in consultation with CDFW and USFWS, would reduce potential short-term construction-related impacts on bald and golden eagles to less than significant.

Volume I Section 3.5.5.3 Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities – Potential Impact 3.5-13 Short-term impacts on bald and golden eagles from construction-related noise and nesting habitat alterations, paragraphs 2 and 3 on page 3-545:

~~It would be appropriate for the recommended terms and conditions relating to protection of bald and golden eagles to include Recommended Terrestrial Measure 11 below, which has been developed in consultation with CDFW and USFWS. This recommended terrestrial measure~~ Mitigation Measure TER-7 includes the following additional components beyond those listed as part of the Proposed Project:

- During the implementation of the 2018 eagle surveys, a two-mile survey area was established surrounding construction and demolition areas and a 0.5-mile survey area surrounding other areas such as reservoirs. Appendix J of the Definite Plan identifies aerial seeding within the reservoir

footprint, and as a result the survey area shall reflect the modified noise disturbance areas around the reservoirs by expanding the surveys buffer around the reservoirs from 0.5 mile to one mile. (A minimum of a one-mile survey area is based on the one-mile buffer distance that would be applied if an active nest was present.)

- Consultation with resource agencies shall include both USFWS and CDFW, as the eagles are protected by the federal Bald and Golden Eagle Protection Act and the bald eagle is listed as a state endangered species.
- Nests shall be monitored within buffer zones.

~~Overseeing development and implementation of recommended term and conditions relating to bald and golden eagles does not fall within the scope of the State Water Board's water quality certification authority. While the KRRC has initiated a process[82] to reach enforceable good citizen agreements with USFWS and CDFW that will be finalized and implemented, at this time the recommended term and conditions are not finalized, and the State Water Board cannot require their implementation. Accordingly, while the State Water Board anticipates that implementation of the recommended term and conditions, including the Recommended Terrestrial Measures and any modifications developed through the FERC process that provide the same or better level of protection for special-status wildlife, would reduce impacts to less than significant, because the State Water Board cannot ensure implementation of the Recommended Terrestrial Measures, it is analyzing the associated impacts in this Draft EIR as significant and unavoidable.~~

Volume I Section 3.5.5.3 Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities – Recommended Terrestrial Measure 11 – Bald and Golden Eagle, paragraph 1 on pages 3-546 and 3-547:

Mitigation Measure TER-7 ~~Recommended Terrestrial Measure 11~~ – Bald and Golden Eagle.

- KRRC shall develop an Eagle Avoidance and Management Plan in coordination with USFWS and CDFW.
- A two-year survey for eagle use patterns shall be conducted prior to construction activities.
    - The first-year survey shall determine bird use patterns at any facilities to be removed or modified during the time of year most likely to detect bird usage (this was completed by KRRC in 2017).
    - The second-year survey shall include focused surveys (see below).
    - Surveys shall be conducted by a qualified avian biologist, approved by resource agencies (CDFW and USFWS).

[82] KRRC submitted the CEQA support document to agencies in September 2017 and requested feedback by November 10, 2017.

- A focused survey (two site visits) shall be conducted in a single nesting season within two years prior to drawdown to document the presence of nests. These focused surveys shall identify bald and golden eagle nests within two miles [123] of disturbance areas within the Limits of Work, including but not limited to demolition areas where there may be any loud noise disturbance (e.g., helicopter or plane). The early nesting season survey shall occur at a time when eagles are most likely found at the nest sites, and the second survey shall occur later in the season and prior to the fledglings leaving the nest to confirm nesting activity. All observations shall be reported to CDFW using the California Bald Eagle Nesting Territory Survey Form (CDFW 2017d).
- Within two weeks prior to commencing construction or ground-disturbing activities, KRRC shall conduct at least one pre-construction survey within the survey area defined above.
- Wherever possible, clearing, cutting, and grubbing activities shall be conducted outside of the eagle nesting season (January 1 through August 31[124]).
- If active eagle nests are documented during the surveys, a ~~one-mile~~[125] restriction buffer shall be identified in coordination with USFWS and CDFW and established around the nest to ensure that nests are not disturbed. This buffer may be reduced in coordination with USFWS and CDFW, while taking into consideration components such as proposed activity, distance to activity, terrain, and line of site. For example, in coordination with agencies, if a nest is not within line-of-site, meaning that trees or topographic features physically block the eagle's view of construction activities, the buffer could be reduced ~~to 0.25 miles~~. Further reduction of buffers or allowance of limited activity inside of buffers could occur in coordination with on-site biologist, CDFW, and the USFWS, while being consistent with the Eagle Avoidance and Minimization Plan, if it is determined that the activities shall not jeopardize nesting success. To reduce the potential for nesting in a previously identified active nest, measures may be implemented prior to the nesting season such as removing the nest or making nest temporarily unavailable (e.g., placing cone or ball in nest).
- Nests within a one-mile buffer shall be monitored by an USFWS- and CDFW-approved biologist when there is a potential for noise disturbance, in order to assess whether eagle activity patterns are normal, as compared with that observed during baseline surveys described above.
- If activities are anticipated to result in take under the Bald and Golden Eagle Protection Act, it would be considered a significant impact and KRRC will coordinate appropriate measures, including procurement of any necessary take permits, with USFWS ~~and CDFW~~. If a take permit is obtained, the need to implement the measures above shall be reevaluated with USFWS. Report on the status of bald and golden eagle surveys within one month of the survey to applicable agencies.

Footnote 123: ~~Eagle breeding season of January 1 through August 31 identified by A. Henderson, CDFW, Environmental Scientist, pers. comm, November 2017.~~ The bald and golden eagle survey distance of two miles identified by Heather Beeler, USFWS, pers. comm, September 2019.

Footnote 124: Eagle breeding season of January 1 through August 31 identified by A. Henderson, CDFW, Environmental Scientist, pers. comm, November 2017.

Footnote 125: ~~Eagle nest restriction buffer of 1.0 mile identified by A. Henderson, CDFW, Environmental Scientist, pers. comm, November 2017~~

Significance
~~*Significant and unavoidable* in the short term~~
No significant impact with mitigation for bald and golden eagles

Volume I Section 3.5.5.3 Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities – Potential Impact 3.5-14 Short- and long-term impacts on bats from construction noise and loss of roosting habitat, Table 3.5-8 Evidence of Bat Use at Structures Based on June 2017 Reconnaissance and Available Information from 2018 surveys (Appendix B: Definite Plan – Appendix J; KRRC 2018a,b) pages 3-547 through 3-549:

Table 3.5-8. Evidence of Bat Use at Structures Based on June 2017 Reconnaissance and Available Information from 2018 Surveys (Appendix B: *Definite Plan – Appendix J;* KRRC 2018a,b; KRRC 2019b)

Building Name	Evidence of Bat Use
All bridges scheduled for removal or modification	No roosting bats
Copco No. 1 and No. 2 Dams and Facilities	
Schoolhouse	No
House 19038 (next to schoolhouse)	Yes – abundant guano in garage ~~crawl space~~.
Vacant House 1 (tan)	Yes – small numbers of bats present under wood panels outside; absent in fall and winter. Use by Yuma myotis confirmed.
Vacant House 2 (blue)	Yes – small numbers of bats present under wood panels outside; absent in fall and winter. Use by Yuma myotis confirmed.
~~Vacant House 3 (yellow)~~	~~Yes – small numbers of bats present under wood panels outside.~~

Building Name	Evidence of Bat Use
Vacant House 3 (yellow-green)	Yes– large colony in garage behind wood window framing~~, whole structure is being heavily used.~~ And under rotting wood panels. Bats present in the summer and absent in fall and winter. Use by Yuma myotis confirmed.
Vacant House 4 (peach)	Yes – maternity colony between flashing & fascia board all around roof edge; pups present. Bats present in the summer and absent in fall and winter. Use by Yuma myotis confirmed.
Cookhouse	Yes – bats present in awning over side door outside, no sign inside. Use by Yuma myotis confirmed.
Bunkhouse	Appendix B: *Definite Plan – Appendix J* noted yes – guano on bed. Night roosting suspected from staining around outside lighting. KRRC 2019b notes no evidence of bat use.
Maintenance Building (next to switchyard)	Yes – guano and staining in the garage.
Copco No. 1 Dam – C12 Gatehouse	Yes – abundant guano/staining on the inside and outside of the building; dead bat (Myotis spp.) found outside on windowsill. Documented a large maternity roost of >2,000 Myotis spp. Inside structure. Use by Yuma myotis confirmed.
Copco No. 1 – C11 Gatehouse	Yes– about 20 Myotis clustered in exposed roof apex (interior) in fall; not present in summer. Not surveyed in winter. Use by Yuma myotis confirmed.
Copco No. 1 Powerhouse	Yes – several dozen bats clustered on wall above Transformer 3781; abundant staining/guano on basement level. Follow-up surveys documented small numbers of roosting bats. Present in summer, but absent in fall and winter. Use by Yuma myotis confirmed. Townsend's big-eared bat detected acoustically during summer emergence surveys, but species not confirmed to be present in the powerhouse.

Building Name	Evidence of Bat Use
Copco No. 1 Diversion Tunnel (also referenced as Tunnel outside of Copco No. 1 Powerhouse)	Yes – several hundred bats observed during emergence. Present in summer, but absent in fall and winter. Use by Yuma myotis confirmed. Townsend's big-eared bat detected acoustically during summer emergence surveys, but species not confirmed to be present in the tunnel.
Copco No. 2 ~~Diversion~~ Dam (concrete dam and associated structures)	No
Vacant House #21601 (light yellow house)	Yes – ~200 bats roosting in attic. Bats present in the summer and absent in fall and winter. Use by Yuma myotis confirmed.
Shed (next to power station)	None found in main portion of shed. Back area of building was inaccessible.
Vacant House (light blue)	Yes – dead bat found in bathroom sink. No guano/staining inside. Attic vents are closed. No points of entry found.
Vacant House (light blue) on Access Road	No
Tin Pumphouse (across from light blue house on Access Road)	No
Groundwater Well House (~~Tin Pumphouse~~ at entrance to Copco Village)	No ~~Yes~~ – small amount of guano on roof indicates bat use of rock crevices above/behind the structure. ~~Outside. Multiple points of entry. Inside inaccessible.~~
Copco No. 2 Powerhouse	Yes – Not found during interior inspections, but confirmed summer use by evening emergence of ~50 bats. 6 (Myotis spp.) adults and pups ~~many dead bats~~ on ground level (on floor, in storage room, control room) and ~~dead pups~~ at bottom of stairs on lower level. More sign/activity found at ground level. Follow-up surveys documented small numbers of roosting bats. Townsend's big-eared bat detected acoustically during summer emergence surveys, but species not confirmed to be present in the powerhouse.
Control Center ~~Room~~ at Copco No. 2 Powerhouse	~~Not inspected during reconnaissance survey.~~No
Maintenance Building ~~Shop~~ next to ~~power station at~~ Copco No. 2 Powerhouse	~~Not inspected during reconnaissance survey.~~No

Building Name	Evidence of Bat Use
Occupied House next to Vacant House 4	~~Not inspected during reconnaissance survey.~~ July 2017 survey of exterior did not document presence of bats; interior survey was not conducted as residence was occupied.
Equipment shed (in front of bunkhouse/cookhouse)	~~Not inspected during reconnaissance survey.~~ No
Haz Waste storage/wood shop ~~by gas pumps (near houses/bunkhouse/cookhouse)~~	~~Not inspected during reconnaissance survey.~~ No
Iron Gate Dam and Facilities	
Diversion Tunnel Gate Structure	No
Gatehouse for low-level outlet (upstream side of dam)	Yes – night roosting evidence outside. No sign found inside.
Iron Gate Diversion Tunnel Outlet (also referenced as Tunnel near Iron Gate Powerhouse and Iron Gate Diversion Tunnel)	Yes – several hundred bats observed during emergence May and June 2018 surveys. Absent in the winter. Use by Yuma myotis confirmed. Townsend's big-eared bat detected acousticaly during summer emergence surveys, but species not confirmed to be present in the tunnel.
Iron Gate Powerhouse Intake Structure (also referenced as Iron Gate Powerhouse Intake)	Yes – from ground level, bats heard through grating below. Entry via open grate on outside. Two dead bats. Observed abundant guano on plastic sheeting on floor inside. Bats observed in summer, while bats absent in the fall. Use by Yuma myotis confirmed.
Iron Gate Emergency Spill Equipment Shed	No
Communication Building/Powerhouse (also referenced as Iron Gate Hydro Resources Office/Powerhouse)	Yes – several hundred bats emerged from concrete shaft in lower portion of powerhouse in the summer. ~~h~~Heavily used night roost by light fixture under stairwell (abundant staining on concrete wall). ~~Sign of significant roost inside concrete shaft (heavy staining/guano).~~ Confined space entry to bottom level of powerhouse, did not inspect due to confined space entry restriction.
Restrooms (near powerhouse) (also referenced as Bathroom/Storage building near powerhouse)	No

Building Name	Evidence of Bat Use
Spawning building	Yes – small amount of guano. Potential night roosting outside.
Fish Holding Facilities	No
2 storage trailers (parked next to each other)	No
Barn/Garage at Iron Gate Village	Yes – bats present in rafters/ceiling; abundant amount of guano. Absent in the fall. Use by Yuma myotis confirmed.
Residence 1 (occupied) blue/gray	No–inspected outside only; inside/attic not accessed due to occupied residence.
Residence 2 (occupied) tan w/green roof	Yes – 15 bats present behind clock on back porch. Attic access likely through loose screen over vent. Outside inspection only; inside/attic not accessed due to occupied residence.

Volume I Section 3.5.5.3 Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities, paragraph 7 on page 3-559:

Potential Impact 3.5-17 Effects on benthic macroinvertebrates from short-term dewatering and sedimentation and long-term alterations to habitat.

Volume I Section 3.5.5.3 Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities – Potential Impact 3.5-18 Short-term impacts on amphibian and reptile in riverine habitats from sedimentation, paragraph 1 on page 3-561:

If suspended sediment settles further downstream, and/or foothill yellow-legged frogs are present, the presence of settled fine silt in slow moving portions of the river reaches would not likely affect the adhesion of egg masses based on foothill yellow-legged frogs' ability to loosen algae and sediment that could enhance the adherence ~~ability~~ of egg masses ~~to adhere~~ to the substrate (Rombough and Hayes 2005).

Volume I Section 3.5.5.3 Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities – Potential Impact 3.5-21 Short- and long-term impacts on birds and bats from loss of aquatic reservoir and shoreline vegetative habitat, paragraph 4 on page 3-562:

The loss of aquatic reservoir habitat would also reduce foraging opportunities for fish-eating birds including bald eagle, osprey, merganser, cormorant, egret, and heron ~~(including the great blue heron rookery documented at Copco No. 1 Reservoir~~ (PacifiCorp 2004b).

Volume I Section 3.5.5.3 Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities – Potential Impact 3.5-21 Short- and long-term impacts on birds and bats from loss of aquatic reservoir and shoreline vegetative habitat, paragraphs 3 on page 3-562:

Following dam removal, reservoir aquatic habitat would transition to wet or upland habitat depending on future hydrologic and physical (topographic) conditions. Following drawdown of the reservoirs, existing upland vegetation is expected to remain unchanged and contribute to successional processes on newly exposed areas. Surrounding the reservoirs, upland tree-dominant vegetation types include Montane Hardwood, Montane Hardwood-Conifer, and Juniper (Section 3.5.2.1 *Vegetation Communities*; Appendix G). Trees dominant in these vegetation types are native trees and drought tolerant; although some of the trees immediately adjacent to the reservoir may currently be benefiting from an elevated water table, lowering groundwater following reservoir drawdown it is not expected to result in a large die-off. In contrast, tree-dominated wet habitats surrounding the reservoir (i.e., Montane Riparian and Palustrine Forested Wetland [Section 3.5.2.1 *Vegetation Communities*; Appendix G]) may transition to upland and existing trees including Oregon ash and bigleaf maple may be impacted; they may turn to snags for perching, form cavities for nesting birds and bats, or ultimately fall to the ground to provide habitat for small mammals and insects which birds and bats may forage. Within a few years following dam removal on the Elwha River, wildlife colonization of the exposed reservoir beds was rapid and dominated by early successional and mobile species and included wildlife that facilitated native seed dispersal (McLaughlin et al 2018). The Proposed Project includes several actions to encourage rapid revegetation with native riparian species including trees as defined in the Reservoir Area Management Plan (Appendix B: *Definite Plan – Appendix H*) which will ultimately provide for tall structure habitat adjacent to the water course to support nesting birds and bats, and provide cover for other wildlife species. (Additional information available above under Potential Impact 3.5-2).

Volume I Section 3.5.5.3 Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities – Potential Impact 3.5-21 Short- and long-term impacts on birds and bats from loss of aquatic reservoir and shoreline vegetative habitat, paragraphs 1 and 2 on page 3-563:

Changes in food availability for birds such as dabbling ducks that consume aquatic vegetation and invertebrates would occur. For example, these species would use the river or other aquatic habitat outside the Proposed Project for foraging once the reservoirs are gone. Similarly, foraging over aquatic habitat by swifts ~~and bats~~ that feed on flying insects would be reduced. Numerous other water bodies in the area are present to provide sufficient foraging opportunities, however, and as discussed in Potential Impact 3.5-17, once BMI populations

reestablish after drawdown, swifts ~~and bats~~ would be able to feed over new riverine habitat. Although golden eagles will eat fish, they primarily feed on small to medium-sized mammals (e.g., rabbits, squirrels), and therefore, are unlikely to be substantially affected by the change in aquatic habitat.

The special-status bird species listed in Table 3.5-5 are not exclusive to the Lower Klamath Project reservoirs, but rather they have also been documented in adjacent areas. For example, special-status bird species including American white pelican, Barrow's goldeneye, common loon, black tern, black swift, Vaux's swift, olive-sided flycatcher, willow flycatcher, yellow warbler, and yellow-breasted chat and bald eagle, greater sandhill crane have been either documented in habitats along the Klamath River upstream of Copco No. 1 Reservoir and downstream of Iron Gate Dam, at Lower Klamath National Wildlife and Tule Lake National wildlife refuges, or at other nearby creeks, lakes, and reservoirs including Emigrant Creek, Emigrant Lake, Howard Prairie Lake City Park, and Hyatt Reservoir north of Iron Gate Reservoir (ebird 2019), and therefore, are unlikely to be substantially affected by the change in aquatic habitat.

Reservoirs provide foraging habitat for bat species (e.g., Yuma myotis) that primarily prey on aquatic emergent insects. Bats that forage on aquatic emergent insects are most likely to be affected by the reduced aquatic foraging habitat along the reservoirs. Numerous other water bodies in the area are present to provide sufficient foraging opportunities, however, and; as discussed in Potential Impact 3.5-17, once BMI populations reestablish after drawdown, these bats would be able to feed over new riverine habitat. Transitioning aquatic habitat to upland habitat may increase foraging opportunities for special-status bat species that feed mostly on terrestrial invertebrate species (Western mastiff bat, Townsends's western big-eared bat, spotted bat, pallid bat, fringed myotis, and long-eared myotis) (Western Bat Working Group 2017).

It is anticipated that birds (e.g., ducks, eagles, swifts) and bats would continue to use the river for foraging, or would use other aquatic habitat outside of the terrestrial resource Primary Area of Analysis; therefore, impacts in both the short- and long-term would be less than significant.

Volume I Section 3.5.5.3 Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities – Potential Impact 3.5-22 Short-term and long-term impacts on western pond turtle from loss of aquatic habitat, paragraph 3 on page 3-567:

Available information regarding western pond turtle sightings is from 2002 and 2018 (PacifiCorp 2004a; ~~K. Stenberg, Principal, CDM Smith, pers. comm., July 2018~~ KRRC 2019b). Surveys conducted in Copco No. 1 Reservoir in 2002 documented 12 turtles while surveys in 2018 documented 42 ~~31 to 36~~, which ~~are~~ is similar to the anticipated density estimate. Surveys conducted in Iron Gate

Reservoir in 2002 documented 8 turtles, while surveys in 2018 also documented 8 ~~17~~, which is lower than the anticipated density estimates.

Volume I Section 3.5.5.3 Terrestrial Resources – Potential Impacts and Mitigation – Special-status Species and Rare Natural Communities – Potential Impact 3.5-24 Effects on terrestrial species from herbicide use during reservoir activities, new paragraph 7 on page 3-571:

- At typical application rates, none of the acute scenarios studied presented unacceptable risks to wildlife, including predatory birds consuming small mammals (Bautista 2007).

Potential short-term impacts on aquatic biota from herbicide application during restoration of the reservoir areas are discussed in Potential Impact 3.2-16, which requires implementation of Mitigation Measure WQ-4 to reduce potential impacts to a less than significant level.

Volume I Section 3.5.5.4 Terrestrial Resources – Potential Impacts and Mitigation – Wildlife Corridors and Habitat Connectivity – Potential Impact 3.5-29 Long-term effects on wildlife from alteration of wildlife movement corridors, paragraph 4 on page 3-575:

Removal of the Lower Klamath Project reservoirs, penstocks, and restoration of the pre-dam river channel would eliminate areas of wide, deep water crossings that currently represent a hindrance to large and small mammal movements from one side of the river to the other or upland migration for reptiles. Following removal of the reservoirs, relatively narrow and shallow water crossing points would be available for both large and small terrestrial species to move across the river. This would provide long-term benefits to wildlife in the terrestrial resources Primary Area of Analysis by increasing the amount of habitat available to these species, making them less vulnerable to disease, malnutrition, and other environmental stressors as compared with existing conditions. Following dam removal on the Elwha River, wildlife colonization of the exposed reservoir beds was rapid and dominated by early successional and mobile species and included wildlife function that facilitated native seed dispersal to restoration sites, herbivore effects on revegetation, and organic matter dispersal to nutrient nutrient-poor sediments (McLaughlin et al 2018).

3.5.6 References

Volume I Section 3.5.6 Terrestrial Resources – References, pages 3-576 through 3-586, includes the following revisions:

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3.6 Flood Hydrology

3.6.2 Environmental Setting

3.6.2.2 Basin Hydrology

Volume I Section 3.6.2.2 Flood Hydrology – Environmental Setting – Basin Hydrology – Historical Water Management Changes to Klamath River Hydrology, paragraph 1 on page 3-596:

Minimum flow requirements, based on consideration of ESA species, at Iron Gate Dam have gone through multiple iterations (e.g., 2002 Biological Opinion, 2008 Biological Opinion, KBRA/2010 Biological Opinion) ~~and are currently operated under the~~ including the 2013 Joint Biological Opinion (2013 BiOp) that was operational at the time of the Notice of Preparation for the Lower Klamath Project EIR, and the 2017 ~~and~~ court-ordered flushing flows (NMFS and USFWS 2012, U.S. District Court 2017). Minimum flow requirements for the Klamath River are currently ~~operated under~~ set by the NMFS and USFWS 2019 biological opinions for the USBR Klamath Irrigation Project (2019 BiOp Flows) (for more detail see Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project,* and the *Iron Gate Reservoir* subsection below) ~~(NMFS and USFWS 2012, U.S. District Court 2017~~ (NMFS 2019; USFWS 2019).

Volume I Section 3.6.2.2 Flood Hydrology – Environmental Setting – Basin Hydrology – Upper Klamath Basin – Upper Klamath Lake and Link River Dam, Table 3.6-4 Klamath River Reservoir Information on page 3-601:

Table 3.6-4. Klamath River Reservoir Information.

Reservoir	Surface Area (acres)	Average Yearly Inflow [a] (cfs)	Average Depth [a] (feet ~~amsl~~)	Maximum Depth [a] (feet ~~amsl~~)	Active Storage (acre-feet)	Total Storage (acre-feet)	Retention Time (days)
Upper Klamath Lake	67,000[a]	1,450	9	60	486,830[a, b]	629,780[a, b]	219[a]
Keno	2,475[a]	1,575	7.5	20	495[a, b]	18,500[a, b]	5.9[a]
J.C. Boyle	350[c]	1,575	8.3	40	1,724[a, b]	2,267[c]	1.1[a]
Copco No. 1	972[c]	1,585	47	108	6,235[a, d]	33,724 [c]	10.7[a]
Copco No. 2	N/A[c]	1,585	[e]	[e]	0[a, b]	70[c]	0[a]
Iron Gate	942[c]	1,733	62	167	3,790[a, d]	50,941 [c]	14.8[a]

Notes:

[a] Source: FERC (2007).

[b] Storage volumes are from Table A2.1-1 of PacifiCorp's Exhibit A, as cited in FERC (2007).

[c] Source : AECOM et al. (2017). Data have been adjusted from those reported in FERC 2007 and USBR 2012a based on available data (e.g., as-built drawings, aerial photographs, topographic information).

[d] Storage for Copco No. 1 Reservoir between the normal maximum water level and the invert of the penstock intakes is approximately 20,000 acre-feet. Storage for Iron Gate Reservoir between the normal maximum water level and invert of the penstock intake is approximately 24,000 acre-feet, as reported in FERC (2007).

[e] Very small reservoir, no information on depth provided.

Volume I Section 3.6.2.2 Flood Hydrology – Environmental Setting – Basin Hydrology – Upper Klamath Basin – Iron Gate Reservoir, paragraph 1 on page 3-610:

Table 3.6-7 shows the ramping rate criteria for Iron Gate Dam established in the 1961 FERC license amendment, 2013 BiOp, and ~~the~~ 2019~~3~~ BiOp Flows (NMFS and USFWS 2013, NMFS 2019, and USFWS 2019~~3~~).

Volume I Section 3.6.2.2 Flood Hydrology – Environmental Setting – Basin Hydrology – Upper Klamath Basin – Iron Gate Reservoir, Table 3.6-7 on page 3-610:

Table 3.6-7. Ramping Rate ~~Requirements~~ Targets for Iron Gate Dam.

Flow Range	Maximum Decrease	Source
1961 FERC License Amendment		
General	250 cfs per hour or 3 inches per hour whichever is less	FERC 1961 license amendment
2013 Joint Biological Opinion (2013 BiOp)		
Greater than 3,000 cfs	Follows a 3-day moving average of net inflow into UKL and accretions between Link River Dam and Iron Gate Dam	NMFS & USFW 2013
~~Above~~ Greater than 1,750 cfs ~~and~~ but equal to or less than ~~or equal to~~ 3,000 cfs	N~~n~~ot more than 125 cfs per 4-hour period and not exceeding 300 cfs per 24-~~-~~hour~~s~~ period	NMFS & USFW 2013
1,750 cfs or less	N~~n~~ot more than 50 cfs per 2-hour period and not exceeding 150 cfs per 24-hour period	NMFS & USFW 2013
2019 Biological Opinions (2019 BiOp Flows)		
Greater than 4,600 cfs	Not more than 500 cfs per 6-hour period and not exceeding 2,000 cfs per 24-hour period	NMFS 2019 & USFWS 2019
Greater than 3,600 cfs but equal to or less than 4,600 cfs	Not more than 250 cfs per 6-hour period and not exceeding 1,000 cfs per 24-hour period	NMFS 2019 & USFWS 2019
Greater than 3,000 cfs but equal to or less than 3,600 cfs	Not more than 150 cfs per 6-hour period and not exceeding 600 cfs per 24-hour period	NMFS 2019 & USFWS 2019
Greater than 1,750 cfs but equal to or less than 3,000 cfs	Not more than 125 cfs per 4-hour period and not exceeding 300 cfs per 24-hour period	NMFS 2019 & USFWS 2019
1,750 cfs or less	Not more than 50 cfs per 2-hour period and not exceeding 150 cfs per 24-hour period	NMFS 2019 & USFWS 2019

Sources: NMFS and USFWS 2013, NMFS 2019, and USFWS 2019

Volume I Section 3.6.2.2 Flood Hydrology – Environmental Setting – Basin Hydrology – Upper Klamath Basin – Iron Gate Reservoir, paragraph 2 on page 3-610:

Flows downstream from Iron Gate Dam are the result of the Link River Dam releases from Upper Klamath Lake, Link River Dam to Iron Gate Dam flow accretions, and management of the Klamath Hydroelectric Project by PacifiCorp. Since approximately 1997, Iron Gate Dam minimum flow releases have been stipulated by various BiOps, which was discussed in detail in the 2007 FEIS as well as the 2008, ~~and~~ 2010, and 2013 BiOps (FERC 2007).

Volume I Section 3.6.2.2 Flood Hydrology – Environmental Setting – Basin Hydrology – Upper Klamath Basin – Iron Gate Reservoir, paragraph 5 on page 3-610:

~~Currently,~~ At the time of the Notice of Preparation (NOP) for the Lower Klamath Project EIR, flow releases at Iron Gate Dam ~~are~~ were dictated by the 2013 BiOp ~~and court-ordered flushing flows~~, which ~~were~~ was designed to protect federally listed coho salmon, Lost River sucker, and shortnose sucker (NMFS and USFWS 2013). Subsequently, ~~U.S. District Court 2017c). The~~ court-ordered flushing flows became effective in February 2017, after the ~~Notice of Preparation (~~NOP~~)~~ was filed by the State Water Board in December 2016, and ~~are~~ were therefore not part of the Existing Conditions for the Proposed Project (U.S. District Court 2017c). However, ~~This~~ the Flood Hydrology section of the Draft EIR noted~~s~~, and as appropriate discussed~~s~~, the potential differences to the Existing Conditions and the impact analyse~~i~~s based on the newer flow requirements. Minimum flow requirements for the Klamath River are currently operated under the NMFS and USFWS 2019 biological opinions for the USBR Klamath Irrigation Project (2019 BiOp Flows), which the Final EIR evaluates as a second baseline for the Existing Conditions (for more details see Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*) (NMFS 2019; USFWS 2019). Because of the similarity between the 2013 and 2019 BiOp flows and the fact that BiOp flows specify minimum flow targets, and not peak flood flows, ~~The~~ current flow regime does not result in any changes to the findings of significance and does not result in any changes regarding mitigation measures.

Volume I Section 3.6.2.2 Flood Hydrology – Environmental Setting – Basin Hydrology – Upper Klamath Basin – Iron Gate Reservoir, paragraph 6 on page 3-610 through paragraph 1 on page 3-611:

See Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project* for a description of USBR's operational details related to implementing the 2013 BiOp and 2019 BiOp Flows.

~~USBR uses the monthly 50 percent exceedance inflow forecasts from the Natural Resources Conservation Service (NRCS) as the basis for Klamath Irrigation Project operations to manage Upper Klamath Lake and the Klamath River during the spring-summer irrigation season (March 1 through September 30). To estimate the water supply available from Upper Klamath Lake and the Klamath River, USBR relies on actual inflows to Upper Klamath Lake and NRCS inflow~~

~~forecasts for Upper Klamath Lake to determine three key operational values: (1) the volume of water to be reserved in Upper Klamath Lake to maintain lake elevations analyzed in the BiOp; (2) the volume of water designated for the Klamath River, referred to as the environmental water account (EWA); and (3) the volume of water available for delivery for irrigation purposes to the Klamath Irrigation Project (USBR 2016).~~

~~USBR makes a preliminary calculation of these three operational values on March 1; however, those estimates are subject to change, based on actual Upper Klamath Lake inflows after March 1 and subsequent NRCS inflow forecasts. USBR recalculates these values on April 1, based on actual Upper Klamath Lake inflows observed in March and NRCS Upper Klamath Lake inflow forecast for April 1 to September 30. This April 1 calculation establishes the initial volume of water available for irrigation from the Upper Klamath Lake and the Klamath River during the spring-summer irrigation season.~~

Volume I Section 3.6.2.2 Flood Hydrology – Environmental Setting – Basin Hydrology – Upper Klamath Basin – Iron Gate Reservoir, paragraphs 2 on page 3-611:

The 2013 and 2019 BiOp's established average daily minimum target flows below Iron Gate Dam. The~~se~~ 2019 BiOp target flows are summarized in Table 3.6-8 and are the same as those specified under the 2013 BiOp. The 2013 BiOp specified ~~M~~average daily maximum target flows ~~are established~~ for July, August, and September, and ~~are~~ were based on the Environmental Water Account (EWA) (water supply from Upper Klamath Lake designated for the Klamath River) volumes. The 2019 BiOp Flows do not specify average daily maximum target flows, although the EWA does vary depending on UKL Supply. ~~These target flows are summarized in Table 3.6-8.~~

Volume I Section 3.6.2.2 Flood Hydrology – Environmental Setting – Basin Hydrology – Upper Klamath Basin – Iron Gate Reservoir, paragraphs 3 on page 3-611:

In addition, increases to the target flows in Table 3.6-8 can occur in late August or early September to support the Yurok Tribal Boat Dance Ceremony. To ensure adequate flow for the Yurok Tribal Boat Dance Ceremony, which occurs during even calendar years, flow releases at Iron Gate Dam can be increased. The volume of water required for the ceremony is estimated to be between 2,000 and 4,000 acre-feet depending on real-time hydrologic conditions, and the EWA is increased by 7,000 acre-feet during even calendar years (NMFW and USFWS 2013, NMFS 2019, USFWS 2019). Deviations to the flow targets in Table 3.6-8 can also occur based on other circumstances, such as large fish disease events or flood hazard risks.

Volume I Section 3.6.2.2 Flood Hydrology – Environmental Setting – Basin Hydrology – Upper Klamath Basin – Iron Gate Reservoir, Table 3.6-8 on page 3-612:

Table 3.6-8. Iron Gate Dam Target Flow Release Criteria According to the 2013 BiOp ~~Biological Opinion~~ and 2019 BiOp Flows.

Month	**~~NMFS & USFWS~~ 2013 BiOp~~Biological Opinions~~ Iron Gate Dam Target Flows (cfs)~~2~~**		**2019 BiOp Flows Iron Gate Dam Target Flows (cfs)**
	Average Daily Minimum	**Average Daily Maximum~~13~~**	**Average Daily Minimum**
April	1,325	--	1,325
May	1,175	--	1,175
June	1,025	--	1,025
July	900	1,000 cfs @ EWA = 320,000 acre-feet 1,500 cfs @ EWA ≥ 1,500,000 acre-feet	900
August	900	1,050 cfs @ EWA = 320,000 acre-feet 1,250 cfs @ EWA ≥ 1,500,000 acre-feet	900
September	1,000	1,100 cfs @ EWA = 320,000 acre-feet 1,350 cfs @ EWA ≥ 1,500,000 acre-feet	1,000
October	1,000	--	1,000
November	1,000	--	1,000
December	950	--	950
January	950	--	950
February	950	--	950
March	1,000	--	1,000

Notes:

"–" none specified, but regulated per ramping rates shown in Table 3.6-7.
cfs = cubic feet per second; EWA = Environmental Water Account

~~1 Source: FERC 2007~~

~~2 Source: NMFS and USFWS 2013a~~

~~13~~ In late August/early September during even calendar years, flow releases at Iron Gate Dam may be increased to support the Yurok Tribal Boat Dance Ceremony. The volume of water required is estimated to be 2,000–4,000 acre-feet depending on real-time hydrologic conditions.

Sources: NMFS and USFWS 2013, NMFS 2019, and USFWS 2019

3.6.2.3 Flood Hydrology

Volume I Section 3.6.2.3 Flood Hydrology – Environmental Setting – Flood Hydrology, paragraph 3 on page 3-623:

During extremely wet years, surface water elevations rise in Upper Klamath Lake. Agency Lake, Barnes Ranch, and the Nature Conservancy-owned lands provide over 108,000 acre-feet of storage around and near Upper Klamath Lake due to recent breaching of local dikes and levees, which can help to reduce flooding downstream. In contrast, there is minimal surplus storage in the Lower Klamath Project to help control flooding downstream of Iron Gate Dam. During wet years, decreased irrigation demands in the upper basin may allow for more water to remain in Upper Klamath Lake for use later in the year. The amount of water retained in Upper Klamath Lake is determined under the 2019~~3~~ BiOp~~'s~~ and depends on decisions related to ESA-listed suckers and the magnitude of spring flushing flows and fall migration flows downstream of Iron Gate Dam (NMFS 2019 and USFWS 2019~~3~~) (see also Section 3.1.6.3~~1~~ Klamath River Flows under the Klamath Irrigation Project's 2019~~3~~ BiOp Flows). The 2019~~3~~ BiOp Flows also includes provisions for average and wet years that ~~increase~~ implement opportunistic surface flushing flows ~~minimum flow requirements~~ at Iron Gate Dam and increase surface water elevations in Upper Klamath Lake to more closely mimic natural flow and lake-level conditions and provide storage for surplus water (NMFS 2019; and USFWS 2019~~3~~).

3.6.2.4 Risks of Dam Failure

Volume I Section 3.6.2.4 Flood Hydrology – Environmental Setting – Risks of Dam Failure, paragraph 3 on page 3-624:

Siskiyou County recently developed a Multi-Jurisdictional Hazard Mitigation Plan which addressed, among other issues, flood and dam failure hazards. Maps are currently available that describe dam inundation areas based on potential failure of Lower Klamath Project dams, including ~~J. C. Boyle and Iron Gate dams as well as~~ a domino effect, depicting the inundation area if multiple dams were to fail at the same time (Siskiyou County 2011). FERC staff have conducted safety inspections of the dam structures as part of the licensing program over the past 50 years. Every five years J.C. Boyle, Copco No. 1 and Iron Gate dams are inspected and evaluated by an independent consultant and reports documenting the evaluation are submitted to FERC for review (FERC 2007).

3.6.4 Impacts Analysis Approach

Volume I Section 3.6.4 Flood Hydrology – Environmental Setting – Impacts Analysis Approach, paragraph 2 on page 3-625:

USBR used KBRA flows as the hydrologic input for modeling floodplain inundation (USBR 2012). The 2013 and 2019 BiOp flows changed the likely flow regime under which dam removal would occur ~~in 2020~~ (i.e., no longer using KBRA flows). However, the differences in hydrology between KBRA and the 2013 and 2019 BiOp flows are minor (see Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project* for further details regarding KBRA and the 2013 and 2019 BiOp flows).

3.6.5 Potential Impacts and Mitigation

3.6.5.1 Flood Hydrology

Volume I Section 3.6.5.1 Flood Hydrology – Potential Impacts and Mitigation – Flood Hydrology – Potential Impact 3.6-1 Reservoir drawdown and dam removal could result in short-term increases in downstream surface water flows and result in exposing people and/or structures to a substantial risk of damage, loss, injury, or death involving flooding, paragraph 3 on page 3-626:

Reservoir drawdown in the Proposed Project includes considerations for minimizing potential flood risks. These considerations include carefully drawing down the LKP reservoirs using controlled flow releases (see Section 2.7.2 *Reservoir Drawdown*) and the increased storage availability in J.C. Boyle, Copco No. 1, and Iron Gate reservoirs once drawdown has begun. If a flood event occurred during drawdown, the KRRC proposes to retain flood flows using the newly available storage capacity and continue drawdown after flood risks have ended. Under ~~E~~existing conditions, PacifiCorp does not currently operate Iron Gate and Copco reservoirs for flood control purposes ~~do not allow these reservoirs to assist in flood prevention~~ in this manner.

Volume I Section 3.6.5.1 Flood Hydrology – Potential Impacts and Mitigation – Flood Hydrology – Potential Impact 3.6-1 Reservoir drawdown and dam removal could result in short-term increases in downstream surface water flows and result in exposing people and/or structures to a substantial risk of damage, loss, injury, or death involving flooding, paragraph 3 on page 3-629:

Dam excavation would proceed at an estimated 7,500 cubic yards (CY) per day in June, 14,250 CY per day in July, and 16,000 CY per day in August and early September, leaving an upstream cofferdam. Minimum reservoir flood release capacities would be approximately ~~7~~4,~~7~~200 cfs in June, ~~7~~3,000 cfs in July, and 3,000 cfs in August and September, to accommodate the passage of at least a 100-year flood during those times of the year. By late September, the reservoir would be drawn down to the maximum possible extent, minimal streamflow would be occurring, and drawdown releases from upstream reservoirs would have ended. The upstream cofferdam would be armored with rockfill to allow a controlled breach. The cofferdam at Iron Gate Dam would be breached prior to breaching the cofferdam at J.C. Boyle Dam to minimize potential downstream

impacts. The breach flow from J.C. Boyle Dam would quickly attenuate as it moved downstream due to the very small reservoir volume.

3.6.5.2 River Floodplain

Volume I Section 3.6.5.2 Flood Hydrology – Potential Impacts and Mitigation – River Floodplain – Potential Impact 3.6-3 The long-term FEMA 100-year floodplain inundation extent downstream from Iron Gate Dam could change between river miles 193 and 174, potentially exposing people and/or structures to a substantial risk of damage, loss, injury, or death involving flooding, paragraph 5 on page 3-630:

Modeling of flood flows downstream of Iron Gate Dam indicates that the Lower Klamath Project dams provide a slight attenuation of peak flood flows. USBR (2012) estimated that the discharge of the 100-year peak flood immediately downstream of Iron Gate Dam would increase by up to seven percent following dam removal (Table 3.6-12) and flood peaks would occur about 10 hours earlier. This increased discharge would result in flood elevations that are 1.65 feet higher on average from Iron Gate Dam (RM 193) to Bogus Creek (RM 192.6) and 1.51 feet higher on average from Bogus Creek to Willow Creek (RM 188) (Appendix B: *Definite Plan*). The impact of dam removal on flood peak elevations would decrease with distance downstream of Iron Gate Dam, and USBR (2012) and the KRRC (Appendix B: *Definite Plan*) estimated that there would be no significant effect on flood elevations downstream of Humbug Creek (RM 174) because flow attenuation would occur in the mainstem channel and tributary peak flows would not coincide with the peak flow downstream of RM 193 (i.e., current location of Iron Gate Dam). <u>USBR (2012) and the KRRC have estimated that below Humbug Creek (RM 174) any change to the 100-year floodplain inundation elevation would be less than 0.5 feet, and that changes of less than 0.5 feet would not result in a significant effect. As FEMA does not recognize changes in flood elevations less than 1 foot, the application of a 0.5-foot change in flood elevation to rule out areas that could be significantly affected is a conservative approach to determining the potential effects of the Proposed Project on the Klamath River floodplain.</u>

Volume I Section 3.6.5.2 Flood Hydrology – Potential Impacts and Mitigation – River Floodplain – Potential Impact 3.6-3 The long-term FEMA 100-year floodplain inundation extent downstream from Iron Gate Dam could change between river miles 193 and 174, potentially exposing people and/or structures to a substantial risk of damage, loss, injury, or death involving flooding, paragraph 3 on page 3-631:

Although the original USBR hydrologic and hydraulic modeling was conducted assuming KBRA flows, it is reasonable to conclude that the likely adverse impacts to structures in the <u>altered</u> 100-year floodplain downstream of Iron Gate Dam and the timing of downstream flood peaks would be similar under the 2013 <u>and 2019</u> BiOp flow regime<u>s</u> because: (1) the <u>2019 BiOp Flows,</u> 2013 BiOp

flows, and KBRA flows are similar, and (2) there is no change to flood operations under the 2019 and 2013 BiOp flows versus the KBRA flows (see also Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*). Furthermore, BiOps specify minimum flow targets, not peak flood flows, and therefore, do not affect peak flow flood hydrology.

Volume I Section 3.6.5.2 Flood Hydrology – Potential Impacts and Mitigation – River Floodplain – Potential Impact 3.6-4 The FEMA 100-year floodplain inundation extent downstream from J.C. Boyle Dam could change between the California-Oregon state line and Copco No. 1 Reservoir, potentially exposing people and/or structures to a substantial risk of damage, loss, injury, or death involving flooding, paragraph 5 on page 3-633:

Because J.C. Boyle Reservoir provides ~~no~~ limited storage and the dam typically operates in spill mode at flows above ~~plant~~ power canal capacity (i.e., approximately ~~6,000~~ 2,800 cfs; Table 2-1 in USBR 2012), existing conditions peak flows in the Hydroelectric Reach are not substantially attenuated as a result of J.C. Boyle Dam.

Volume I Section 3.6.5.2 Flood Hydrology – Potential Impacts and Mitigation – River Floodplain – Potential Impact 3.6.5 The release of sediment stored behind the Lower Klamath Project dams and resulting downstream sediment deposition under the Proposed Project could result in potentially exposing people and/or structures to a substantial risk of damage, loss, injury, or death involving flooding, paragraph 3 on page 3-634 to paragraph 1 on page 3-635:

Potential Impact 3.6-5 The release of sediment stored behind the Lower Klamath Project dams and resulting downstream sediment deposition under the Proposed Project could result in potentially exposing people and/or structures to a substantial risk of damage, loss, injury, or death involving flooding.

Depending on hydrologic conditions during drawdown and dam removal, approximately 90,000 to 170,000 U.S. tons of sediment behind J.C. Boyle Dam, 950,000 to 1,590,000 U.S. tons of sediment behind Copco No. 1 Dam, and 420,000 to 550,000 U.S. tons of sediment behind Iron Gate Dam would be eroded and flushed down the Klamath River during dam removal activities (USBR 2012) (see also Section 2.7.3 *Reservoir Sediment Deposits and Erosion During Drawdown*). After dam removal, the remaining reservoir sediment would ~~be left in place~~consolidate above the active channel. USBR conducted an analysis of future geomorphology and sediment transport during and after dam removal for dry, average (median), and wet start year scenarios. Most of the erosion would occur during the primary drawdown period from January 1 to March 15 of the drawdown year and afterwards the river bed in the reservoir reaches is expected to stabilize. Significant short term sediment deposition in the Klamath River channel is expected between Iron Gate Dam (RM 193) and the confluence of Cottonwood Creek (RM 185.1) ~~Minor deposition would occur in~~

~~some of the reaches downstream~~ from dam removal activities, however no significant deposition is predicted downstream of Cottonwood Creek ~~none is expected downstream of the Shasta River confluence~~ (USBR 2012). The Geology and Soils analysis considers the effects of sediment deposition in more detail (see Section 3.11.5 *[Soils, Geology, and Mineral Resources] Potential Impacts and Mitigation* of this EIR). Sedimentation would occur downstream from the Lower Klamath Project, but the quantity would vary depending on water year types during and following drawdown. The magnitude of sediment deposition predicted is relatively small compared to sediment loading from other existing sources along the Klamath River. ~~The only measurable sedimentation would occur in the reach from Bogus Creek to Cottonwood Creek.~~ Short-term (2-years) sediment and hydraulic model simulations focused on reservoir sediment erosion and fine sediment load in the Klamath River following drawdown indicate up to about 0.9 feet of reach-averaged sediment deposition between Bogus Creek (RM 192.6) and Willow Creek (RM 188) (Figure 3.11-15), although conservative long-term (50-year) simulations focused on channel bed elevation change indicate that fine and coarse sediment deposition within 2 years of dam removal may be up to 1.7 feet (see Figure 3.11-18) (USBR 2012). Short-term simulations also indicate up to about 0.4 feet of sediment deposition from Willow Creek to Cottonwood Creek (Figure 3.11-15), although conservative long-term (50-year) simulations indicate that fine and coarse sediment deposition within 2 years of dam removal may be up to 0.9 feet (see Figure 3.11-18) (USBR 2012). ~~In the short term (i.e., 2 years following dam removal), there is anticipated to be approximately 1.2 feet of deposition between Bogus Creek (RM 192.6) and Cottonwood Creek (RM 185.1) (Figure 3.11-12). This estimate is based on two successive median water years following dam removal. The predicted bed elevation changes under other modeled scenarios (i.e., two successive wet water year types and two successive dry water year types) are both less than the median water year scenario (USBR 2012). In the long term, average bed elevation is predicted to increase by approximately 1.5 feet in the reach from Bogus to Willow Creek and less than one foot downstream of Willow Creek. Additionally, I~~ sedimentation is anticipated to be localized and occur primarily in slack-water areas, such as pools, and not in the riffle and bedrock sections that tend to control water surface elevations. Because the sediment deposition would be relatively small in comparison with the existing channel bed and bar sediment conditions, it would not affect stream characteristics in a way that would substantively alter flood inundation or flood risks and would therefore be a less than significant impact. Note that even though the effects of sediment deposition would be less than significant with respect to flooding risk, increases in bed elevations due to sedimentation were included in USBR's (2012) hydraulic modeling and mapping of the 100-year floodplain inundation areas downstream of Iron Gate Dam as described above.

Significance

No significant impact

3.6.5.3 Risks of Dam Failure

Volume I Section 3.6.5.3 Flood Hydrology – Potential Impacts and Mitigation – Risks of Dam Failure, Potential Impact 3.6-6 Dam failure could flood areas downstream of the Lower Klamath Project, paragraph 2 to paragraph 7 on page 3-635, which includes new paragraphs:

Potential Impact 3.6-6 Dam failure could flood areas downstream of the Lower Klamath Project.

Removing the Lower Klamath Project dams could reduce the risks of downstream flooding associated with a dam failure. The Lower Klamath Project dams store over ~~169,000~~87,000 acre-feet of water that could inundate a portion of the watershed if the dams failed (Siskiyou County Web Site 2011). The dams are inspected regularly and ~~the probability for failure has been found to be low~~ all three California dams have received a satisfactory rating, meaning that no existing or potential dam safety deficiencies are recognized by the California Department of Water Resources, Division of Safety of Dams (DSOD 2019). Copco No. 1 and Iron Gate dams are classified as having a "high" downstream hazard potential which means that these dams are "expected to cause loss of at least one human life" should the dam fail while operating with a full reservoir (DSOD 2019). Removing the Lower Klamath Project dams would eliminate the potential for dam failure and subsequent flood damages and would therefore be beneficial.

The reservoir drawdown and dam removal processes are specifically designed to reduce the potential for dam failure during dam demolition that could result in downstream flooding, and further details are discussed below. Dam embankment excavation at each site would not take place until after the reservoir was completely drawn down (Appendix B: *Definite Plan*). This approach precludes the possibility of dam demolition activities increasing the risk for failure and subsequent downstream flooding.

As stated in Volume I Section 2.7.2 *Proposed Project – Proposed Project – Reservoir Drawdown* (page 2-57) the maximum drawdown rate of 5 feet per day is proposed by KRRC as a conservative value based upon dam slope stability analyses conducted for each of the Lower Klamath Project reservoirs. According to USBR (2012), the rate of reservoir drawdown is an important factor that affects the stability of the upstream slope of an earthen dam, such as Iron Gate Dam. If the reservoir drawdown occurs at a fast enough rate, pore pressures in the upstream zone and foundations of the dam embankment may not have time to dissipate, which may result in failure of the upstream slope of the dam (USBR 2012).

As discussed in Volume II Appendix B: *Definite Plan – Appendix D Dam Stability Analyses*, Iron Gate Dam is a zoned earth and rock fill embankment dam, with a central impervious clay core, an upstream and a downstream compacted pervious shell with filter zones, and a downstream drain. A 10-foot thick layer of

riprap protects the upstream slope of the dam against erosion. A 5-foot thick riprap layer is present on the downstream slope. Additional material characterization, including details of the materials present in the different zones of Iron Gate Dam, is presented in Volume II Appendix B: *Definite Plan – Appendix D*. The dam stability analyses described in the Definite Plan acknowledge that the shear strength parameters of the earthen shell and core of a dam are very important for the rapid drawdown analysis, and because no laboratory shear strength tests are available for the Iron Gate Dam shell and other embankment materials, shear strength parameters for these materials were selected based on available information such as the type of construction, parameters used in previous analyses, and published data. The material properties used for the analyses of Iron Gate Dam stability during drawdown are presented in Table 1 of Volume II Appendix B: *Definite Plan – Appendix D*. The embankment stability analysis for Iron Gate Dam (and J.C. Boyle Dam, which also has earthen embankments) was conducted for the following scenarios:

1. Instantaneous drawdown from steady state condition with full pore pressure dissipation in the shell materials (least conservative bound).
2. Instantaneous drawdown from steady state condition with no pore pressure dissipation in the shell materials (most conservative bound).
3. Slow drawdown rate (3 feet per day for Iron Gate Dam and 2 feet per day for J.C. Boyle Dam).
4. Intermediate drawdown rate (6 feet per day for Iron Gate Dam and 5 feet per day for J.C. Boyle Dam).
5. Rapid drawdown rate (10 feet per day for Iron Gate Dam and 10 feet per day for J.C. Boyle Dam).

As discussed in Volume II Appendix B: *Definite Plan – Appendix D*, the embankment stability analysis results for Iron Gate Dam indicate that the minimum factor of safety of 1.3 for transient seepage analyses would be more than met for all cases analyzed. Note that the minimum factor of safety of 1.3 selected for the KRRC's embankment stability analysis is conservatively at the higher end of the range of minimum acceptable factors of safety of 1.1 to 1.3 established by the Engineering Manual (EM-110-2-1902) of United States Army Corps of Engineers (USACE 2003). Based on the KRRC's analyses, reservoir drawdown could be as high as 10 feet per day without risk of failure of the earthen embankment at Iron Gate Dam. However, the KRRC has proposed that reservoir drawdown be limited to a maximum value of 5 feet per day.

Further, as described in Volume I Section 2.7.2 *Proposed Project – Proposed Project – Reservoir Drawdown* (page 2-57), drawdown of Iron Gate Reservoir (as well as Copco No. 1 Reservoir) would be managed through automated gate control systems with operator oversight, where inputs to determine the amount of gate opening at each reservoir would include continuous measurement of reservoir levels by remote sensor. The gate control system would incrementally open (or close) the gate to increase (or decrease) flow through the diversion

tunnels (14-foot by 16-foot each) to maintain the reservoir drawdown of the reservoirs at an approximately constant rate. This would allow the dams to maintain embankment and reservoir rim stability during the drawdown period even as reservoir inflows vary. For example, flows may also vary due to storms and any changes in upstream reservoir releases.

With respect to the potential for Iron Gate Dam to fail during excavation, Iron Gate Dam is the most downstream of the four Lower Klamath Project dams proposed for removal, and excavation of this dam would begin in June of dam removal year 2 after demolition of Copco No. 1 and Copco No. 2 dams are scheduled to begin. J.C. Boyle Dam deconstruction would begin just after Iron Gate Dam deconstruction begins. Following reservoir drawdown and during dam deconstruction, there would be no water stored at the upstream dams or within Iron Gate Reservoir, so there is no possibility of dam failure due to excavation that would result in a substantial flooding risk to downstream areas under these conditions. In the event of large storms or upstream dam failure that could send relatively large amounts of water into Iron Gate Reservoir during the excavation period from early June of dam removal year 2 through mid-October of the same year, this dam would maintain available storage and discharge capacity to pass a 1 percent probable flood without overtopping any embankment that is remaining (Volume I Section 2.7.2 *Proposed Project – Proposed Project – Reservoir Drawdown* [page 2-57]).

Copco No. 1 Dam is a concrete gravity arch structure that would require drilling and blasting during the dam removal phase (Appendix B: *Definite Plan*). Copco No. 1 Dam is thicker and wider at its base, which makes it very strong and less prone to risk of failure as the dam crest is lowered through demolition. With minimal water behind the dam due to reservoir drawdown, there would be little hydrostatic pressure against the remaining sections of the dam that could cause dam failure. Additionally, overtopping flows would not cause dam failure as is evidenced by the lack of deterioration to the stepped face on the downstream side of the dam. High flows have poured over the downstream side of the dam for over 100 years with no scour to the concrete. Seismic loading cannot be controlled by the Proposed Project, but as the dam is lowered, the strength of the remaining gravity structure increases, and therefore, the risk of seismic-induced failure would go down for a given event. Thus, there are no likely failure modes created by the removal process even if water did enter the drained reservoir during a late spring storm, and risk of a failure from the removal process is insignificant (S. Leonard, AECOM as KRRC Technical Representative, pers. comm., November 2018).

FERC requires a potential failure modes analysis, and the KRRC will be revisiting this topic in more detail prior to dam removal. FERC dam safety experts would have to approve the final dam removal analysis before a license surrender order could be issued.

See Potential Impact 3.6-1 for further discussion of reservoir drawdown and dam removal details.

Significance
Beneficial following dam removal

No significant impact during reservoir drawdown and dam removal

3.6.6 References

Volume I Section 3.6.6 Flood Hydrology – References, pages 3-636 through 3-638, includes the following revisions:

DSOD (Division of Safety of Dams). 2019. Dams Within Jurisdiction of the State of California. Dams listed alphabetically by dam name. September 2019. Department of Water Resources, California Natural Resources Agency, Sacramento, California.

NMFS (National Marine Fisheries Service). 2019. Endangered Species Act Section 7(a)(2) Biological Opinion, and Magnuson-Stevens Fishery Conservation and Management Act essential fish habitat response for Klamath Project operations from April 1, 2019 through March 31, 2024. Technical memorandum. Prepared by NMFS, California Coastal Office for U.S. Bureau of Reclamation, Klamath Basin Area Office.

USACE (U. S. Army Corps of Engineers). 2003. Slope Stability Engineer Manual. EM 1110-2-1902. USACE, Washington, D. C.

USFWS (U.S. Fish and Wildlife Service). 2019. Biological Opinion on the Effects of the Proposed Klamath Project Operations from April 1, 2019, through March 31, 2024, on the Lost River Sucker and the Shortnose Sucker. TAILS # 08EKLA00-2019-F-0068. Prepared by U.S. Fish and Wildlife Service, Southwest Region, Klamath Falls Fish and Wildlife Office.

Other references cited as part of text included in the Section 3.6 list of revisions:

AECOM, CDM Smith, and River Design Group. 2017. Klamath River Renewal Project. California Environmental Quality Act (CEQA) and California and Oregon 401 Water Quality Certifications Technical Support Document. Prepared by AECOM, Oakland, California; CDM Smith, Sacramento, California; and River Design Group, Corvallis, Oregon for Klamath River Renewal Corporation, California State Water Resources Control Board, and Oregon Department of Environmental Quality. Available at: https://www.waterboards.ca.gov/waterrights/water_issues/programs/water_quality_cert/docs/lower_klamath_ferc14803/20170929_krrc_tech_report.pdf

FERC (Federal Energy Regulatory Commission). 2007. Final Environmental Impact Statement for Hydropower License, Klamath Hydroelectric Project, FERC Project No. 2082-027, FERC/EIS-0201F. Washington, D.C., Federal Energy Regulatory Commission, Office of Energy Projects, Division of Hydropower Licensing. https://www.ferc.gov/industries/hydropower/enviro/eis/2007/11-16-07.asp

Siskiyou County. 2011. Siskiyou County Multi-Jurisdictional Hazard Mitigation Plan. Website. https://co.siskiyou.ca.us/content/oes-hazard-mitigation-plan. [Accessed December 2018].

USBR. 2012. Hydrology, Hydraulics and Sediment Transport Studies for the Secretary's Determination on Klamath River Dam Removal and Basin Restoration. Technical Report No. SRH-2011-02. Prepared for Mid-Pacific Region, Bureau of Reclamation, Technical Service Center, Denver, Colorado.

3.8 Water Supply/Water Rights

3.8.2 Environmental Setting

3.8.2.1 Upper Klamath Basin

Volume I Section 3.8.2.1 Water Supply/Water Rights – Environmental Setting – Upper Klamath Basin, new paragraph 3 on page 3-670:

At the time of the Notice of Preparation (NOP) for the Lower Klamath Project EIR, operation of USBR's Klamath Irrigation Project (which includes flow releases at Iron Gate Dam) was dictated by the 2013 Joint Biological Opinion (2013 BiOp), which was designed to protect federally listed coho salmon, Lost River sucker, and shortnose sucker (NMFS and USFWS 2013). Minimum flow requirements for the Klamath River are currently operated under the NMFS and USFWS 2019 biological opinions for the USBR Klamath Irrigation Project (2019 BiOp Flows), which the Final EIR evaluates as a second baseline for the Existing Conditions (for more details see Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*) (NMFS 2019; USFWS 2019). Because of the similarity between the 2013 and 2019 BiOp flows, the current flow regime does not result in any changes to the findings of significance and does not result in any changes regarding mitigation measures.

Volume I Section 3.8.2.1 Water Supply/Water Rights – Environmental Setting – Upper Klamath Basin, paragraph 3 on page 3-670:

The 2013 ~~Joint Biological Opinion (2013~~ BiOp~~) for operation of USBR's Klamath Irrigation Project~~ set~~s~~ minimum lake and river hydrologic conditions to avoid jeopardizing the continued existence of ESA-listed species and adverse modification of designated critical habitat, while providing for delivery of water for irrigation purposes consistent with historical operations, subject to water

availability. The 2013 BiOp included~~s~~ two distinct operational approaches for water management for the fall/winter (October through February) and spring/summer (March through September) time periods. The 2019 BiOp Flows specify comparable hydrologic conditions, irrigation supply objectives, and operational approaches (see sections 3.1.6 *Summary of Available Hydrology Information for the Proposed Project* and 3.6.2.2 *[Flood Hydrology] Basin Hydrology* for further details).

Volume I Section 3.8.2.1 Water Supply/Water Rights – Environmental Setting – Upper Klamath Basin – Fall Creek Water Rights, paragraph 1 on page 3-671:

Four water rights are located on Fall Creek: two non-consumptive rights for hydropower generation at PacifiCorp's Fall Creek powerhouse, which is not part of the Proposed Project, one for the City of Yreka's municipal water supply, and one for fish propagation at the Fall Creek Hatchery (see Appendix M). Additionally, PacifiCorp operates a small diversion dam on neighboring Spring Creek that diverts up to 16.5 cfs into Fall Creek upstream of the diversion facilities that supply the Fall Creek powerhouse and City of Yreka diversion. See Section 3.6.2.2 *Flood Hydrology – Environmental Setting – Basin Hydrology – Spring, Fall and Jenny Creeks* (pages 3-606 to 3-607) for further discussion of the Spring Creek diversion.

Volume I Section 3.8.2.1 Water Supply/Water Rights – Environmental Setting – Mid and Lower Klamath Basin – Federal Reserved Rights for Native American Tribes, paragraph 8 on page 3-673:

Hoopa Valley Tribe, ~~and~~ Yurok Tribe, and Klamath Tribes

Volume I Section 3.8.2.1 Water Supply/Water Rights – Environmental Setting – Mid and Lower Klamath Basin – Federal Reserved Rights for Native American Tribes, new paragraph 1 on page 3-674:

On November 14, 2019 the United States Court of Appeals issued its opinion in the *Baley v. United States* case that the Klamath Basin tribes (i.e., Yurok Tribe, Hoopa Valley Tribe, and Klamath Tribes) have senior, federally reserved water rights that predate the water rights of Klamath Irrigation Project irrigators and that the tribes' water rights require at least enough instream water to ensure the continued existence of tribal trust species listed under the Endangered Species Act (ESA). Additionally, in May 2019 the Yurok tribal council passed a resolution declaring rights of personhood for the Klamath River.

3.8.4 Impacts Analysis Approach

Volume I Section 3.8.4 Water Supply/Water Rights – Impacts Analysis Approach, paragraph 1 on page 3-675:

The 2013 and 2019 BiOps changed the flow regime under which dam removal would occur (i.e., KBRA flows are no longer anticipated). However, the differences in hydrology between KBRA and the 2013 and 2019 BiOp flows are minor (see Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*, for further details regarding KBRA and the 2013 and 2019 BiOp flows) and thus do not affect the analysis of future water supply or water rights under the Proposed Project.

3.8.5 Potential Impacts and Mitigation

Volume I Section 3.8.5 Water Supply/Water Rights – Potential Impacts and Mitigation – Potential Impact 3.8-1 Dam removal could change the amount of surface water flow available for diversion under existing water rights in the mainstem Klamath River within the Hydroelectric Reach and downstream from Iron Gate Dam – Middle and Lower Klamath River, paragraph 3 on page 3-677:

This estimate of peak flow diversion would likely be lower during wetter water years, since not all users would be likely to divert the maximum amount during summer months. Comparing the peak potential diversion flow (138 cfs) to the low-flow condition of a dry water year type immediately downstream of Iron Gate Dam (900 cfs, or a 90 percent exceedance flow per the 2013 and 2019 BiOps), the diversions would represent approximately 15 percent of Klamath River flows in the upstream portion of this reach under the Proposed Project.

Volume I Section 3.8.5 Water Supply/Water Rights – Potential Impacts and Mitigation – Potential Impact 3.8-1 Dam removal could change the amount of surface water flow available for diversion under existing water rights in the mainstem Klamath River within the Hydroelectric Reach and downstream from Iron Gate Dam – Middle and Lower Klamath River, paragraph 3 on page 3-677:

Note that the USBR (2012) modeling effort assumed KBRA flows, rather than the 2013 BiOp flows, or 2019 BiOp F~~f~~lows under which the upstream Klamath Irrigation Project (and hence the Lower Klamath Project) currently operates. Compared to KBRA flows, the 2013 BiOp slightly increased~~s~~ the annual average Environmental W~~w~~ater Account (EWA) (i.e., water available to the Klamath River from Upper Klamath Lake) ~~supply~~ by about 9,000 acre feet (NMFS and USFWS 2013). The 2019 BiOp Flows increase the minimum EWA by 80,000 acre feet (87,000 acre feet in Yurok Boat Dance years) compared to the 2013 BiOp (NMFS and USFWS 2013, NMFS 2019, and USFWS 2019). During summer months when irrigation demand is highest (i.e., July ~~and August~~) in dry water years, the 2013 and 2019 BiOps specify~~requires~~ a higher minimum daily average flow target of 900 cfs at Iron Gate Dam, compared to 83124 cfs under KBRA (see also Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*). Overall, the hydrologic differences between KBRA flows and those implemented under the 2013 and 2019 BiOps are small, decrease the relative effect of other diversion in the river in summer, and do not change the assessment of Proposed Project impacts on surface

water flows available for diversion under existing water rights in the Klamath River downstream of the Oregon-California border. Furthermore, under the No Project alternative, flow releases would still be controlled by the 2019~~3~~ BiOp, and therefore, the same quantity of Klamath River flow would be available for downstream water rights.

Volume I Section 3.8.5 Water Supply/Water Rights – Potential Impacts and Mitigation – Potential Impact 3.8-2 Dam removal could change the amount of surface water flow available for diversion from Upper Klamath Lake and/or Keno Reservoir to California water users in the USBR Klamath Irrigation Project, paragraph 5 on page 3-679:

The aforementioned releases did not result in a change to Klamath River flows or water supply downstream of Iron Gate Dam since USBR was~~is~~ obligated under the 2013 BiOp to release the water into the Klamath River. If PacifiCorp had not released the flows from Iron Gate and Copco No. 1 reservoirs in the fall of 2014 and spring of 2018, then USBR would have released the flows at Keno Dam and the water would have traveled downstream through the Lower Klamath Project reservoirs to be discharged at Iron Gate Dam, regardless. The same conditions are true under the current 2019 BiOp Flows.

Volume I Section 3.8.5 Water Supply/Water Rights – Potential Impacts and Mitigation – Potential Impact 3.8-2 Dam removal could change the amount of surface water flow available for diversion from Upper Klamath Lake and/or Keno Reservoir to California water users in the USBR Klamath Irrigation Project, paragraph 6 on page 3-679:

Ultimately, precipitation, irrigation needs, and the 20193 BiOp flow requirements determine the amount of surface water flow available for diversion from Upper Klamath Lake and/or Keno Reservoir to the USBR Klamath Irrigation Project. The same conditions were true under the 2013 BiOp. Under the 2013 BiOp, D~~d~~uring extreme dry years, any reduction in available water for existing water rights would result in additional water being drawn from Upper Klamath Lake until lake levels drop to 4,137.72 feet (1,261.5 meters), at which point USBR would adjust water deliveries to the Klamath Irrigation Project to prevent the lake elevation from dropping below that value (NMFS and USFWS 2013). Similarly, under the 2019 BiOp Flows, water supply deliveries from Upper Klamath Lake to the Klamath Irrigation Project can be curtailed to comply with legal requirements and hydrologic conditions, as necessary (NMFS 2019; USFWS 2019). Decreased water supply caused by such an adjustment would potentially result in reduced deliveries to Klamath Irrigation Project water users (irrigators and wildlife refuges in Oregon and California).

Volume I Section 3.8.5 Water Supply/Water Rights – Potential Impacts and Mitigation – Potential Impact 3.8-2 Dam removal could change the amount of surface water flow available for diversion from Upper Klamath Lake and/or Keno

Reservoir to California water users in the USBR Klamath Irrigation Project, paragraph 1 on page 3-680:

The Lower Klamath Project has no obligation to apply the water stored in its reservoirs to meeting USBR's 2013 and 2019 BiOp requirements, and PacifiCorp has indicated that any future borrowing of water from Lower Klamath Project reservoirs would be predicated upon a definitive, rapid refill schedule, and compensation to PacifiCorp for the value of lost power generation due to reduced Lower Klamath Project reservoir capacity, both of which limit the benefit to USBR of borrowing water from the Lower Klamath Project. This places uncertainty as to whether the water-borrowing operation that ~~has~~ occurred in two years ~~since implementation of~~under the 2013 BiOp ~~will~~ would continue. Additional uncertainty comes from potential necessary changes to water rights to accommodate more than sporadic emergency use of the reservoirs for other than hydroelectric purposes. Despite the stated limitations of borrowing water from the Lower Klamath Project reservoirs, and the uncertainty of what, if any, permissions would be necessary to affect regular implementation of the operations, dam removal under the Proposed Project would preclude the potential option of utilizing the Lower Klamath Project reservoir water supply to help meet 2013 and 2019 BiOp flow requirements and thereby extend the available water supply to the USBR Klamath Irrigation Project.

Volume I Section 3.8.5 Water Supply/Water Rights – Potential Impacts and Mitigation – Potential Impact 3.8-2 Dam removal could change the amount of surface water flow available for diversion from Upper Klamath Lake and/or Keno Reservoir to California water users in the USBR Klamath Irrigation Project, paragraph 2 on page 3-680:

Despite this minor chance of a reduction, there would be no legal injury to the Klamath Irrigation Project users because the Lower Klamath Project operators are not required to temporarily supplement water deliveries, per the 2013 and 2019 BiOp flow requirements. Additionally, there is no indication that water would not be available for public health purposes, absent supplementation of Klamath Irrigation Project available water.

Volume I Section 3.8.5 Water Supply/Water Rights – Potential Impacts and Mitigation – Potential Impact 3.8-2 Dam removal could change the amount of surface water flow available for diversion from Upper Klamath Lake and/or Keno Reservoir to California water users in the USBR Klamath Irrigation Project, paragraph 2 on page 3-680:

The Tulelake Basin is designated a medium priority basin under the Sustainable Groundwater Management Act (SGMA), in part because of declining groundwater levels and high-volume groundwater extractions (DWR 2018~~4~~).

3.8.6 References

Volume I Section 3.8.6 Water Supply/Water Rights – References, pages 3-683 through 3-694, includes the following revisions:

DWR (Department of Water Resources). 2018<u>4</u>. Groundwater Monitoring Elevation Monitoring Basin Prioritization Process. June 2018<u>4</u>.

<u>NMFS. 2019. Endangered Species Act Section 7(a)(2) Biological Opinion, and Magnuson-Stevens Fishery Conservation and Management Act essential fish habitat response for Klamath Project operations from April 1, 2019 through March 31, 2024. Technical memorandum. Prepared by NMFS, California Coastal Office for U.S. Bureau of Reclamation, Klamath Basin Area Office.</u>

<u>NMFS and USFWS (U. S. Fish and Wildlife Service). 2013. Biological opinions on the effects of proposed Klamath Project operations from May 31, 2013, through March 31, 2023, on five federally listed threatened and endangered species. Prepared by NMFS, Southwest Region, Northern California Office; and USFWS, Pacific Southwest Region, Klamath Falls Fish and Wildlife Office.</u>

<u>USFWS (U.S. Fish and Wildlife Service). 2019. Biological Opinion on the Effects of the Proposed Klamath Project Operations from April 1, 2019, through March 31, 2024, on the Lost River Sucker and the Shortnose Sucker. TAILS # 08EKLA00-2019-F-0068. Prepared by U.S. Fish and Wildlife Service, Southwest Region, Klamath Falls Fish and Wildlife Office.</u>

Other references cited as part of text included in the Section 3.8 list of revisions

USBR. 2012. Hydrology, Hydraulics and Sediment Transport Studies for the Secretary's Determination on Klamath River Dam Removal and Basin Restoration. Technical Report No. SRH-2011-02. Prepared for Mid-Pacific Region, Bureau of Reclamation, Technical Service Center, Denver, Colorado.

3.9 Air Quality

This section was recirculated on December 21, 2019. Revisions to this section to address public comments can be found in Volume III Attachment 2.

3.10 Greenhouse Gas Emissions and Energy

This section was recirculated on December 21, 2019. Revisions to this section to address public comments can be found in Volume III Attachment 2.

3.11 Geology, Soils, and Mineral Resources

3.11.2 Environmental Setting

3.11.2.1 Regional Geology

Faulting and Seismicity

Volume I Section 3.11.2.1 – Geology, Soils, and Mineral Resources – Environmental Setting – Regional Geology – Faulting and Seismicity, paragraph 4 on page 3-736:

In California, the nearest active fault to the Lower Klamath Project is the Meiss Lake fault~~, which is~~ (part of the Cedar Mountain fault zone), located approximately five miles east of the Klamath River near the California-Oregon State line in Siskiyou County.

Volume I Section 3.11.2.1 – Geology, Soils, and Mineral Resources – Environmental Setting – Regional Geology – Faulting and Seismicity, Table 3.11-1 Earthquake and Fault Information on page 3-737:

Table 3.11-1. Earthquake and Fault Information.

Fault	Zoned by State of California [a]	Magnitude of Maximum Credible Earthquake (moment magnitude) [b]	Approximate Slip Rate (inches/year)	Approximate Recurrence Interval (years)
Meiss Lake fault (Cedar Mountain fault zone)	Yes	6.9	0.04 [c]	3,600[c]
Hat Creek–McArthur faults	Yes	7	0.06 [c]	Unknown, possibly 1,000 to 3,000 [c]
Gillem–Big Crack faults	No	6.6	0.04 [c]	Not available
Pittville fault	No	6.7	less than 0.03 [c]	Not available
Mayfield fault	No	6.5	0.03–0.19 [c]	A few thousand years [c]
Rocky Ledge fault	No	N/A	less than 0.03 [c]	Not available

3.11.2.4 Sediment Load

Volume I Section 3.11.2.4 – Geology, Soils, and Mineral Resources – Environmental Setting – Sediment Load, paragraph 2 on page 3-751:

USBR (2010b) used reach average hydraulic properties and grain size data from previous studies to estimate the flow magnitude and return period at which sediment mobilization occurs downstream of Iron Gate Dam. The representative particle diameters for all data collected downstream of Iron Gate Dam are given in Figure 3.11-5. The estimates did not include the reach from Iron Gate Dam to Bogus Creek, for which there were no grain size data. USBR (2010b) assumed this reach to be fully armored because reservoir trapping has eliminated coarse sediment supply to the reach during the past 50 years. Flows required to initiate mobilization of the median grain size (D_{50}), and for geomorphic reworking of the channel bed, in reaches downstream of Bogus Creek are summarized in Figure 3.11-6.

Volume I Section 3.11.2.4 – Geology, Soils, and Mineral Resources – Environmental Setting – Sediment Load, Figure 3.11-6. Flow and Corresponding Return Period at which Bed Mobilization Begins Under Existing Conditions (USBR 2012) on page 3-753:

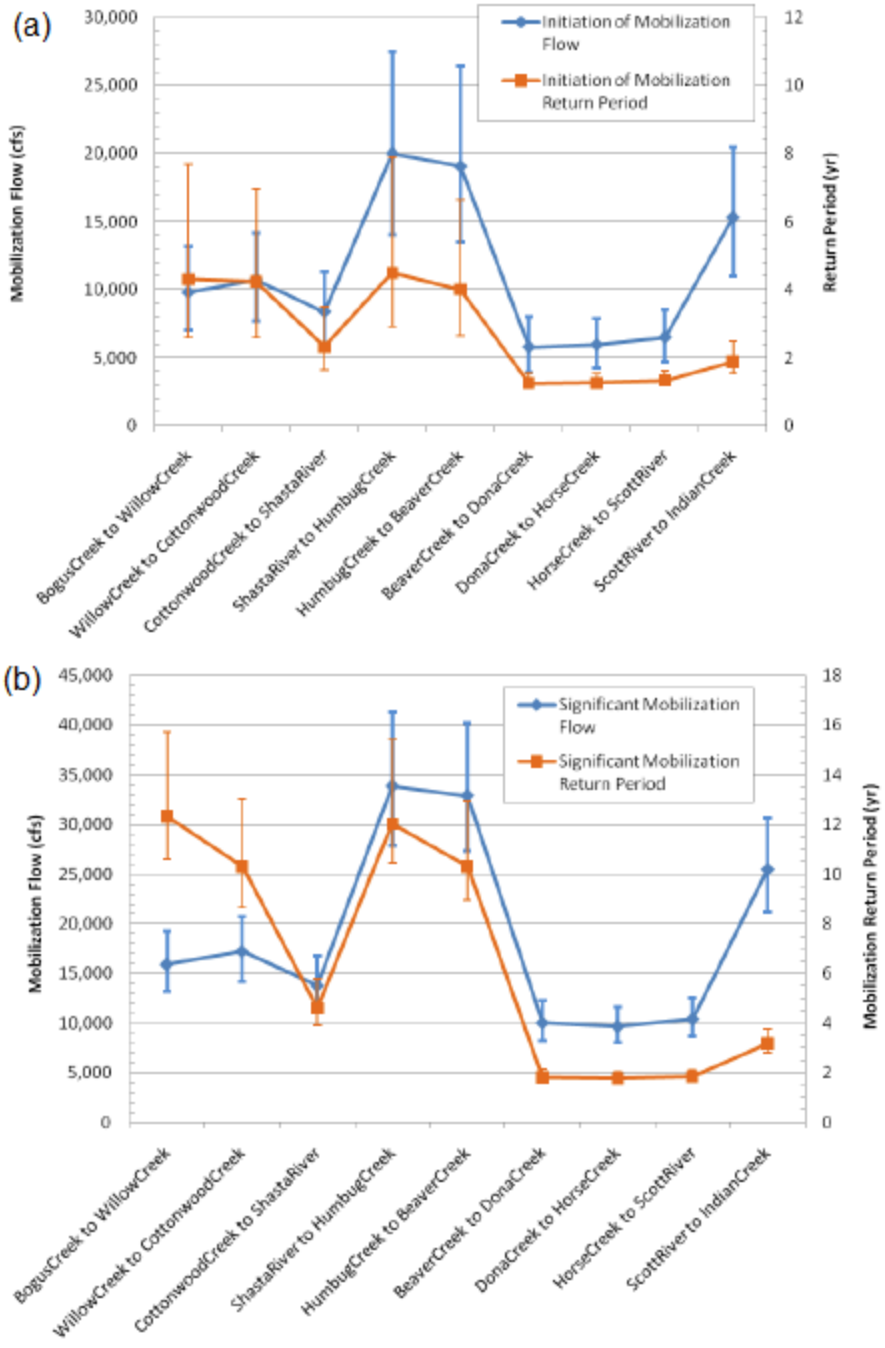

Figure 3.11-6. (a) Flow and Corresponding Return Period at which Bed Mobilization Begins Downstream of Iron Gate Dam Under Existing Conditions (USBR 2012). (b) Flow and Corresponding Return Period at which Significant Bed Material Mobilization Occurs Downstream of Iron Gate Dam Under Existing Conditions (USBR 2012). ~~Flow and Corresponding Return Period at which Bed Mobilization Begins Downstream of Iron Gate Dam Under Existing Conditions (USBR 2012).~~

3.11.3 Significance Criteria

Volume I Section 3.11.3 – Geology, Soils, and Mineral Resources – Significance Criteria, paragraphs 1 and 2 on page 3-759:

For the Lower Klamath Project EIR, impacts to geology and soils would be considered significant if Proposed Project implementation would result in any of the following:

- Substantial soil erosion from upland areas into the reservoirs or the Klamath River due to project construction activities.
- New or exacerbated mass wasting around the rim of the reservoirs during drawdown.
- Substantial deposition of sediment in the Klamath River channel or Klamath estuary due to erosion of reservoir sediment deposits, where substantial is defined as a considerable amount of sediment that would not be redistributed by high flow events that occur in the long-term.
- Long-term removal of access to mineral resources for extraction.
- Exposure of people or structures to adverse effects resulting from rupture of a known earthquake fault, strong seismic ground shaking, volcanic activity, or large-scale slope instability.

Unless otherwise specified, ~~For the purposes of this EIR,~~ substantial is defined as "of considerable importance to public health and safety, water quality, and/or physical conditions supporting aquatic resources as these resources pertain to geology and soils." ~~Additional criteria related to geology and soils associated effect to other resources is addressed in Section 3.2 *Water Quality*, Section 3.3 *Aquatic Resources*, and Section 3.6 *Flood Hydrology* of this EIR.~~

3.11.4 Impacts Analysis Approach

3.11.4.1 Flows

Volume I Section 3.11.4.1 Geology Soils and Mineral Resources – Impacts Analysis Approach – Flows, paragraph 2 on page 3-760:

Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project* provides a summary of flow conditions relevant to the Proposed Project. Because the flow modeling used for this EIR dates back to the 2012 KHSA EIS/EIR, the modeling used NMFS 2010 Biological Opinion flows (2010 BiOp Flows) for the analysis of the scenario where dams would remain in place, and modified 2010 BiOp Flows based on KBRA operations criteria for the Klamath Irrigation Project (KBRA Flows) for the analysis of the scenario where dams would be removed (USBR and CDFG 2012). At the time of the 2018 Draft EIR, the KBRA Flows had expired and hydrology was analyzed~~Flows under the Proposed Project were modeled assuming Klamath River hydrology defined by KBRA operations of the Klamath Irrigation Project (USBR 2012). As described in Section 3.1.6 *Summary of Available Hydrology Information for the Proposed*~~

~~*Project*, the KBRA has expired, and hydrology under the Proposed Project would be~~ pursuant to the 2013 Biological Opinion (2013 BiOp) (NMFS and USFWS 2013). ~~As detailed in Section 3.1.6, I~~ 2013 BiOp Flows were found to provide~~s~~ similar flow releases to KBRA, and di~~d~~oes not alter the key hydrological factors that drive model results., ~~including timing, frequency, and magnitude of flows released during winter and spring.~~ The range of 2013 BiOp Flows was found to be within the range of modeled KBRA Flows approximately 99.9 percent of the time at Keno and Iron Gate dams; therefore, the hydrologic (flow and sediment transport) model (USBR 2012) developed for the 2012 KHSA EIS/EIR was still applicable. In addition to the analyses of 2013 BiOp Flows, at the time of the 2018 Draft EIR, 2017 court-ordered flushing and emergency dilution flow requirements (U.S. District Court 2017) were analyzed as part of the cumulative effects and alternatives analyses, separate from the primary resource area analyses.

After the issuance of the 2018 Draft EIR, the applicable biological opinion and the operational flow requirements for the Klamath River changed again because new biological opinions were issued by NMFS (2019) and USFWS (2019). 2019 Biological Opinion flows (2019 BiOp Flows) are now the current operational flow requirement for the Klamath River, superseding all the flow conditions mentioned above, and provide a second CEQA baseline for the EIR analyses. As summarized in Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*, the 2019 BiOp Flows were compared to the previously modeled KBRA Flows to determine whether 2019 BiOp Flows would be sufficiently similar such that hydrologic model outputs developed for the 2012 KHSA EIS/EIR would still be applicable. The range of 2019 BiOp Flows is within the range of modeled KBRA Flows approximately 99.0 percent of the time at Keno Dam and approximately 99.9 percent of the time at Iron Gate Dam, and the previously modeled results are sufficiently representative of the range of flow conditions under the 2019 BiOp Flows. The sediment transport model (USBR 2012) developed for the 2012 KHSA EIS/EIR would produce nearly identical results during the main drawdown period between January and May if it was run using 2013 BiOp Flows or 2019 BiOp Flows, because flows are similar for all water year types. Therefore, the sediment transport analysis provided below is not modified from the Draft EIR in relation to anticipated future flow conditions and continues to be applicable to the Proposed Project considering both the original and current water flow baselines. Please refer to Sections 3.1.6.3 *Klamath River Flows under the 2019 BiOp Operations Criteria for the Klamath Irrigation Project* and Section 3.1.6.4 *Comparison of Klamath River Flows under the 2019 BiOp Operational Criteria and the KBRA Operations Criteria* for further details regarding the details of, and similarities between, the applicable flows.

3.11.4.2 Suspended Sediment

Volume I Section 3.11.4.2 – Geology, Soils, and Mineral Resources – Impacts Analysis Approach – Suspended Sediment, paragraph 3 on page 3-760:

USBR (2012) analyzed the potential effects of the Proposed Project on suspended sediment concentration (SSC) using output from the One Dimension Version (2.4) of the Sedimentation and River Hydraulics sediment transport model (SRH-1D). Using the SRH-1D model, 48 two-year simulations (1961-2008) focused on reservoir erosion and suspended sediment load. SRH-1D provided estimates of daily average SSCs at different points in the river under the No Project Alternative and dam removal conditions (Huang and Greimann 2010, as summarized in USBR 2012) (see also Appendix E of this EIR and ~~). Existing conditions were also simulated using the SRH-1D model, to provide a comparison of what SSCs would be under existing conditions or under the Proposed Project in the years 2020 and 2021(see~~ Section 3.2.4.2 *[Water Quality] Suspended Sediments* for more details). ~~Modeling assumed the Proposed Project occurred within the 48-year period beginning in 1961.~~

3.11.4.3 Bedload Sediment

Volume I Section 3.11.4.3 – Geology, Soils, and Mineral Resources – Impacts Analysis Approach – Bedload Sediment, paragraph 4 on page 3-760:

USBR (2012) also analyzed potential changes to ~~river~~channel bed elevation and grain size ~~bedload sediment~~ using output from the ~~the~~SRH-1D model (Huang and Greimann 2010, USBR 2012) (see also Appendix F of this EIR). Information on the data and parameters input to the SRH-1D model ~~is included~~are described in USBR (2012, pages 9-4 to 9-5). The sediment load inputs to the SRH-1D model are also described in USBR (2012, pages 5-4 to 5-11), with additional information on tributary sediment loads provided in Stillwater Sciences (2010). Both the 48 two-year simulations (1961-2008) and three 50-year simulations conducted using the SRH-1D model were used to analyze fine and coarse sediment deposition on the channel ~~river~~bed, although the 50-year simulations were the focus of the analysis of long-term channel evolution (USBR 2012). ~~Short term (2 year) and long term (5, 10, 25, 50 year)~~ C~~c~~hanges in bed elevation ~~load~~ were evaluated for a range of hydrologic conditions using representative flows taken from historical hydrology. A long-term simulation was not conducted for the Klamath River upstream of Iron Gate Dam under the assumption that short-term bedload sediment conditions (i.e., at the end of 2 -years) are representative of long-term bedload sediment conditions (USBR 2012).

3.11.5 Potential Impacts and Mitigation

Volume I Section 3.11.5 Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation – Potential Impact 3.11-3 Reservoir drawdown could result in hillslope instability in reservoir rim areas, pages 3-762 through 3-763:

Potential Impact 3.11-3 Reservoir drawdown could result in hillslope instability in reservoir rim areas.

The KRRC proposes drawdown of J.C. Boyle, Copco No. 1, and Iron Gate reservoirs would take place between November 1 of dam removal year 1 and

March 15 of dam removal year 2 as detailed in the proposed Reservoir Drawdown and Diversion Plan (Appendix B: *Definite Plan*). For all reservoirs, the minimum drawdown rate would be 2 feet per day and the maximum drawdown rate would be 5 feet per day, until drained. Although the new gates at Copco No. 1 and Iron Gate dams would be able to accommodate higher drawdown rates, the maximum drawdown rate of 5 feet per day is recommended by KRRC as a conservative value based upon slope stability analyses conducted for each of the Lower Klamath Project reservoirs.

The area surrounding J.C. Boyle Reservoir is generally low gradient and underlain by competent materials. Review of topographic data and reconnaissance of the reservoir slopes indicate that no landslides occur adjacent to the reservoir. For these reasons, the stability of the J.C. Boyle Reservoir slopes would be unaffected by the reservoir drawdown and there would be no impact due to the Proposed Project.

No large-scale landslides have been identified in the terrestrial or subaqueous slopes around Copco No. 1 Reservoir. Diatomaceous deposits and associated fluvio-lacustrine terrace deposits along the rim and below the reservoir water level present the greatest potential for slope instability during drawdown (Appendix B: *Definite Plan*). Where the toe of the diatomite deposit lies above the current high lake level, slope response to rapid drawdown is determined by the properties and geometry of the underlying volcanic and volcaniclastic strata. Where the toe of the diatomite deposit lies below the current high lake level, slope response to rapid reservoir drawdown is determined by the properties and thickness of the diatomite deposits and the underlying material. Based on the low diatomite permeability, the proposed drawdown rate (2 to 5 feet per day) would have minimal effect on its stability. KRRC is therefore not proposing to limit the drawdown rate of Copco No. 1 Reservoir beyond that proposed.

The geologic assessment and slope stability analysis conducted by KRRC (Appendix B: *Definite Plan – Appendix E*) indicated that certain segments ~~along the~~around Copco No. 1 Reservoir ~~rim~~ have a potential for slope failure that could impact existing roads and/or private property (Figure 3.11-10). These areas include approximately ~~3,700~~1,780 linear feet ~~of slopes along Copco Road and approximately 2,800 linear feet of slope adjacent to private property (Appendix B: *Definite Plan*)~~of shore-parallel length with potential for failures to impact existing structures outside the reservoir rim, including approximately 430 linear feet of slopes along Copco Road (north shore segment N11a) and approximately 1,350 linear feet of slope adjacent to private property (south shore segments S5, S11a, and S12b). ~~Up to eight~~Twelve parcels and four habitable structures in these potentially unstable areas could potentially be impacted by slope failure. An additional five parcels and four habitable structures may experience damage and/or deformation due to nearby slope failure. ~~KRRC has proposed to complete additional field geologic investigation and laboratory testing of material properties to better understand the potential for slope instability in these areas.~~

As part of the Proposed Project, KRRC would consider the following actions to minimize, remediate, or offset potential impacts in reservoir rim areas where there is a high probability of slope failure (Appendix B: *Definite Plan – Appendix E [Amended 2019],* pages 48-49):

1. Additional testing and analyses to provide a satisfactory level of safety, such as permeability testing or deformation analyses.
2. Along the south shore where habitable structures may be impacted, temporary relocation of residents and monitoring until it is safe for residents to return, as well as property purchase or repairs if there is permanent deformation or damage to structures.
3. Stabilization with retaining wall(s) designed to meet the required factor of safety.
4. Stabilization with buttress(es) at the toe or the slope(s).
5. For the north shore segment along Copco Road, rerouting the road to a stable area.

~~1. For segments along Copco Road:~~

~~a. Re-align road segment away from rim slope~~

~~b. Engineer structural slope improvements (e.g., drilled shafts or other structural elements that could be installed to resist slope movement)~~

~~2. For segments adjacent to property or structure:~~

~~a. Move structure or purchase property~~

~~b. Engineer structural slope improvements (e.g., drilled shafts or other structural elements that could be installed to resist slope movement)~~

While the KRRC proposed actions in the Definite Plan are ~~the proposed actions is~~ designed to reduce potential impacts ~~the potential for new or exacerbated mass wasting around the rim of the reservoirs~~ associated with slope instability as a result of reservoir drawdown, the proposed actions do not explicitly address potential impacts resulting from hillslope instability outside of those areas currently identified as having a high probability of slope failure or commit KRRC to implementation of their aforementioned proposed actions. Therefore, the impact of the project on properties, structures, and Copco Road from hillslope instability in reservoir rim areas would be significant.

Subsequent to the Definite Plan, the KRRC agreed to implement actions (Mitigation Measure GEO-1, below) to reduce potential impacts to people, structures/public facilities, water quality, and/or volitional fish passage associated with slope instability as a result of reservoir drawdown. Implementation of Mitigation Measure GEO-1 would reduce the impact of slope failure in reservoir areas to less than significant. If instability ~~of these deposits~~ exposes cultural resources, then the impact may be significant and mitigation may be required (see Volume III Attachment 1 Section 3.12.5 *[Historical Resources and Tribal Cultural Resources] Potential Impacts and Mitigation*).

The extent and morphology of bedrock outcrops and general lack of surficial deposits around Iron Gate Reservoir suggest stable reservoir slopes under rapid drawdown conditions (Appendix B: *Definite Plan*). There may be potential for drawdown to induce block sliding where hard, strong volcanic flow rocks are underlain by saturated tuffaceous beds and bedding dips into the valley (PanGEO 2008). Hammond (1983) reports several low to moderate dip angles of volcaniclastic beds into the valley, but there is no evidence of previous slope instability at these locations. Historical aerial photographs indicate that the three possible old landslide-related features that occur on the south rim of Iron Gate Reservoir have been stable and unaffected by historical reservoir drawdowns and have a low risk of instability during future drawdown (Appendix B: *Definite Plan*). Shallower slides are likely to occur in the shallow surficial deposits around the reservoir rim and on the reservoir slopes that are currently below the reservoir surface (Appendix B: *Definite Plan*). Small, shallow soil failures in the more deeply weathered volcaniclastic beds and in colluvial deposits present a minor hazard to Copco Road where the road is immediately adjacent to the shore (Appendix B: *Definite Plan*). These slope failures are likely to be shallow and local and therefore, if they were to occur, would constitute a less than significant impact.

Volume I Section 3.11.5 Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation – Potential Impact 3.11-3 Reservoir drawdown could result in hillslope instability in reservoir rim areas – updated Figure 3.11-10 on page 3-764:

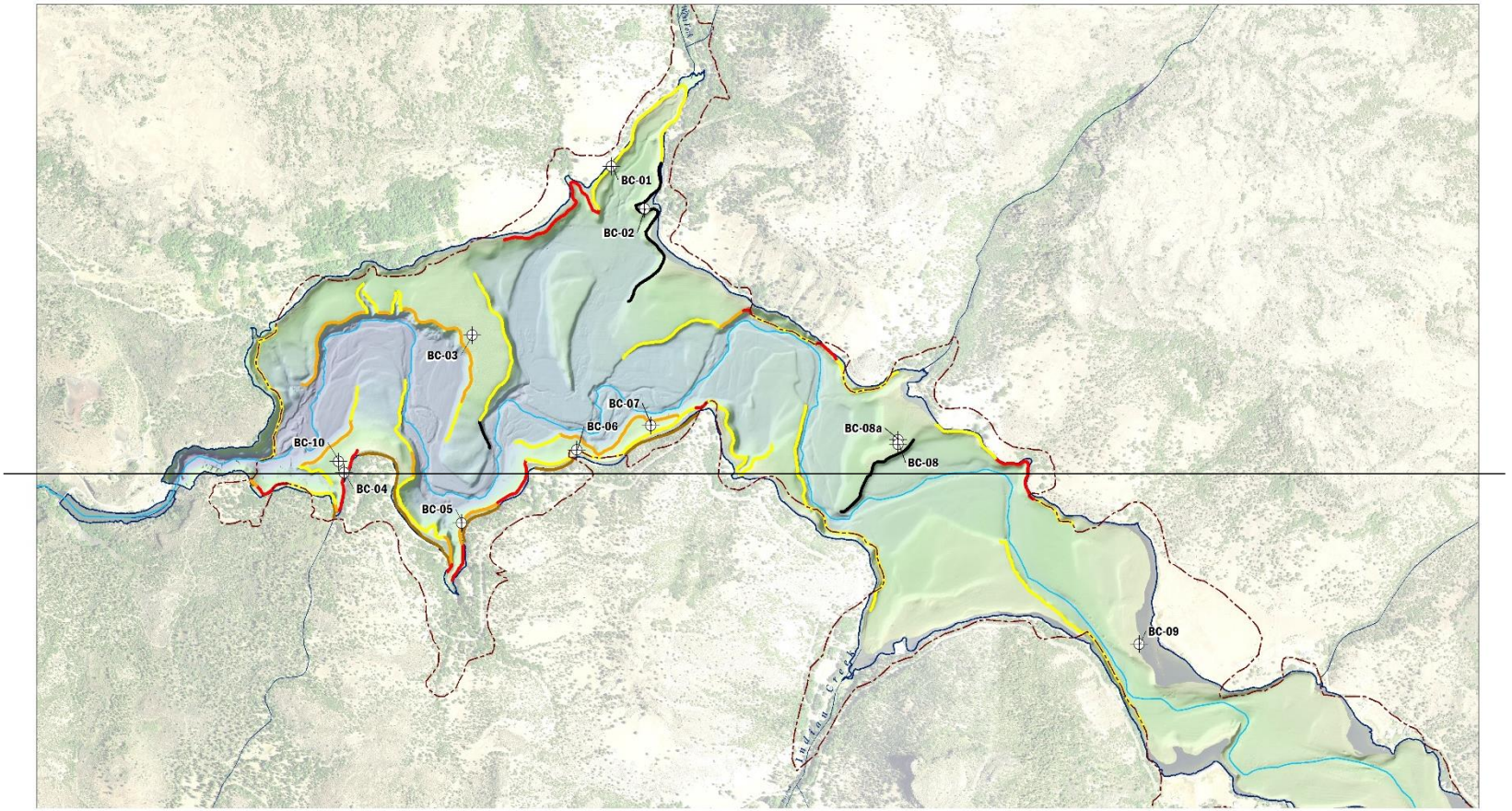

FIGURE 3-4
Copco Dam - Slope Failure Analysis Overview Map

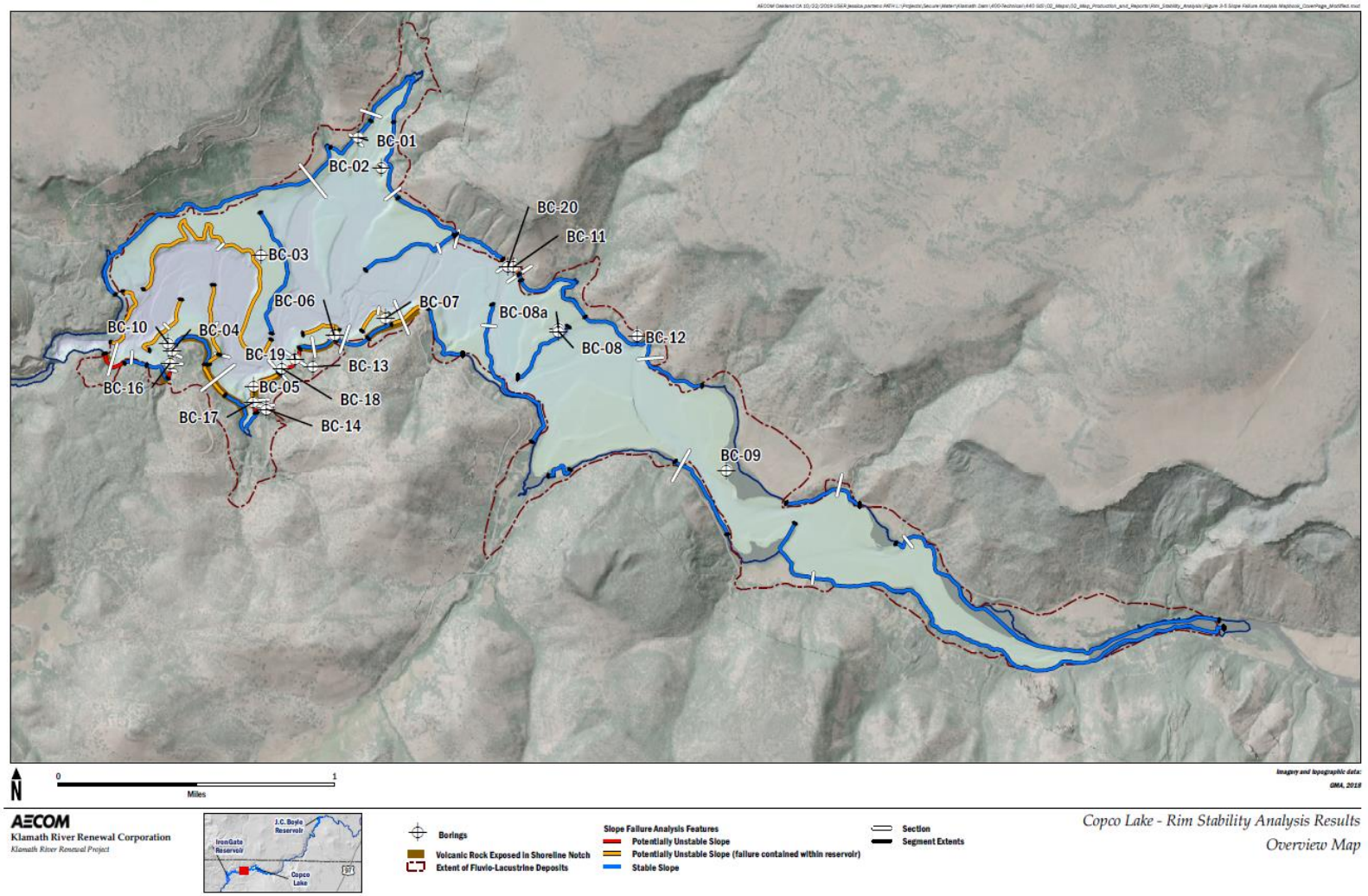

Figure 3.11-10. Results of slope failure analysis at Copco No. 1 Reservoir (Appendix B: *Definite Plan*).

Mitigation Measure GEO-1 – Slope Stabilization.
Prior to the start of reservoir drawdown, KRRC shall offer to temporarily relocate or otherwise assist residents who reside on potentially unstable slopes on the south shore of Copco Lake, and residents on the north shore of Copco Lake whose residences may be affected by slope failures during the drawdown of the reservoir, if testing and analysis undertaken by KRRC indicates that potential slope failures and/or structural impacts related to Project activities could occur in these locations. Potentially unstable slopes currently include those listed in Appendix B: *Definite Plan – Appendix E* (2018). Prior to reservoir drawdown, KRRC shall reroute or take other appropriate action to maintain safe conditions on Copco Road (currently includes the potential areas listed in Appendix B: *Definite Plan – Appendix E* (Amended 2019) if testing and analysis undertaken by KRRC indicates that potential slope failures related to Project activities could affect the road.

KRRC will ~~visually~~ monitor ~~large,~~ potentially unstable areas ~~within~~along the Copco No. 1 Reservoir ~~footprint~~rim for the duration of reservoir drawdown and for two weeks~~ following drawdown~~, or longer if KRRC determines that a longer monitoring period is prudent, after the drawdown is complete. Monitoring may include inclinometers, surveys, vibrating wire piezometers, and visual inspections. Depending on the location, monitoring may involve tribal monitors (see also Mitigation Measures TCR-1, TCR-2, and TCR-3). If slope failure related to Project activities is observed, an exclusion zone will be established around the unstable area and the KRRC will monitor the unstable area.

~~Following~~Throughout drawdown activities, and ~~once~~when the areas are safe to inspect, the KRRC shall inspect any Project-related slope failures that occurred during and following drawdown, and implement slope stabilization measures, as appropriate. For any ~~large~~ slope failure related to Project activities that occurs during drawdown or the year following drawdown and that adversely impacts a structure or public facility or impacts or has a material potential to impact water quality or volitional fish passage, KRRC will ~~offset potential impacts by implementing~~fund or implement the following actions:

1. By agreement with the property owner, repair or ~~M~~move affected structures and/or purchase affected property~~,~~; or
2. Repair and/or ~~R~~re-align affected road segments~~,~~; or
3. Regrade and/or ~~E~~engineer structural slope improvements (e.g., retaining walls, buttresses, drilled shafts or other structural elements that could be installed to resist slope movement)~~,~~; and
4. Revegetate affected areas to the extent revegetation is feasible and appropriate.

Volume I Section 3.11.5 Geology, Soils, and Mineral Resources – Potential Impacts and Mitigation – Potential Impact 3.11-5 Reservoir drawdown could result in substantial short-term sediment deposition in the Klamath River downstream of Iron Gate Dam due to erosion of reservoir sediment deposits and a long-term change in sediment supply and transport due to dam removal, pages 3-765 through 3-775:

Potential Impact 3.11-5 Reservoir drawdown could result in substantial short-term sediment deposition in the Klamath River downstream of Iron Gate Dam due to erosion of reservoir sediment deposits and a long-term change in sediment supply and transport due to dam removal.
Based on average annual sediment deposition rates, approximately 15.1 million yd^3 (4.16 million tons) of sediment would be deposited behind the dams by 2020 (USBR 2012) (Table 3.11-6). Since submitting the original application, KRRC has revised its projection for the year of primary drawdown to be 2022, rather than 2020. Between 2020 and 2022~~1~~ (i.e., ~~revised~~ dam removal year 2 when drawdown would primarily occur), the sediment volume present behind the dams would increase by approximately 162,600~~81,300~~ cubic yards in Copco No. 1 Reservoir (1.97 percent increase) and approximately 2~~1~~00,000 cubic yards in Iron Gate Reservoir (3.51~~%~~ percent increase) based on estimates of annual sedimentation rates for each reservoir (USBR 2012). The percent increase in the total reservoir sediment volume between 2020 and 2022~~, when drawdown is now anticipated,~~ would be less than five percent. The increase in sediment volume between 2020 and 2022~~1~~ would be an order of magnitude less than the total uncertainty of the 2020 total sediment volume estimates and the annual sediment deposition rates (i.e.,~~,which is~~ approximately 2,000,000 ~~1,984,943~~ cubic yards for Copco No. 1 and Iron Gate reservoirs).~~and the percent increase in the total reservoir sediment volume would be less than 5 percentso~~ Therefore, model results using the 2020 sediment volumes would still be representative of, and applicable to, the Proposed Project.

Table 3.11-6. Estimated Amount of Sediment in the Lower Klamath Project Reservoirs in 2020 (Source: USBR 2012).

Reservoir	Estimated 2020 Total			
	Total Volume (yd^3)	Total Sediment (tons)[1]	Fine Sediment[2] (tons)	Sand[3] (tons)
J.C. Boyle	1,190,000	340,000	220,000	120,000
Copco No. 1	8,250,000	2,090,000	1,800,000	290,000
Iron Gate	5,690,000	1,730,000	1,460,000	280,000
Total[4]	**15,130,000**	**4,160,000**	**3,480,000**	**680,000**
Total Copco No. 1 and Iron Gate	**13,940,000**	**3,820,000**	**3,260,000**	**560,000**

[1] Ton is defined as equal to 2,000 pounds (dry weight).
[2] Fine sediment is sediment with a diameter less than 0.063 millimeters.
[3] Sand is sediment with a diameter between 0.063 and 2 millimeters.
[4] Sediment volumes and weights from individual reservoirs from USBR (2012) were rounded to the nearest 10,000th unit. Copco No. 2 Reservoir does not retain measurable amounts of sediment and therefore is not included in the estimates of total stored sediment.

Reservoir sediment consists primarily of silts and clays that would be easily eroded during drawdown. Approximately 36 to 57 percent of the total sediment stored in J.C. Boyle, Copco No. 1, and Iron Gate reservoirs by dam removal year 2 ~~2021~~ would be eroded and transported downstream during the drawdown period and the year following dam removal (i.e., short-term), or an estimated 5.4 to 8.6 million yd^3 (1.2 to 2.3 million tons) (Table 3.11-7, Figure 3.11-11). Approximately 15 percent of this sediment eroded from reservoir areas during the first year following dam removal would be transported farther downstream as bedload.

The rate of reservoir drawdown would affect the amount of erosion of the sediment deposit. A faster drawdown rate would reduce the time of interaction between the flow and reservoir sediment deposits, thus reducing the overall amount of sediment erosion, whereas a slower drawdown rate would increase the time of interaction between the flow and reservoir sediment deposits, thus increasing the overall amount of sediment erosion. It is expected that increasing the previously modeled maximum drawdown rate of 2.25 to 3 feet per day (USBR 2012~~b~~) to the Proposed Project maximum drawdown rate of 5 feet per day (Appendix B: *Definite Plan – Appendix P*) would slightly decrease the total amount of sediment erosion that occurs during drawdown. The previously modeled maximum drawdown rate would result in erosion of 36 to 57 percent of the reservoir sediment deposits (Table 2.7-11). Increasing the drawdown rate to 5 feet per day would most likely result in less erosion than previously modeled.

Erosion and transport of sediment deposits within Copco No. 1 and Iron Gate reservoirs during drawdown would be assisted by using barge-mounted pressure sprayers to jet water onto newly exposed reservoir sediment deposits as the water level drops (a process referred to as sediment jetting). Sediment jetting would maximize erosion of reservoir sediment deposits in historical floodplain areas (especially the historical two-year floodplain) during drawdown and minimize the potential for future erosion of reservoir sediment deposits after the drawdown period. Additionally, removal of reservoir sediment deposits with sediment jetting would promote riparian bank and floodplain connectivity by increasing river inundation on the historical floodplain during high flow events and minimize manual excavation and grading of sediments from proposed restoration sites after completing drawdown. Sediment jetting would be focused in the six areas where restoration actions are proposed within the Copco No. 1 Reservoir footprint (see enumerated areas for wetlands, floodplains, and off-channel habitat features, and associated yellow triangles depicting areas of tributary connectivity, in Figure 2.7-11~~9~~) and the three areas where restoration actions are proposed within the Iron Gate Reservoir footprint (see enumerated areas for wetlands, floodplains, and off-channel habitat features, and associated yellow triangles depicting areas of tributary connectivity, in Figure 2.7-12~~100~~).

While the anticipated amount of sediment that will be eroded varies by reservoir, approximately 36 to 57 percent (5.4 to 8.6 million yd^3 [1.2 to 2.3 million tons]) of the total dam removal year 2~~2020~~ reservoir sediment volume is expected to erode and be transported downstream during the drawdown period (Table 2.7-1). Large quantities of sediment would remain in place after dam removal in each of the former reservoirs, primarily in areas above the active channel. The remaining sediments would consolidate (dry out and decrease in thickness). Studies of the existing sediments in J.C. Boyle Reservoir show an anticipated change in sediment depth of up to 61 percent of original depth (USBR 2010b; USBR 2012b~~a~~). A higher degree of shrinkage of the sediment layers is expected in Copco No. 1 and Iron Gate reservoirs due to the increased organic matter content in these sediment deposits.

The range in the estimated volume of sediment eroded from each reservoir is primarily dependent upon whether the prevailing hydrology during reservoir drawdown corresponds to a dry hydrologic year or a wet hydrologic year. The majority of the erosion would occur during the reservoir drawdown process and would be a combination of direct erosion of sediment by moving water, slumping of the fine sediment along the reservoir sides toward the river, and sediment jetting of some areas of reservoir-deposited sediments during drawdown. In a dry hydrologic year, reservoir pool levels can be drawn down steadily and relatively quickly, resulting in a shorter period of interaction between the flow and sediment deposits, and thus less overall sediment erosion. In a wet hydrologic year, the reservoir pool may experience cycles of drawdown followed by periods of refilling during high flow events, resulting in longer period of interaction

between the flow and the sediment deposits, and thus more overall sediment erosion.

Table 3.11-7. Estimated Amount of Sediment Erodible with Dam Removal (Source: USBR 2012).

Reservoir	Percent Erosion[1]		Fine Sediment Erosion		Sand Erosion	
	Minimum Erosion (percent)	Maximum Erosion (percent)	Minimum (tons)	Maximum (tons)	Minimum (tons)	Maximum (tons)
J.C. Boyle	27	51	60,000	110,000	30,000	60,000
Copco No. 1	45	76	820,000	1,370,000	130,000	220,000
Iron Gate	24	32	350,000	460,000	70,000	90,000
Total	36	57	1,230,000	1,950,000	230,000	370,000
Total Copco No. 1 and Iron Gate	36	56	1,170,000	1,830,000	200,000	300,000

[1] The erosion rates are based on hydrologic conditions recorded for the March to June flow volume at Keno gage on the Klamath River from water year 2001 (90 percent exceedance) and 1984 (10 percent exceedance). Erosion would primarily occur during the drawdown period. Additional erosion and sediment transport could occur in the following year that would be indistinguishable from the background sediment regime.

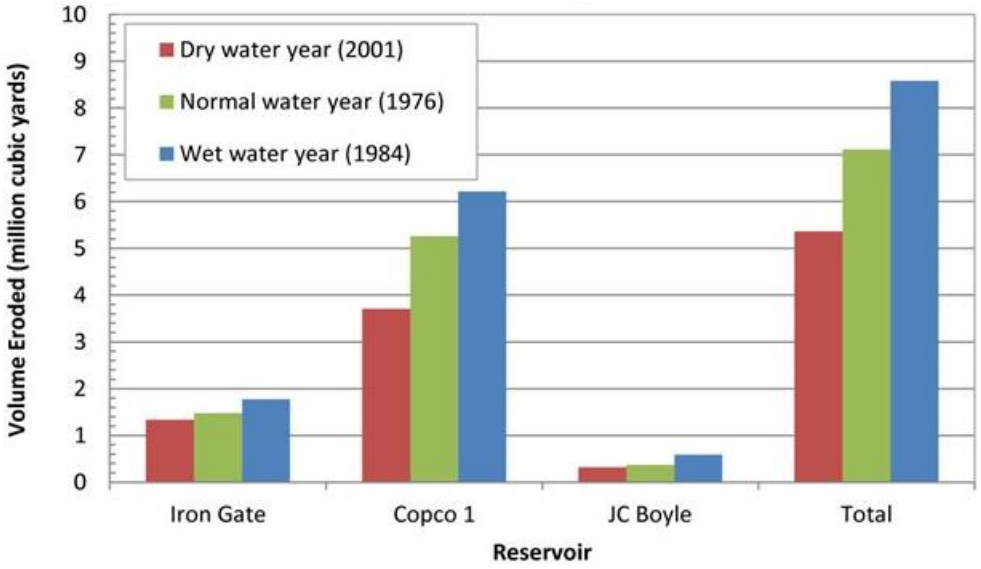

Figure 3.11-11. Volume of Sediment Eroded from Reservoirs in the Hydroelectric Reach During 2020 Drawdown, Beginning in January (USBR 2012, page 9-34).

Model simulations indicate that 43 percent to 64 percent of the sediment stored in the reservoirs would remain in place following the year after dam removal (i.e., long-term), primarily as a relatively thin wedge in areas above the active channel. The remaining sediment would consolidate (i.e., harden, dry, shrink in volume, and decrease in thickness) following reservoir drawdown (USBR 2012). Studies of the existing sediment in Lower Klamath Project reservoirs indicate an anticipated change in sediment thickness in J.C. Boyle Reservoir of up to 61 percent due to consolidation (USBR 2012). A higher degree of shrinkage of the sediment layers is expected for Copco No. 1 and Iron Gate reservoirs due to the increased organic matter content in the sediment deposits contained within these reservoirs. Sediment deposits remaining in the reservoir footprints following reservoir drawdown would erode slowly, or potentially not at all due to consolidation. Secondary erosion of residual reservoir deposits would be affected by increases in shear strength with desiccation, the prevalence of cracks, and disintegration in response to wetting and drying cycles. The prevalence of cracking would encourage gully erosion as lower infiltration rates intensify surface runoff and concentrate flow in cracks. Gullies would incise and widen with time. The availability of coarse sediment (i.e., sand and larger) to abrade fine-grained deposits may be an important factor encouraging gully erosion. Gullies closer to coarse sediment sources (e.g., near the steep hillslopes at Copco No. 1 and Iron Gate reservoirs) may have more effective secondary erosion than areas lacking those sediment sources (e.g., Upstream Reach of J.C. Boyle Reservoir) (Appendix B: *Definite Plan* – Appendix H *Reservoir Area Management Plan*, page 131). As riverine conditions return within the reservoir footprints, any additional erosion and transport of reservoir sediment farther downstream would be indistinguishable from background rates within the watershed. Overall, this degree of long-term erosion would be a less than significant impact. Future construction activities (e.g., access road construction, recreation facilities) would need to consider the potential instability and erodibility of sediment remaining within the reservoir footprints.

~~Anticipated erosion volume due to dam removal into the context of annual basin-wide sediment discharge are estimated to average an annual total sediment supply from the Klamath River to the Pacific Ocean of approximately 5.8 million tons (4 million tons/yr of fine sediment and 1.8 million tons/yr of sand and larger sediment (Stillwater Sciences (2010). Farnsworth and Warrick (2007) estimate that the average annual silt and clay discharge is 1.2 million tons/yr.~~ The total average annual sediment supply to the Klamath River is estimated to be approximately 6.2 million tons (4.2 million tons/yr of fine sediment and 2.0 million tons/yr of sand and larger sediment) (modified from Stillwater Sciences [2010]). Farnsworth and Warrick (2007) estimate that the average annual yield of silt and clay size sediment to the Pacific Ocean is approximately 1.2 million tons/yr. The considerable uncertainty in these average annual ~~average sediment load~~ estimates of supply and yield is related to channel and floodplain sediment storage, the different approaches to estimation, lack of established relationship between flow and SSC, ~~the lack of a unique relationship between flow and SSC,~~

the large variation in ~~the~~ measurement of SSCs, and the large annual variation in sediment loads between different water year types. In dry years the supply of sediment to the ocean could be less than 1 million tons/yr (Figure 3.11-12). Given these estimates, it is expected that the amount of sediment released during the year of drawdown and dam removal would be similar to that transported by the Klamath River to the Pacific Ocean in a year with average flow, much less than that transported by the Klamath River in a wet year, and greater than that transported by the Klamath River in a dry year.

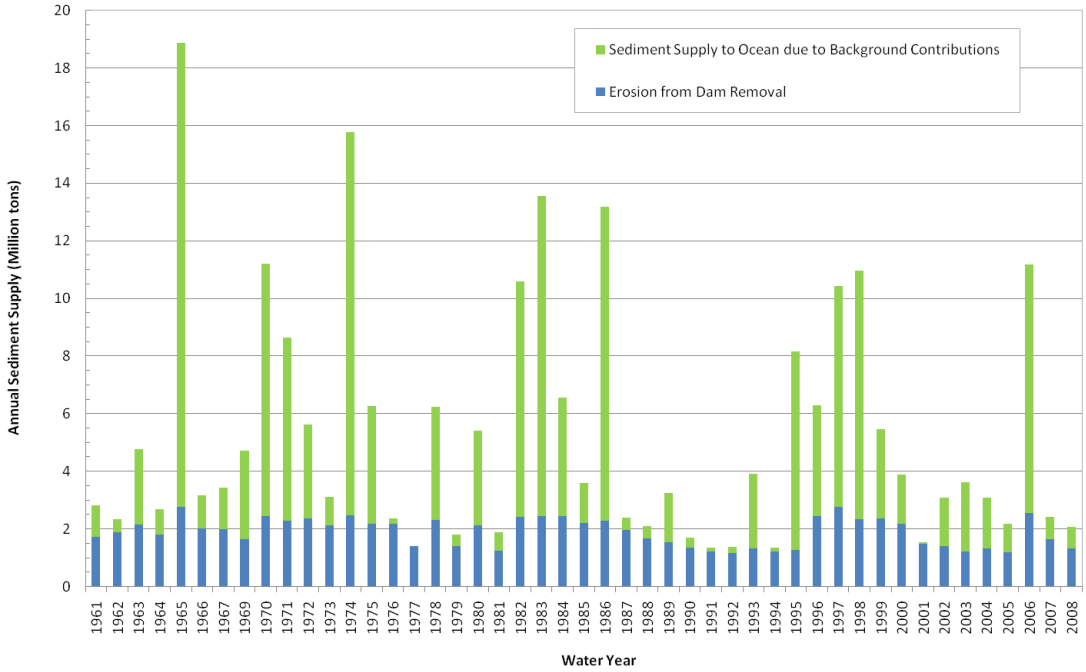

Figure 3.11-12. Annual Predicted Sediment Delivery to the Pacific Ocean under the Proposed Project and Existing Conditions ("Background Contributions") by Water Year. Model results are only valid for the year of dam removal, and no significant increase in sediment loads is predicted in years following dam removal (Source: USBR 2012, page 9-27).

Channel Response in the Hydroelectric Reach

SRH-1D modeling results indicate channel bed elevations would decrease and median channel substrate size would increase within the reservoir reaches during drawdown (January to May of the drawdown year) (Figure 3.11-13, Figure 3.11-14). The proportion of fine sediment would decrease to near zero within two months after drawdown; the proportion of sand would initially increase to 30 to 50 percent then decrease to 10 to 25 percent; the proportion of gravel would change (mostly increase) to 20 to 35 percent; and the proportion of cobble would increase to 50 to 70 percent. The estimated changes depend on the reservoir and simulation water year type (i.e., wet, median, or dry). These changes would

stabilize within six months as the bed within the historical river channel reaches pre-dam elevations (USBR 2012). After dam removal, channels currently inundated by reservoirs would likely vary from narrow, single-threaded to wide and sinuous with the potential to form complex features, such as meander cut-offs and vegetated islands (USBR 2012).

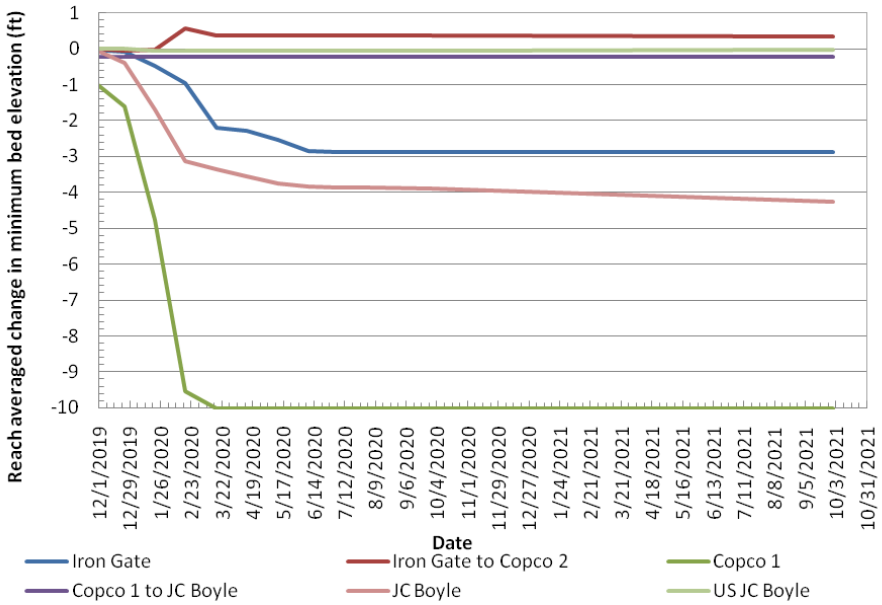

Figure 3.11-13. Reach-Averaged Erosion in the Hydroelectric Reach during a Representative Wet Water Year (USBR 2012, page 9-35).

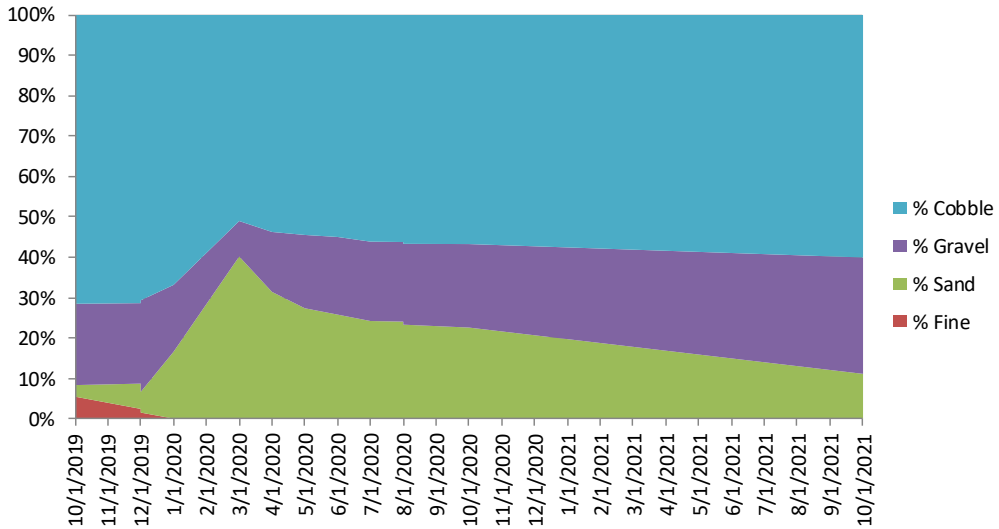

Figure 3.11-14. Simulated Bed Composition from Copco No. 2 to Iron Gate Reservoirs during Two Successive Representative Dry Water Years During and After Drawdown (Based on simulation results provided by USBR, ~~March~~ 2012).

The river reaches upstream of J.C. Boyle Reservoir and from Copco No. 1 Reservoir to J.C. Boyle Dam would experience little change in bed composition or median substrate size during drawdown (USBR 2012). Currently, these reaches are predominantly cobble (90 percent) with small fractions of gravel and sand. Modeling of the Copco No. 2 Dam to Iron Gate Reservoir reach shows decreases in the combined proportion of sand and fines, with the dry simulations showing decreases to approximately 35 percent of sand and fines two years after drawdown.

Channel Response in the Klamath River Downstream of Iron Gate Dam

The short-term (i.e., two years following dam removal) effects of the Proposed Project on dam-released sediment and sediment resupply would likely extend from Iron Gate Dam to approximately Cottonwood Creek (USBR 2012). Because approximately 85 percent of the sediment stored within the reservoirs is fine (silt and clay), most sediment eroded from the reservoirs would be fine. Fine sediment transport rates would increase downstream of Iron Gate Dam during the short-term, but a large portion of this fine sediment would be transported to the ocean as suspended sediment shortly after being eroded (Stillwater Sciences 2008; Stillwater Sciences 2010;~~,~~ USBR 2012). Coarse sediment (i.e., sand and larger) transport would occur more slowly depending on the frequency and magnitude of mobilization flows and attenuation by channel storage.

Short-term (2-year) SRH-1D model simulations ~~–~~focused on reservoir sediment erosion and fine sediment load in the Klamath River following drawdown ~~-~~indicate up to about 0.9 feet of reach-averaged sediment deposition between Bogus Creek and Willow Creek (RM 188.0) (Figure 3.11-15), although conservative long-term (50-year) simulations focused on channel bed elevation change indicate that fine and coarse sediment deposition within 2 years of dam removal may be up to 1.7 feet (see Figure 3.11-18 below) (USBR 2012). Short-term simulations also indicate~~and~~ up to about 0.4 feet of sediment deposition from Willow Creek to Cottonwood Creek ~~(USBR 2012)~~ (Figure 3.11-15), although conservative long-term (50-year) simulations indicate that fine and coarse sediment deposition within 2 years of dam removal may be up to 0.9 feet (see Figure 3.11-18 below) (USBR 2012). Model simulations indicate that reaches located farther downstream will change little (< 0.5 feet of erosion or deposition) (Figure 3.11-15; Figure 3.11-18) (USBR 2012). ~~Any f~~Fine sediment that does deposit on the channel bed in the short term would be transient and subject to remobilization. Smaller quantities of coarse sediment would be less transient, as discussed below in relation to long-term sedimentation. Eight miles of the Klamath River mainstem channel from Iron Gate Dam to Cottonwood Creek could potentially be affected by significant short-term sediment deposition released upon dam removal~~, and resupply~~, representing 4 percent of the total mainstem channel length downstream of Iron Gate Dam (190 miles).

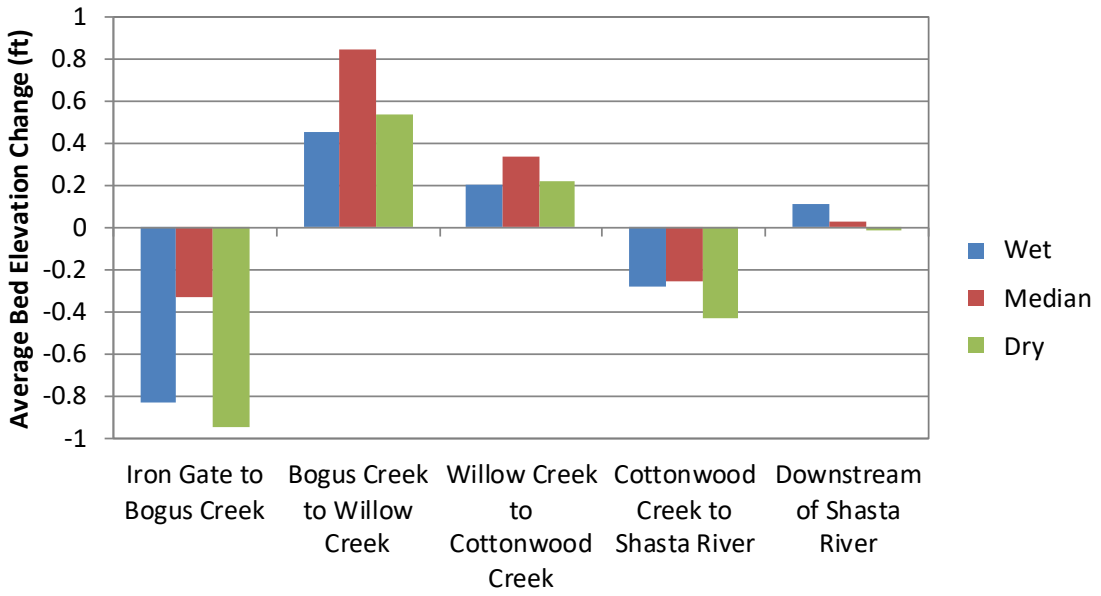

Figure 3.11-15. Reach-~~A~~averaged Bed Elevation Change for Two Successive Wet, Median, or Dry Water Years Following Reservoir Drawdown (Based on SRH-1D 2-year model simulation results provided by USBR ~~,March~~ 2012). Model results contain more uncertainty in the reach from Iron Gate to Bogus Creek due to data gaps.

It is not possible to accurately predict short-term deposition patterns in the mainstem river channel at a fine spatial scale (e.g., individual pools or other slack-water areas) under the Proposed Project using 1D sediment transport models. However, the general short-term sediment transport and depositional patterns can be reasonably surmised based on patterns observed in the Klamath River and other analogous river channels. Dam-released sediment may temporarily deposit in pools and other slack water areas (e.g., eddies) and at tributary confluences, with the greatest deposition predicted in the reach from Iron Gate Dam to Cottonwood Creek. These transient sediment deposits would be highly erodible during subsequent flow events, leading to a short residence time (i.e., the median return period for initiation of sediment remobilization from Iron Gate Dam to Indian Creek is approximately four years considering historic flows [1961-2008] and is predicted to be shorter than this in the reaches from Iron Gate Dam to Cottonwood Creek following dam removal due to fining of the bed [described in more detail below] ~~likely one year or less except during dry years~~). KRRC proposes a channel survey to document pool depths in the Klamath River from Iron Gate Dam to Humbug Creek prior to dam removal, and every year after dam removal for the first 3 years.

In the short term, SRH-1D model simulations indicate that dam-released sediment and sediment resupply under the Proposed Project would increase the

proportion of sand in the channel bed and decrease median bed substrate size (Figure 3.11-16 and Figure 3.11-17) (USBR 2012). Under wet, median and dry simulations, sand within the bed in the reach from Iron Gate to Bogus Creek would increase to 30 to 35 percent by March to June of the drawdown year, gradually decreasing to 10 to 20 percent by September two years later. Median substrate size (D_{50}) would fluctuate slightly before stabilizing to approximately existing conditions with a D_{50} of 100 mm (Appendix F). Short-term model simulations also indicate a decrease in median grain size (from an initial value of approximately 80 mm down to 40 to 65 mm) and an increase in the proportion of sand (up to 40 percent) in the reach from Bogus Creek to Willow Creek, and an increase in the proportion of sand (up to 35 percent) and a decrease in median grain size (from an initial value of approximately 65 mm down to 38 to 45 mm) in the reach from Willow Creek to Cottonwood Creek (Appendix F).

Given that the mechanism for short-term sediment deposition in the Klamath River downstream of Iron Gate Dam is erosion of the reservoir sediment deposits that results in elevated SSCs as analyzed in Potential Impact 3.2-3, the reasons that the significant short-term sediment deposition described for the Klamath River from Iron Gate Dam to Cottonwood Creek cannot be avoided or substantially decreased through reasonably feasible mitigation described in Potential Impact 3.2-3 also apply to this significant impact.

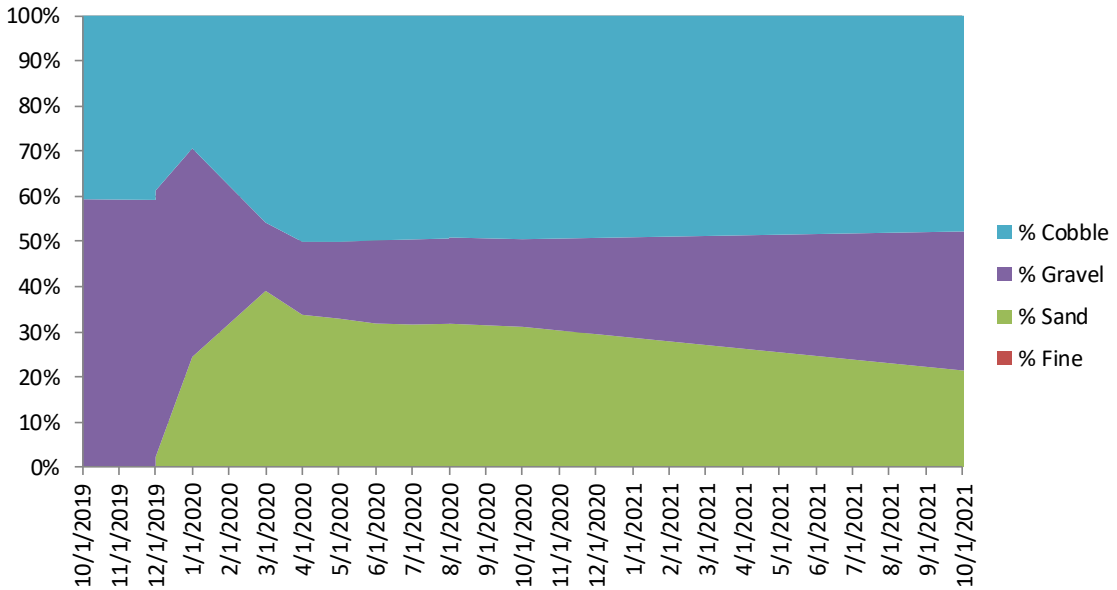

Figure 3.11-16. Simulated Bed Composition from Iron Gate Dam to Bogus Creek during Two Successive Dry Water Years Following Reservoir Drawdown (Based on simulation results provided by USBR, March 2012).



Figure 3.11-17. Simulated D50 (mm) from Iron Gate Dam to Bogus Creek during Successive Wet, Median, and Dry Water Years Following Reservoir Drawdown (Based on simulation results provided by USBR~~, March~~ 2012).

In general, the Proposed Project would have the beneficial long-term (i.e., 50 years) effects of increasing sediment supply and transport and creating a more dynamic and mobile bed downstream of Iron Gate Dam. During the 50 years following the initial release of sediment by the Proposed Project, bed elevations would adjust to a new equilibrium in response to sediment supplied by upstream tributaries within the Hydroelectric Reach. While long-term (50-year) SRH-1D model simulations indicate that 0.8 to 1.7 feet of aggradation could result from the Proposed Project between Iron Gate Dam and Cottonwood Creek (i.e., simulations based on a median start year), no significant long-term sediment deposition is expected downstream of Cottonwood Creek (Figure 3.11-18) (USBR 2012). The assumptions in the SRH-1D model regarding bed mixing result in i~~s~~ conservatively thick ~~regarding bed mixing; thus the~~ estimates of long-term bed deposition ~~is conservative~~ (USBR 2012). Long-term (5 to 50 year) simulations indicate that after 5 years, the Proposed Project would increase the proportion of sand in the bed to 5 to 22 percent and decrease the D_{50} to approximately 50 to 55 mm (Appendix F). These changes would stabilize and continue through to Year 50. Fining of the bed surface would reduce the median estimate of flow required to initiate mobilizatione of the channel bed from approximately 10,000 cfs to 6,000 cfs in the reach from Bogus Creek to Willow Creek (RM 192.6 to RM 188) and from 11,000 cfs to 6,000 cfs in the reach from Willow Creek to Cottonwood Creek (RM 188 to RM 185.1) (USBR 2012). The corresponding return period for the initiation of a bed-mobilizing flow in the reach

from Iron Gate Dam to Cottonwood Creek (USGS RM 193.1 to RM 185.1) would decrease from approximately 4 years to approximately 2 years (USBR 2012, pages 9-86 to 9-88) (Figure 3.11-19). Downstream of Cottonwood Creek, the return periods for bed-mobilizing flows would not be significantly altered from historic conditions (Figure 3.11-6).

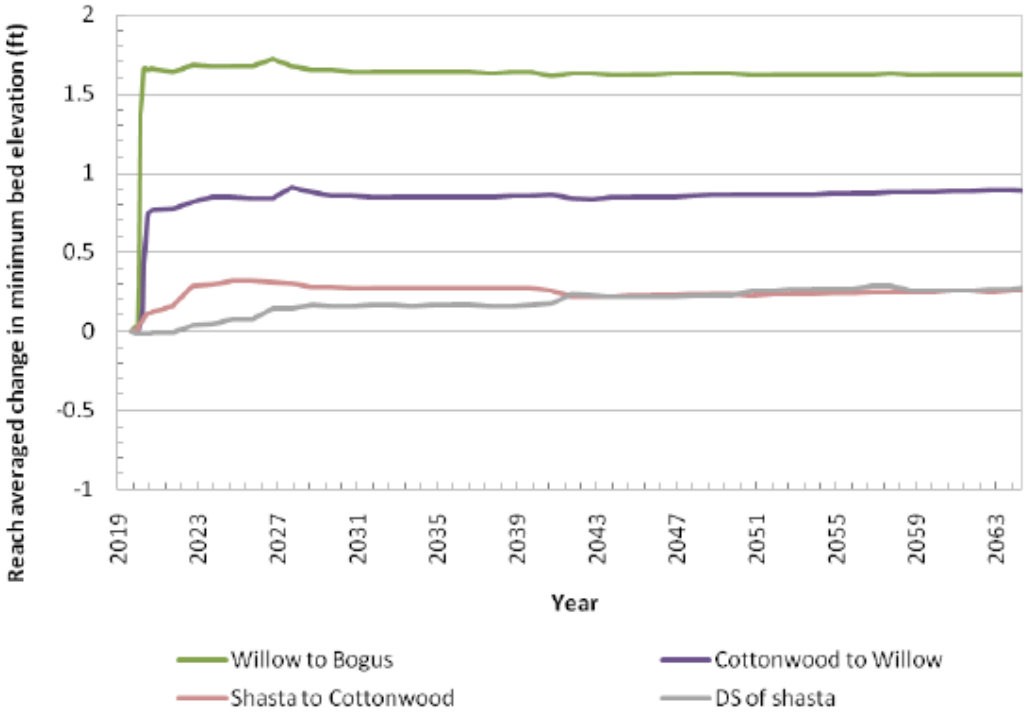

Figure 3.11-18. Reach-averaged Bed Elevation Change from Iron Gate Dam to Shasta River Post Dam Removal, with Dam Removal Occurring in a Median Water Year (Based on SRH-1D 50-year model simulation results provided by USBR 2012, page 9-36).

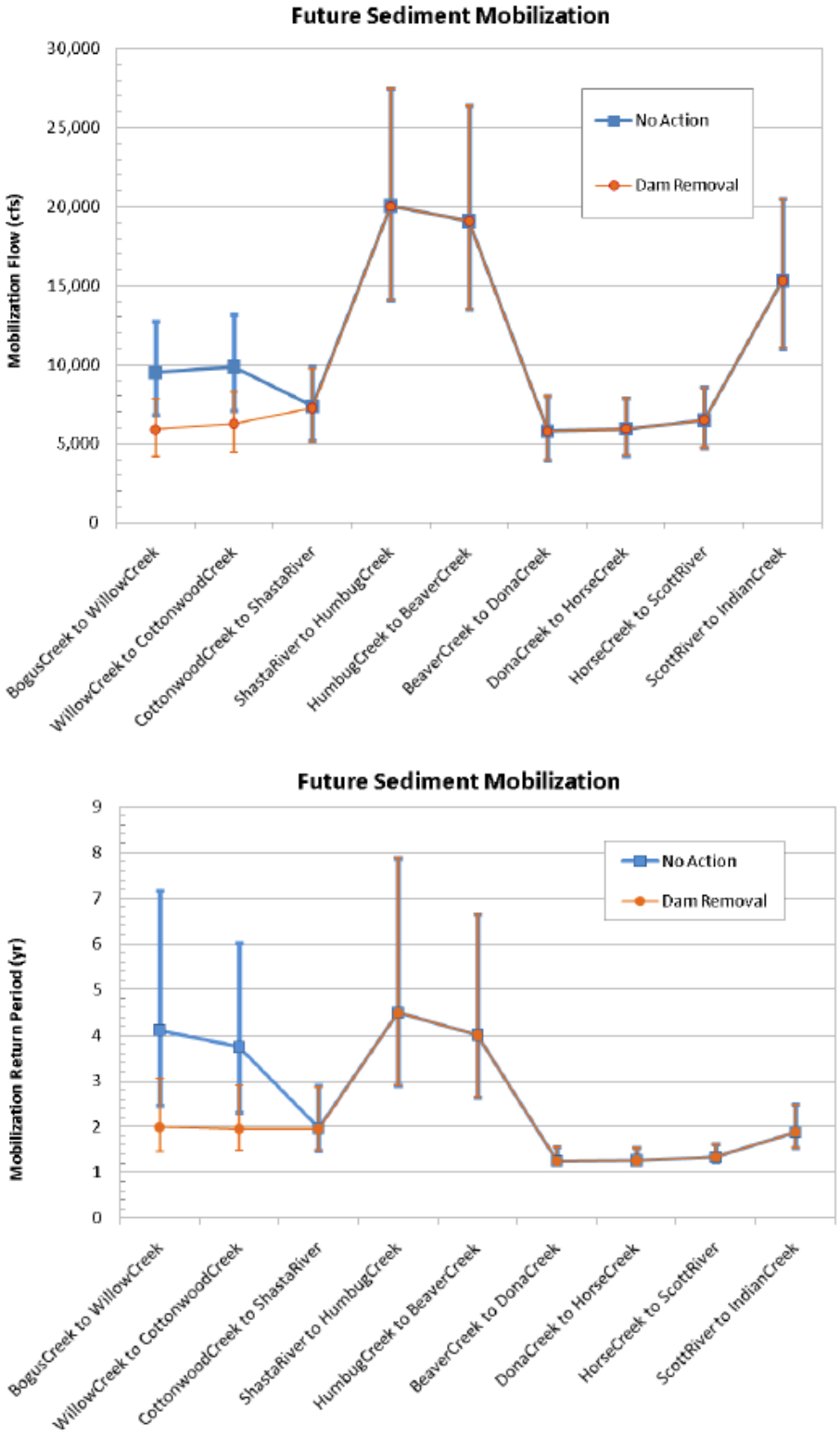

Figure 3.11-19. Flow and Associated Return Period Water Flow for the Initiation of Sediment Mobilization in the Klamath River for the Proposed Project and No Action Alternative (USBR 2012, pages 9-87 to 9-88).

Channel Response in the Klamath River Estuary

The majority of the fine sediment (silts, clays, and organics) released by dam removal would be transported to the ocean (Stillwater Sciences 2010, USBR 2012). The fine material is unlikely to deposit in significant quantities in the estuary, as the mouth only occasionally closes during summer low flow periods (Stillwater Sciences 2008), and it would be open during the drawdown period (November to March)~~evidenced by the lack of a large sandbar within the mouth of the Klamath River under existing conditions~~. There are currently high concentrations of silt and clay transported through the estuary, and sediment sampling by USBR (2010) documented the absence of fine material in the estuary except in the backwater and vegetated areas. If dam removal occurs during a low flow year, there may be relatively small volumes of sediment deposited in these areas.

Pacific Ocean Nearshore Environment

Because of the complexities of the transport processes, the area and depth of fine sediment deposition in the Pacific Ocean nearshore environment resulting from the Proposed Project cannot be precisely predicted. A considerable amount of fine sediment is anticipated to initially deposit on the seafloor shoreward of the 196-feet isobath along the coast, with greater quantities depositing in close proximity to the mouth of the Klamath River. After fine sediment loading onto the continental shelf during river floods, fluid-mud gravity flows typically transport fine sediment offshore. Summer coastal upwelling naturally re-suspends some of the river sediments that are transported to the nearshore environment and deposited on the continental shelf, especially those from the previous winter (Ryan et al. 2005; Chase et al. 2007; see Potential Impact 3.2-7). Along with the background river sediments transported annually by the Klamath River and deposited on the continental shelf, a portion of the sediment deposited on the continental shelf following dam removal would also have the potential to be re-suspended during the summer coastal upwelling. Any sedimentation of the nearshore seafloor resulting from the Proposed Project would likely be transported farther offshore to the mid-shelf and into deeper water depths off-shelf. The short-term (less than two years following dam removal) and long-term (2–50 years following dam removal) effects of the Proposed Project on sediment delivery to the Pacific Ocean would be less-than-significant, given the relatively small amount of total sediment input from reservoir sediment release in comparison to the total annual naturally occurring sediment inputs to the nearshore environment.

Bedload sediment effects related to coarse sediment released by the Proposed Project or sediment re-supply likely would not extend downstream of the Cottonwood Creek confluence (RM 185.1). Therefore, there would be no bedload-related effects in the Klamath River Estuary or Pacific Ocean nearshore environment under the Proposed Project.

Significance

Significant and unavoidable in Middle Klamath River from Iron Gate Dam to Cottonwood Creek in the short term

No significant impact in the Middle Klamath River downstream of Cottonwood Creek, Lower Klamath River, and Klamath River Estuary in the short term

Beneficial for Hydroelectric Reach, Middle and Lower Klamath River, and Klamath River Estuary in the long term

No significant impact in Pacific Ocean nearshore environment in the short term and long term.

3.11.6 References

Volume I Section 3.11.6 Geology, Soils, and Mineral Resources – References, pages 3-776 through 3-780, includes the following revisions:

NMFS (National Marine Fisheries Service). 2019. Endangered Species Act Section 7(a)(2) Biological Opinion, and Magnuson-Stevens Fishery Conservation and Management Act essential fish habitat response for Klamath Project operations from April 1, 2019 through March 31, 2024. Technical memorandum to J. Nettleton, Area Manager, Klamath Basin Area Office, Bureau of Reclamation from A. Van Atta, Assistant Regional Administrator, California Coastal Office, National Marine Fisheries Service.

USBR and CDFG (California Department of Fish and Game). 2012. Klamath Facilities Removal Final Environmental Impact Statement/Environmental Impact Report. Volume 1. December 2012. http://kbifrm.psmfc.org/wp-content/uploads/2017/05/2012_0246_Klamath-Facilities-Dam-Removal-Final-EIS.pdf.

USBR. 2012b. Detailed Plan for Dam Removal – Klamath River Dams, Klamath Hydroelectric Project, FERC License No. 2082, Oregon – California. July 2012. Available from: https://www.fws.gov/yreka/klamrest.html.

U.S. District Court. 2017. Hoopa Valley Tribe v. U.S. Bureau of Reclamation et al. and Klamath Water Users Association et al. Case No. 3:16-cv-04294-WHO. Order modifying February 8, 2017 injunction. U.S. District Court for the Northern District of California, San Francisco Division.

USFWS (U.S. Fish and Wildlife Service). 2019. Biological Opinion on the Effects of Proposed Klamath Project Operations from April 1, 2019, through March 31, 2024, on the Lost River Sucker and the Shortnose Sucker. Prepared by USFWS, Southwest Region, Klamath Falls, Oregon.

Other references cited as part of text included in the Section 3.11 list of revisions:

Chase, Z., P. G. Strutton, and B. Hales. 2007. Iron links river runoff and shelf width to phytoplankton biomass along the U.S. West Coast. Geophysical Research Letters 34, L04607, doi:10.1029/2006GL028069

Huang, J., and B. Greimann. 2010. User's manual for SRH-1D 2.5, Sedimentation and River Hydraulics – One Dimension Version 2.5. Bureau of Reclamation, Technical Service Center, Denver, Colorado.

NMFS and USFWS (National Marine Fisheries Service and U. S. Fish and Wildlife Service). 2013. Biological opinions on the effects of proposed Klamath Project operations from May 31, 2013, through March 31, 2023, on five federally listed threatened and endangered species. Prepared by NMFS, Southwest Region, Northern California Office; and USFWS, Pacific Southwest Region, Klamath Falls Fish and Wildlife Office.

Ryan J. P., F. P. Chavez, and J. G. Bellingham. 2005. Physical-biological coupling in Monterey Bay, California: topographic influences on phytoplankton ecology. Marine Ecology Progress Series 287: 23 – 32.

Stillwater Sciences. 2008. Technical Report – Klamath River Dam Removal Study: Sediment Transport DREAM-1 Simulation. Prepared for the Coastal Conservancy. October.

Stillwater Sciences. 2010. Anticipated sediment release from Klamath River Dam removal within the context of basin sediment delivery. Final Report. Prepared by Stillwater Sciences, Arcata, California for California Coastal Conservancy, Oakland, California.

USBR (Bureau of Reclamation). 2010a. Klamath River Sediment Sampling Program, Phase I – Geologic Investigations. September.

USBR. 2012. Hydrology, Hydraulics and Sediment Transport Studies for the Secretary's Determination on Klamath River Dam Removal and Basin Restoration. Technical Report No. SRH-2011-02. Prepared for Mid-Pacific Region, Bureau of Reclamation, Technical Service Center, Denver, Colorado.

3.12 Historical Resources and Tribal Cultural Resources

This section focuses on the potential for impacts to historical and tribal cultural resources due to the Proposed Project. For the purposes of this section of the EIR:

Tribal Cultural Resources: Tribal Cultural Resources (TCRs) are defined consistent with Public Resources Code section 21074(a)(which includes sites, features, places, cultural landscapes, sacred places, and objects with cultural value to a California Native American tribe that are either included or determined to be eligible for inclusion in the California Register of Historical Resources, or included in a local register of historical resources, or as determined by the lead agency under the criteria for listing. Tribal Cultural Resources are, by definition, historical resources.

Historical Resources: Historical Resources are defined consistent with Public Resources Code section 21084.1 which includes a resource listed in, or determined to be eligible for listing in, the California Register of Historical Resources (CRHR), included in a local register of historical resources, or determined to be significant by the lead agency (Pub. Resc. Code, section 21084.1, CEQA Guidelines Section 15064.5 (a)). While not all CRHR-eligible resources are also eligible for the National Register of Historic Places (NRHP), resources listed on or evaluated as eligible for the NRHP are considered historical resources under CEQA. The fact that a resource does not meet NRHP listing criteria does not preclude a lead agency from determining that the resource may be an historical resource under the criteria in Public Resources Code Section 5024.1(c). Historical resources may be prehistoric or historic in age and may be archaeological resources, part of the existing built environment, other important historic resources, or a tribal cultural resource such as a sacred place. Additionally, CEQA recognizes the possibility that an archaeological site may not meet the definition of an historical resource but may meet the definition of a “unique archaeological resource” (Pub. Resc. Code, section 21083.2 (g)). Similar to historical resources, unique archaeological resources are afforded protection under CEQA.

Many comments were received during the NOP public scoping process relating to historical and/or tribal cultural resources (Volume II Appendix A). Several commenters expressed a profound personal and tribal connection to the Klamath River, its water quality, and its fishery from a traditional, subsistence, ceremonial, and spiritual viewpoint, and expressed that dam removal would provide an opportunity for river restoration, including the return of a traditional fishery. Other commenters expressed concern regarding low flows and poor water quality that would ensue following dam removal and could preclude certain tribal ceremonies. Several commenters expressed concern regarding dam removal and the potential for impacts to specific known cultural resources associated with ancient Shasta tribal occupation of the landscape and that there may be unknown archaeological resources that could be adversely affected by dam

removal. A summary of the historical and/or tribal cultural resources comments received during the NOP public scoping process, as well as the individual comments themselves, are presented in Volume II Appendix A.

After circulation of the Draft EIR, numerous additional comments were received regarding Historical Resources and Tribal Cultural Resources (see Volume III), and changes to the section in response to those comments are flagged in the comment responses and then printed in this Final EIR section. None of the changes result in significant new information in the EIR under the meaning of CEQA Guidelines, section 15088.5, subdivision (a):

> New information added to an EIR is not 'significant' unless the EIR is changed in a way that deprives the public of a meaningful opportunity to comment upon a substantial adverse environmental effect of the project or a feasible way to mitigate or avoid such an effect (including a feasible project alternative) that the project's proponents have declined to implement.

However, the changes were numerous enough that reprinting the section rather than simply including a list of revisions was warranted to improve clarity and readability of the document.

Assembly Bill 52 (AB52) (Gatto 2014) amended Section 5097.94 of the Public Resources Code to require consideration of tribal cultural resources in CEQA review and to require certain consultation requirements with California Native American Tribes. AB52's requirements went into effect on July 1, 2015.

A tribal cultural resource is defined as a site, feature, cultural landscape, sacred place or object with cultural value to a California Native American tribe that is listed or determined to be eligible for listing in the California Register of Historical Resources or under certain local registers, or that the lead agency determines to be significant under the criteria for listing (Public Resources Code, Section 21074, subdivision (a)). For purposes of this analysis, with the exception of isolated occurrences of cultural material, all known and unknown prehistoric archaeological sites within the Project area are considered to be tribal cultural resources, and thus significant resources under CEQA.

The Yurok Tribe, the Shasta Indian Nation, and the Shasta Nation requested consultation under AB52, and met with the State Water Board and the KRRC in a series of confidential consultation meetings within the timeframe of February 2017 through October 2018. The consultations with the Yurok Tribe and the Shasta Indian Nation resulted in identification of potentially-impacted resources, articulation of potential impacts, and development of, and agreement on, specific mitigation measures (see Section 3.12.5.1 *Potential Impacts to Tribal Cultural Resources*, TCR-1 through TCR-8). KRRC has formally committed to implementing the measures as part of concluding AB52 consultation, and has initiated consultation for development of a Tribal Cultural Resources

Management Plan to meet the requirements described in TCR-1 through TCR-4, as well as the requirements of National Historic Preservation Act, Section 106. The TCRMP will be submitted to FERC for implementation.

Consultation with the Shasta Nation has informed the analysis in this EIR, but concluded after the Shasta Nation and the State Water Board acknowledged that it would not be possible to reach agreement on mitigation measures, despite a good faith effort to do so.

In order to support Project development, the KRRC undertook efforts to identify and evaluate historical and tribal cultural resources in the vicinity of the Proposed Project, and these efforts have provided information contributing to the Historical and Tribal Cultural Resources environmental setting, potential impacts and mitigation measures. KRRC has also prepared a Draft Cultural Resources Plan (Appendix B: *Definite Plan – Appendix L*), which provides a framework for understanding the cultural resources studies that KRRC has completed, those that are currently ongoing, and others that KRRC anticipates completing in order to comply with regulatory requirements. The KRRC proposes that the Final Cultural Resources Plan would be available prior to implementation of the Proposed Project. However, this document acknowledges that not all of the required cultural resources inventory and significance analyses will be completed prior to certification of this EIR. Additionally, overseeing development and implementation of the Cultural Resources Plan does not fall within the scope of the State Water Board's water quality certification authority. Therefore, for the purposes of this analysis, all known and unknown cultural resources within the Project area are considered to be significant historical resources under CEQA. This includes the historic built environment; historic-period archaeological resources; and prehistoric archaeological resources, which as stated above are considered TCRs herein.

3.12.1 Area of Analysis

The Area of Analysis for historical and tribal cultural resources is shown in Figure 3.12-1. Within the Area of Analysis, there are four subareas relevant to the analysis of potential historical and tribal cultural resource impacts, as follows:

- *Subarea 1* (Figure 3.12-2)
  - KRRC's Limits of Work for the Proposed Project, which includes the horizontal boundary conforming to the high-water line around the Lower Klamath Project reservoirs, the construction footprint needed for dam and other structure removal, ingress and egress routes, staging and stockpiling areas, disposal areas, and transmissions lines to be removed; and,
  - The inclusive area of known cultural sites that lie partially within and partially outside of the Limits of Work.

- *Subarea 2* (Figure 3.12-3)
  - Post-dam removal altered Federal Emergency Management Agency (FEMA) 100-year floodplain along the 18-river mile stretch of the Middle Klamath River downstream of Iron Gate Dam (RM 193.1) to the confluence with Humbug Creek (RM 174).
- *Subarea 3* (Figure 3.12-4)
  - Parcel B lands immediately surrounding the Lower Klamath Project, which would be transferred from PacifiCorp to the KRRC prior to dam removal and then transferred to the respective states (i.e., California, Oregon), as applicable, or to a designated third-party transferee, following dam removal. The lands would thereafter be managed for public interest purposes (KHSA Section 7.6.4.A).
- *Subarea 4* (Figure 3.12-5)
  - 0.5-mile buffer on either side of the Hydroelectric Reach, Middle Klamath River, and Lower Klamath River encompassing the existing conditions and post-dam removal altered FEMA 100-year floodplain, which, with the exception of the Middle Klamath River reach described in *Subarea 2*, have the same extent.

To allow for individual impact analyses specific to geographic location (e.g., reservoir footprint, riverside location) and Proposed Project activity timing (e.g., pre-dam removal, reservoir drawdown, restoration activities), the subareas include overlap. The subarea overlap has no bearing on the analysis of any impact, since the subareas are considered independently by impact.

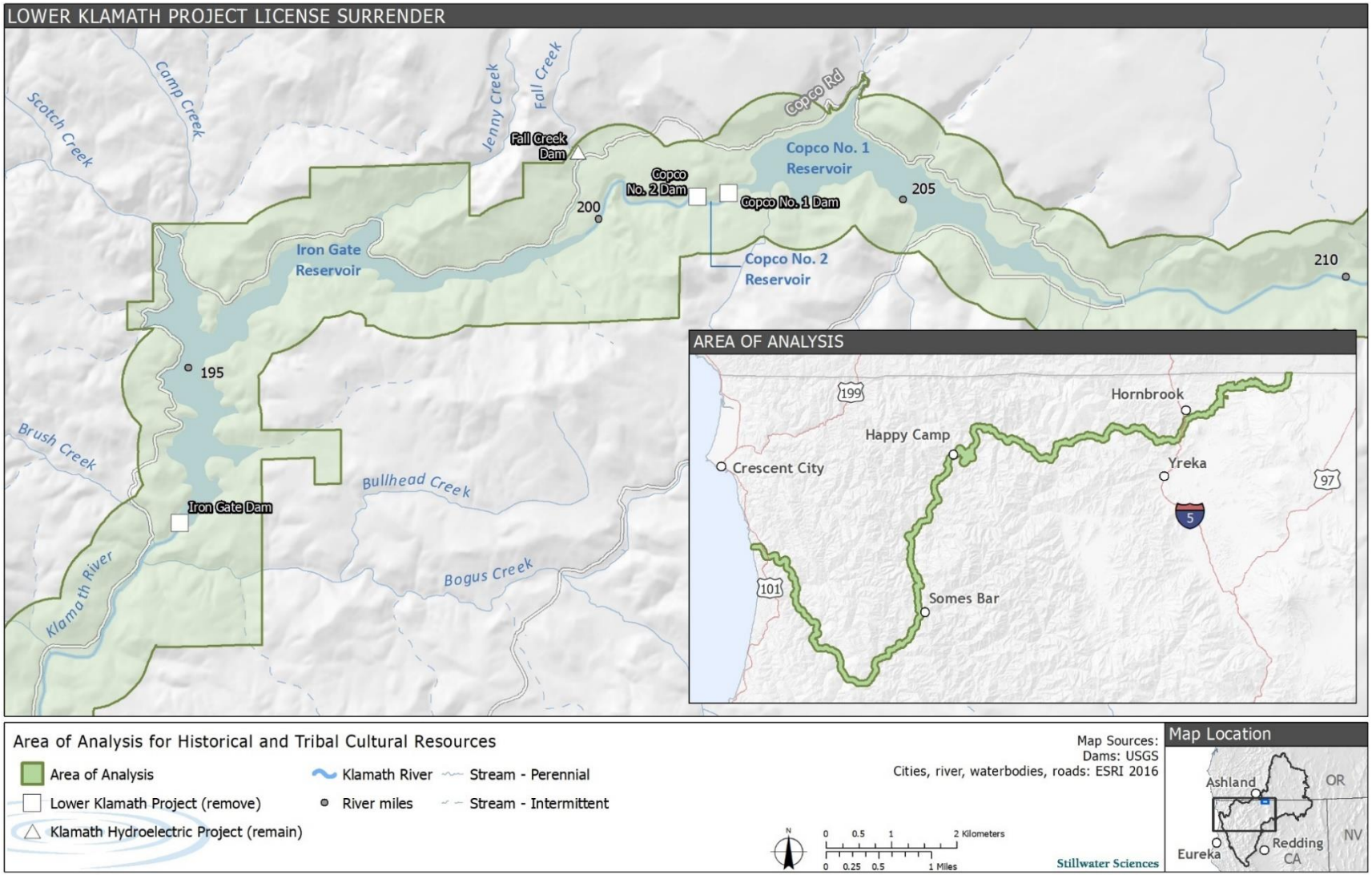

Figure 3.12-1. Area of Analysis for Historical and Tribal Cultural Resources.

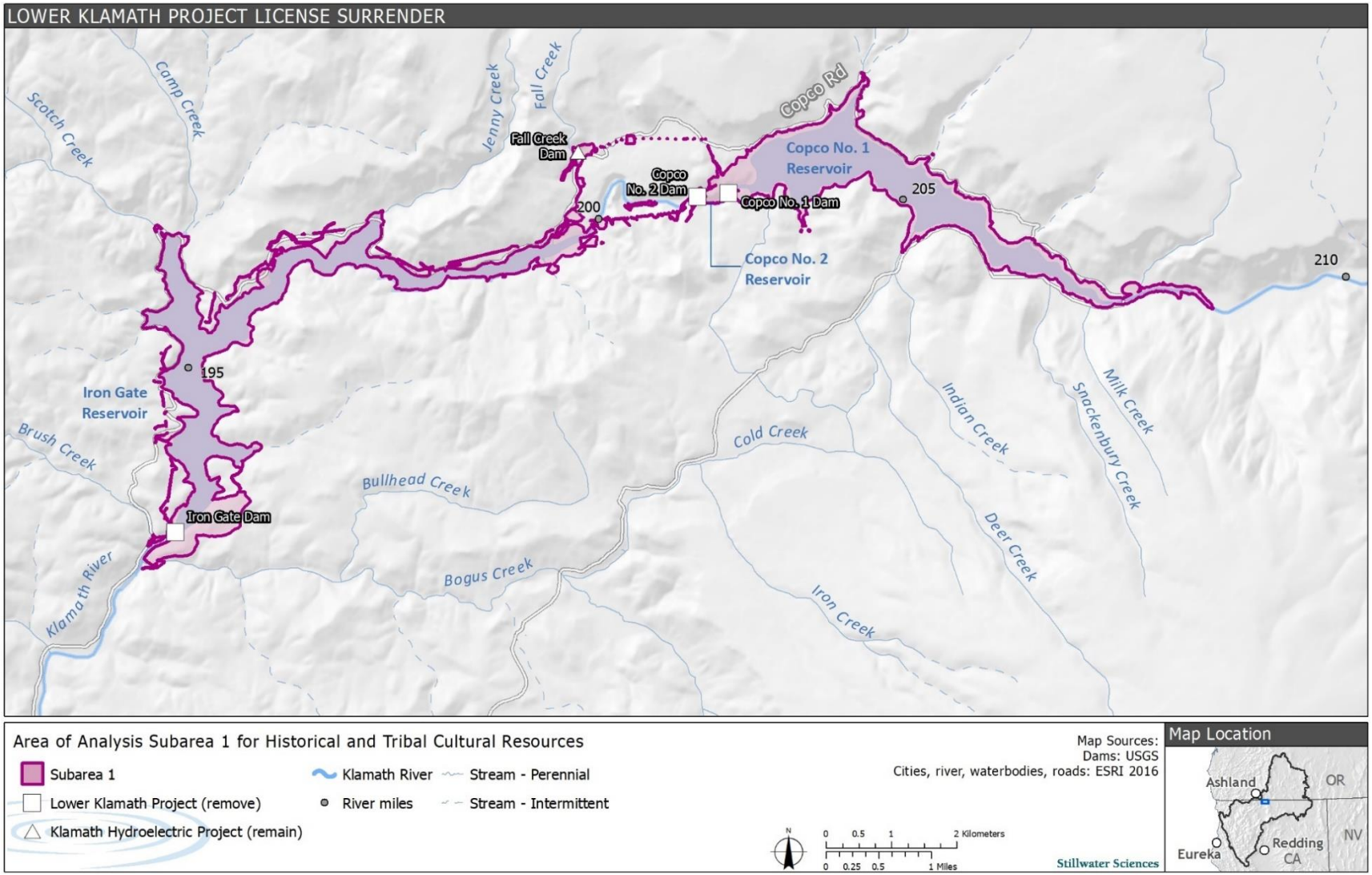

Figure 3.12-2. Area of Analysis *Subarea 1* for Historical and Tribal Cultural Resources.

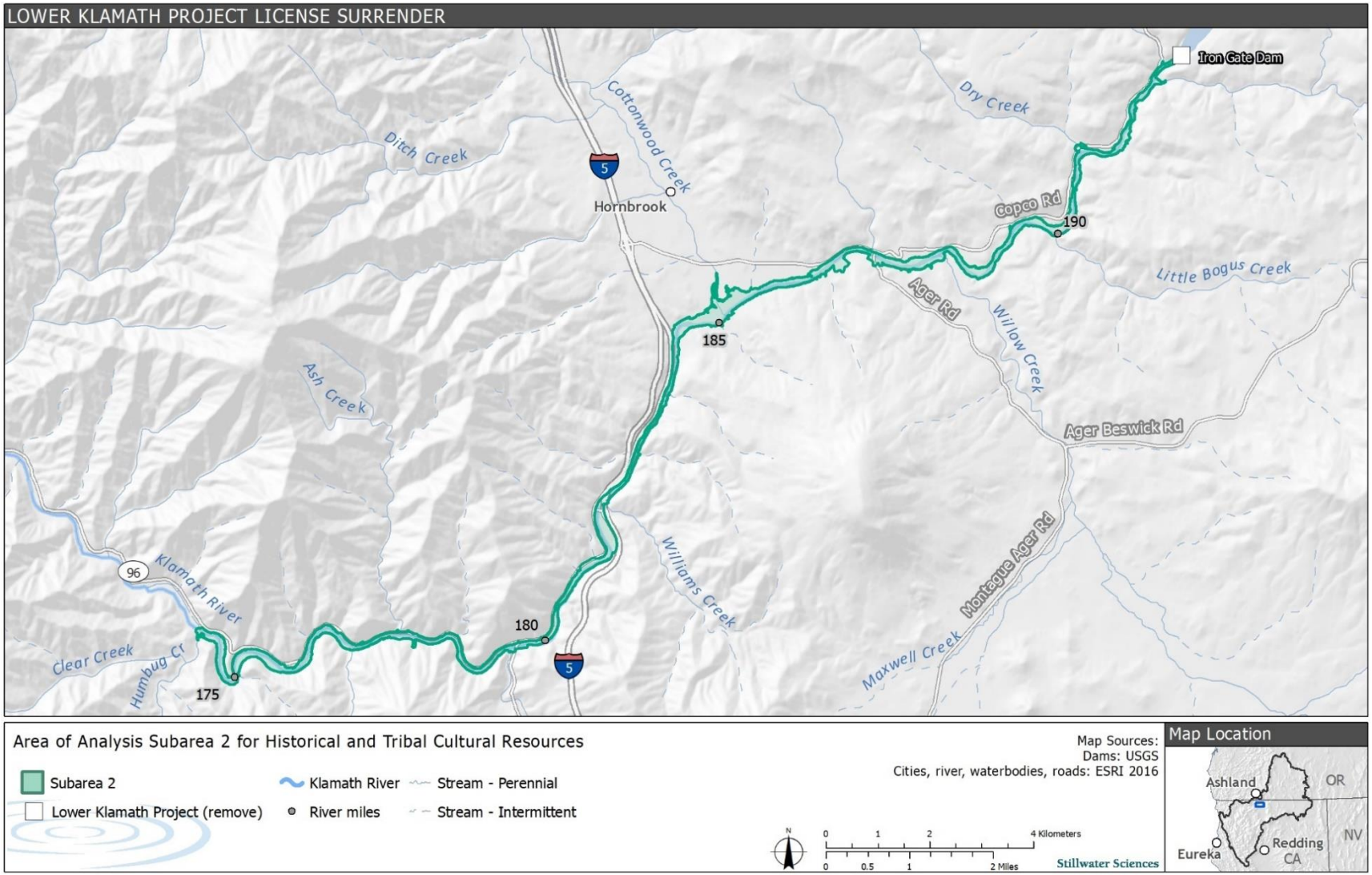

Figure 3.12-3. Area of Analysis *Subarea 2* for Historical and Tribal Cultural Resources.

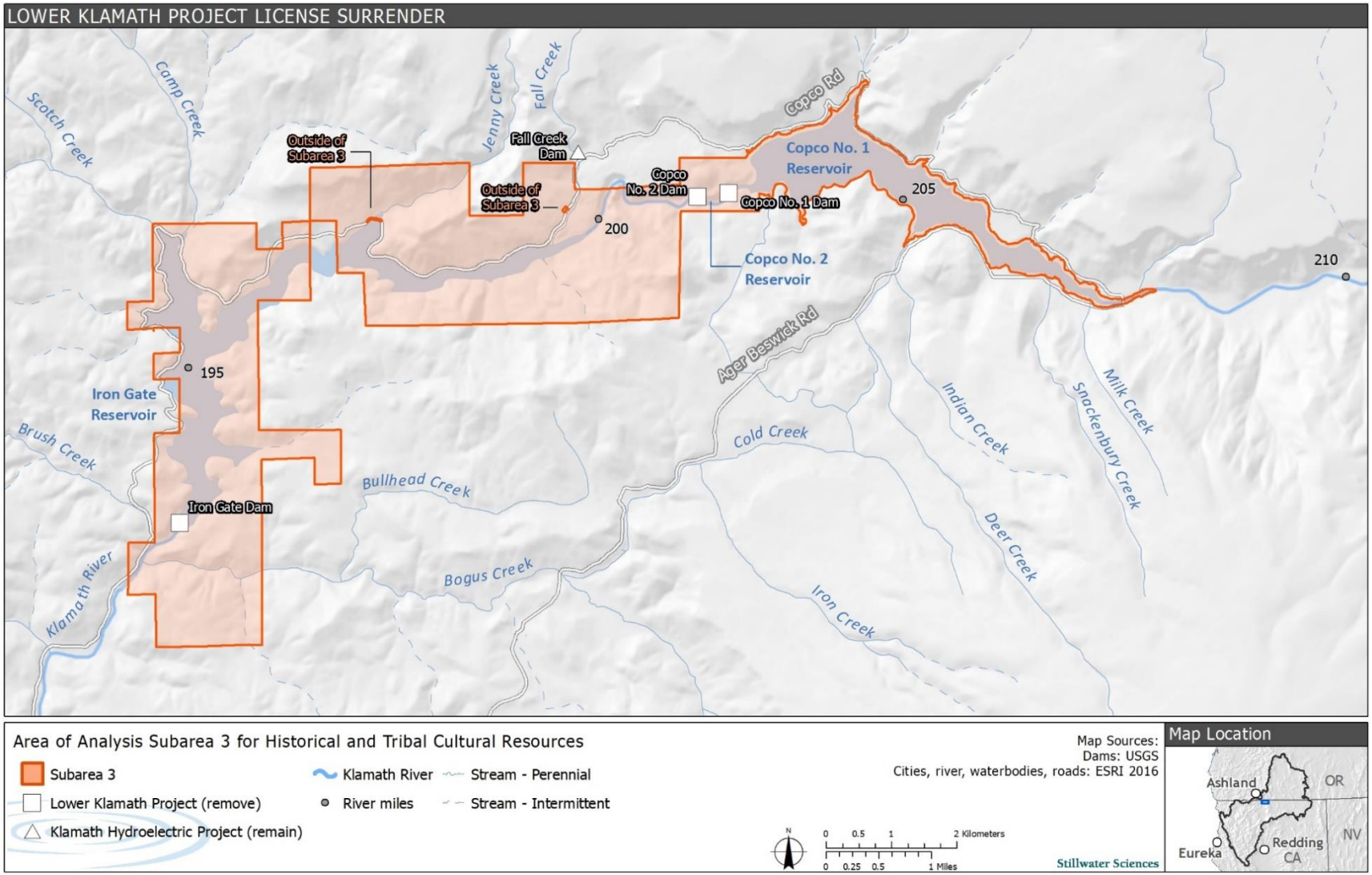

Figure 3.12-4. Area of Analysis *Subarea 3* for Historical and Tribal Cultural Resources.

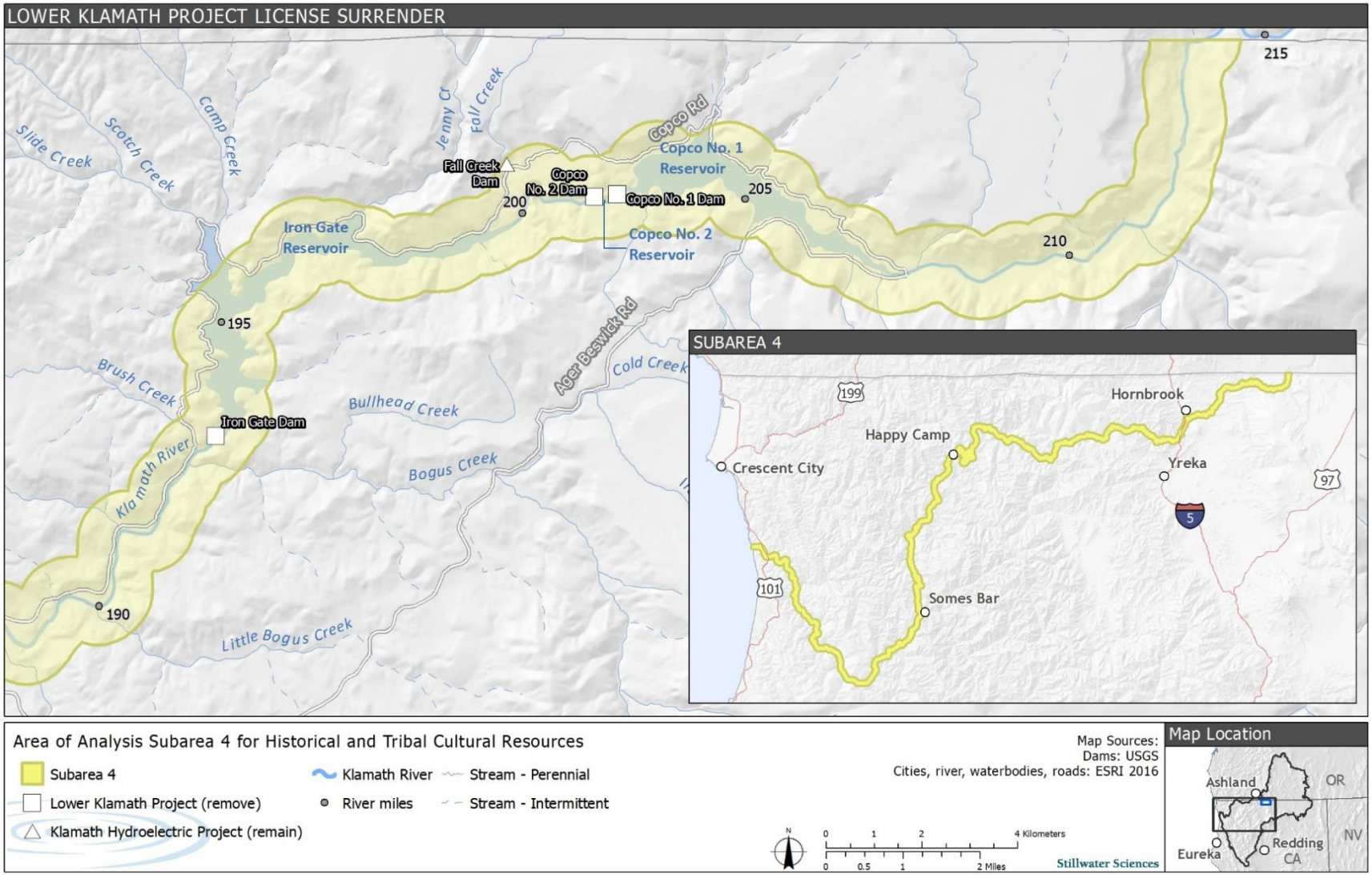

Figure 3.12-5. Area of Analysis *Subarea 4* for Historical and Tribal Cultural Resources.

3.12.2 Environmental Setting

The Klamath River flows through several cultural regions in California's Northwest Coast, the Great Basin, and portions of the Columbia Plateau. These unique cultural regions have been used and occupied by Native American peoples for centuries.

3.12.2.1 Tribal Cultural Chronology and Ethnography (including Historic and Pre-Historic Periods)

The tribal cultural resources analysis focuses on Shasta, Klamath, Karuk, Modoc, Hupa[83], and Yurok peoples that occupy the territory along and adjacent to the Klamath River in the vicinity of the Proposed Project. These tribes have a long history of occupation along the Klamath River as evidenced by the numerous archaeological and ethnographical resources that are present. Traditional beliefs indicate that these groups have occupied the area for time immemorial.

Over the millennia, native peoples occupied the area along the Klamath River in the vicinity of the Proposed Project, especially the corridor along the Klamath River. Ancient stream terraces—composed of gravel and sand and covered in meadows of grass with mixed oak groves—provided ideal conditions for food supply. Additionally, the area of the Upper and Middle Klamath River provided naturally occurring salt deposits, geothermal hot springs, basalt rock caves, and food such as anadromous and resident fish, seeds, roots, birds, and mammals.

Archaeological investigations have confirmed over 10,000 years of human presence in the Middle and Upper Klamath Basins, which extend beyond the extent of the Klamath River (Balter 2008, Ames et. Al 1998, and Aikens and Jenkins 1994). Mammal remains document their use as a food source for native people approximately 7,500 years before the present (BP) (Ames et al., 1998). The presence of milling slabs, mortars, and mullers on the landscape dating back to approximately 6,000 BP, provides evidence for use of bulbs and seeds for subsistence (Mack 1983 and 1991). Use of fish, as a food source, began about 2,600 years BP (Beckham 2006, Daniels 2006, Deur 2011).

Section 3.12 *Tribal Trust* of the 2012 KHSA EIS/EIR is included as Appendix V of this EIR, and includes significant additional context regarding the histories of Native Americans in the basin and the longstanding relationships with various resources. Because this information was developed under auspices of the USBR's trust responsibilities towards federally-recognized Native American tribes, it includes only federally-recognized tribes. Additionally, the subsections of Section 3.12 *Tribal Trust* that address the various potential impacts of the alternatives that were being evaluated in the 2012 KHSA EIS/EIR are not directly

[83] The term Hupa describes the Hupa People. The term Hoopa is used to reference the Hoopa Valley place or the tribal government.

applicable to the Proposed Project because they involve similar, but not exactly the same, actions.

Columbia Plateau and Great Basin Culture Areas

The Upper Klamath Basin and Klamath Lakes area exhibits a blend of cultural traits from the Columbia Plateau and Great Basin culture areas. The chronology of the area may be organized into the Paleoarchaic (14,000 to 7,000 BP), Early Archaic (7,000 to 4,500 BP), Middle Archaic (4,500 to 2,500 BP), and Late Archaic/Late Prehistoric (2,500 to 200 BP) periods (Ames et al. 1998; Balter 2008; Aikens and Jenkins 1994; Mack 1983, 1991).

Paleoarchaic (14,000 to 7,000 BP)

During the Paleoarchaic period, the Klamath Basin was occupied by hunter-gatherers that tended to focus on hunting large game animals, but also supplemented their diet with fish, birds, and plant resources. These groups were seasonally mobile and generally small in size (Ames et al. 1998). Two of the oldest sites in the region are Paisley Cave, which is dated at 14,200 BP (Balter 2008) and Fort Rock Cave, which is dated between 13,200 and 10,200 BP (Aikens and Jenkins 1994). The oldest site in the upper Klamath River area is the Klamath Shoal midden site, 35KL21, which yielded a date of 7,700 BP.

Early Archaic (7,000 to 4,500 BP)

Most of the archaeological evidence for early human occupation in the Klamath River Canyon dates to the beginning of the Early Archaic period (Mack 1983 and 1991). Semi-subterranean house pits first appear in the Plateau region during this period suggesting that some people were adopting a less mobile lifestyle. Typical artifacts associated with the Early Archaic include large stemmed, lanceolate, or leaf-shaped projectile points, knives, gravers, scrapers, and some cobble and ground stone tools (e.g., abraders or grinding slabs, mortars, mullers, and stone bowls).

Middle Archaic (4,500 to 2,500 BP)

The Middle Archaic period is characterized by an increase in the exploitation of riverine and marsh environments and food resources such as salmon and various plant roots/tubers. There was also an increase in the use of milling stones and pestles at sites during this period. Typical Middle Archaic artifacts include broad-necked, corner-notched, and side-notched projectile points, many types of ground stone tools, bone and antler tools (e.g., chisels and wedges), and specialized fishing gear (e.g., bone harpoon barbs and net sinkers).

Late Archaic/Late Prehistoric (2,500 to 200 BP)

Several major cultural changes occurred during the Late Period, including: the widespread appearance of pit houses; a shift to a heavy reliance on fishing; the use of storage pits for salmon; camas exploitation; the development of seasonal land use patterns (i.e., use of “winter villages”); the appearance of the bow as evidenced by the presence of small corner- and side-notched projectile points at

sites; and the appearance of Olivella shell beads. Extensive trade networks became important across the region by as early as 1,500 years ago, as suggested by tools made from obsidian sources 110 to 120 miles away and the presence of beads made from marine shells.

Ethnography

Klamath Tribes

The Klamath Tribes include the Klamath, Modoc, and Yahooskin Band of Snake Indians. Prior to their placement on a shared reservation, these groups utilized overlapping resource areas in the Upper Klamath Basin. The Klamath and Modoc people occupy the entire Upper Klamath Basin and adjacent interior drainages to the east, living in close association with the marsh and riverine resources of this area (Spier 1930 and Barrett 1910). The Klamath and Modoc tribes were occupying the Upper Klamath Basin prior to Euro-American contact, and also participated in salmon fishing and social gatherings along the Klamath River at least as far downstream as Seiad Valley (Deur 2011). The Yahooskin principally occupy lands east of the Klamath Basin, but did participate in resource harvests, including fish harvests, with Klamath and Modoc on the Sprague River and other Klamath River tributaries (Deur 2011).

Deur (2011) also presents a summary of the ethnography of The Klamath Tribes and their relationship to the Klamath River. Klamath ancestral territory stretches from the southern boundary of the Deschutes River watershed in the north to Shovel Creek drainage in the south (Stern 1998). These encompass the Sprague River and Sycan Rivers, Sycan Marsh, Klamath Lake, and Klamath Marsh (Spier 1930, Berreman 1937). Modoc territory extends from Mount Shasta in the south to an area near the current Oregon-California state line in the north and from the eastern slope of the Cascade Range near Mount Shasta to the area around Goose Lake in the east (Ray 1963). This area encompassed Lower Klamath Lake and Tule Lake.

Klamath and Modoc were both organized in villages that collectively owned productive fishing or other resource (e.g., seed or other plants) gathering areas. Influential heads of households, supported by extended families, assumed leadership roles in the villages (Stern 1998). Villages included various types of structures including semi-subterranean winter lodges for families and extended families. The Klamath and Modoc rebuilt their winter lodges in the fall. Spier (1930) identified five geographic subdivisions of winter villages:

- Klamath Marsh-Williamson River group on the southern margin of Klamath Marsh and the Lower Williamson and Sprague rivers (about 34 villages, plus four to five villages on the upper Sprague and Sycan rivers).
- Agency Lake group on Agency Lake and the northern arm of Klamath Lake (one village and one hamlet).
- Lower Williamson River group close to the mouth of Williamson River (about seven villages).

- Pelican Bay group that includes the Pelican Bay district on the west side of Klamath Lake, Four Mile Creek, and the marsh north of the lake (about eight villages).
- Klamath Falls group: along Klamath Lake south of Modoc Point (about 14 villages).

The permanent winter villages were never fully abandoned during the year. Each group of villages maintained one or more places for cremation of the dead. The ashes of cremated individuals were covered with soil and rocks. Individuals dying away from home might be interred under piles of rocks or cremated and returned to the cremation ground. Particular sweat houses, said to have been built by the legendary *Kemu'kumps*, and a hot spring were used to cleanse mourners.

Fish is the primary resource for the Klamath and Modoc; consequently, settlements clustered near rivers and streams. Runs of fish began in the early spring and lasted into the fall (Spier 1930). Men, with some assistance from women, fished throughout the year from the banks of rivers or streams or from canoes using long-handled dip nets, spears, harpoons, and hook-and-line. During parts of the year, fish drives were also used to harvest fish. Members of the tribe would drive fish toward individuals dragging triangular nets on A-frames or purse nets through the water either on foot or from a canoe. Gill nets drawn between canoes and traps were also used to acquire fish. In addition, stone barriers were constructed on some streams to restrict fish passage and facilitate fishing.

Klamath and Modoc typically left their winter villages in early spring to begin a seasonal round of harvest activities. Spring activities began with harvesting fish from the run of large suckers that took place in Upper Klamath Lake in March. Fish were dried on the branches of pine saplings and sometimes pounded into a meal and bagged for storage. As the spring sucker run subsided, Klamath and Modoc women turned their attention to digging ipos (*Carum oregonum*) roots, gathering waterfowl eggs, and scraping the cambium layers of young ponderosa pines for food. By late spring, women dug camas bulbs in wet meadows, baking them in earth ovens and sun-drying them for storage while men hunted waterfowl and other animals.

Summer was the season when women harvested wocas, the nutritious seeds of the yellow pond lily, at Klamath Marsh, Sycan Marsh, Tule Lake, Lower Klamath Lake, and other water bodies. Wocas were an important food resource and shaman conducted a ceremony at the beginning of the harvest. The seeds were processed for soup and flour. Women also collected cattail roots for drying and grinding into meal. During the summer months men hunted waterfowl and a variety of small mammals.

In fall, Klamath and Modoc gathered chokecherries, serviceberries, Klamath plums, pine nuts, blackberries, and gooseberries. Klamath and Modoc eventually moved into the high country of the western Cascades to harvest huckleberries. Women dried the berries before fires, while men hunted deer and elk and trapped furbearing mammals. Deer hunting methods included stalking and driving the animals into the lakes, rivers, or confined spaces where they could be clubbed by women in canoes or shot with bows and arrows. Whitefish were also harvested in the fall primarily by the use of dip-nets.

Klamath and Modoc sought power by visiting places where they believed that sacred beings resided and sought to gain their power through ritualized activities. Klamath and Modoc parents sent boys and girls on a power quest when they reached puberty. Fathers and mourning kinsmen sometimes sought power at the birth of a child or death of a wife or child (Stern 1998). Seekers of power often sought specific competence such as luck in hunting or fishing, war, love-making, gambling, foot-racing, or curing. Seekers of power went alone into the mountains for 5 days to fast, pile rocks, wrestle with trees, run, perhaps take sweat baths, and climb hills. Power might come in the form of a dream or a visit by a spirit, which would be followed by the seeker waking with blood in his mouth or nose and a personalized spirit song in his ears.

Shamans, mourners, and gamblers also sought power by swimming in deep river eddies. During the day, the seeker sweated and fasted, waiting in the brush until nightfall. At that time the power seeker went to the river and dove to the bottom in search of a spirit. The seeker did not appear to be frightened even if he saw something moving under the water. Similar to other power-seeking events, it is reported that sometimes a seeker surfaced from the bottom of the river unconscious, with blood flowing from his mouth and/or nose (Spier 1930).

Shamans performed important ceremonies in midwinter gatherings, first-fruit rites for wocas gathering, and other occasions. They also cured illnesses and provided spiritual and practical support during warfare. Novice shamans received their initiation as a group at midwinter ceremonies. Helpers worked with shamans over a 5-day period during the ceremonies to call spirits, interpret spirit messages, and lead the audience in singing sacred songs.

Euro American expansion into Klamath and Modoc territory had a dramatic effect on their traditional cultural practices. Regardless, The Klamath Tribes exhibited considerable and well-documented persistence in their ceremonial and social traditions, particularly as they related to site-specific and resource-specific traditions. However, in 1954 Congress terminated the reservation and its trust relationship with The Klamath Tribes. The Klamath Tribes retained some rights to resources, but a majority of the tribal members withdrew from the tribe and received a portion of the tribal holdings. The trust account created for the rest of the members was later liquidated. In addition, in 1974 the Federal Government condemned thousands of forest acres that had been part of the Klamath

Reservation so that the forest land could be added to the Winema National Forest (Klamath Tribes 2003).

The Klamath Tribes accomplished restoration of Federal recognition in 1986 and began to rebuild their tribal government, economy, and community. Currently, the tribal Culture and Heritage Department is working to protect, preserve, and enhance traditional cultural values (Klamath Tribes 2003). The Klamath Tribes are also pursuing a variety of economic enterprises through their Economic Self-Sufficiency Plan. (Please refer to 2012 KHSA EIS/EIR Section 3.12 *Tribal Trust* in Appendix V of this EIR for additional information on traditional and current lifeways and the history of Federal recognition.)

Northern Interior California Culture Area

Previous archaeological investigations in the vicinity of the Proposed Project were conducted in response to hydroelectric developments and highway construction projects beginning in the 1940s. These early archaeological investigations contain limited general information on the cultural chronology of lands in the vicinity of the Proposed Project. However, the investigations of Basgall and Hildebrandt (1989) and Cleland (1997a,b) in the northern Sacramento River Canyon do offer information on cultural chronology of lands in the Sacramento River Canyon which can provide additional insights to cultural chronology of lands in the Proposed Project area because it is likely that the subsistence and settlement patterns identify for the Sacramento River Canyon are similar to the patterns along the Klamath River and within the vicinity of the Proposed Project.

Basgall and Hildebrandt (1989) propose a three-phase cultural chronology for the northern Sacramento River Canyon, which is thought to be similar to the prehistory of the Klamath Basin. These are the Pollard Flat Phase (2,700–5,300 BP), the Vollmers Phase (1,700–4,500 BP), and the Mosquito Creek Phase (1,900 BP to contact). The Pollard Flat Phase appears to represent a forager population that occupied residential base camps for extended periods of time, and is characterized by relatively large projectile points, ground stone tools, anvils, mauls, and net weights. The Vollmers Phase represents populations that were more mobile than those of the previous phase, while still maintaining residential camps, and are characterized by medium size projectile points, ground stone tools, anvils, mauls, and net weights. The Mosquito Creek Phase populations consisted of small groups that practiced a pattern of seasonal migration, and have ben archaeologically characterized by small projectile points, ground stone tools, and the absence of hand stones, milling stones, hammer stones, anvils, mauls, and net weights.

Cleland's (1997a,b) chronology for the Lake Britton area is divided into six periods spanning 7,000 years. The six periods include: Paleo-Indian (prior to 7,500 BP; Early Archaic-A (5,000–7,500 BP); Early Archaic-B (3,900–5,000 BP);

Middle Archaic-A (3,000–3,900 BP); Middle Archaic-B (2,000–3,000 BP); Late Archaic (1,000–2,000 BP); and Emergent (150–1,000 BP).

The Paleo-Indian Period is poorly represented at the Area of Analysis and only sporadic use of the area may have been occurring during this time. Early Archaic Period sites along the Pit River and Klamath River, however, may be associated with an intensification of use of the area. Sites associated with this period are usually on mid-slope terraces and tend to be situated some distance from rivers. This period reflects increased occupation of the area and freshwater mussel shell midden deposits appear at sites suggesting the exploitation of riverine resources.

The Middle Archaic Period is highlighted by a continued increase in the intensity of use of the area and a diversification of the overall settlement pattern. Occupation of the higher terraces above the river continues, but habitation sites also occur closer to the river. The diversified settlement pattern of the Middle Archaic-A Period continues during the Middle Archaic-B Period, but there is increased occupation of sites near the river. The Late Archaic-A Period is characterized by an increase of more riverine sites. This pattern continues into the Emergent-A Period during which occupation of riverine sites intensifies.

Ethnography

Shasta People

The Shasta People are currently represented by various Native American entities including but not limited to the Shasta Nation, Shasta Indian Nation, and the Etna Band of Indians. During separate consultations between the State Water Board and the Shasta Indian Nation and Shasta Nation, tribal representatives provided various historic accounts related to locations, individuals, and significant events permanent to the specific tribe's history and culture. These accounts, and specific tribal histories are included in confidential appendixes of this EIR (Confidential Appendix P and Q). Below is the traditional information provided for the Shasta people based on literary research.

Silver (1978) summarizes ethnographic information regarding Shasta collected by Dixon (1907), Voegelin (1942), and Holt (1946). These sources generally agree that traditional Shasta territory extended north to a point about 20 miles north of Ashland, Oregon, and from Clear Creek on the Klamath River east to Mt. Hebron (Silver 1978, Jester 2016) (Figure 3.12-6). Shasta are members of the Hokan language family (Silver 1978).

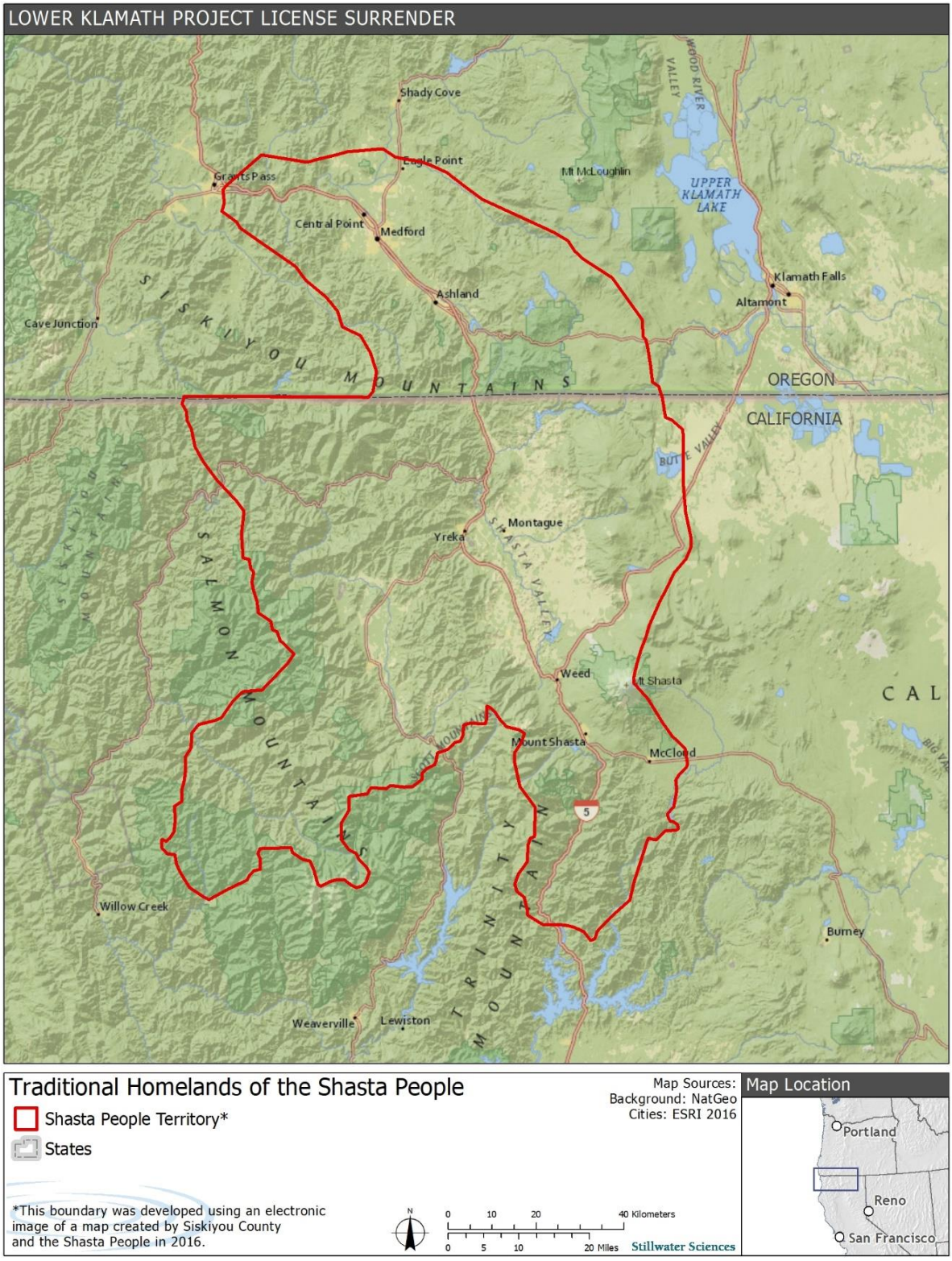

Figure 3.12-6. Traditional Homelands of the Shasta People. Map based on GIS interpretation of traditional Shasta People Homeland map provided by Shasta Nation and Siskiyou County.

There are several groups of Shasta that exhibit different cultural traits. Information presented here focuses on the Klamath River Shasta, called the Wiruhikwaiiruka or Kammatwa (Daniels 2006). Shasta were organized into autonomous tribelets consisting of extended family groups that occupied a group of villages. The family was the basic social unit of the Shasta, with the village being the political and economic unit. Each village had a chief/headman to provide leadership and organize important social, political, and economic events (Silver 1978). Shamans conducted a variety of ceremonies in villages, and the Shasta people considered Mount Shasta to be sacred ground that was used for healing, blessing, and ceremonies. Mount Shasta is a significant part of Shasta traditions and ceremonialism.

Shasta along the Klamath River tended to build their winter villages near the river. Villages had recognized territories with areas for each family, including fishing places with fish weirs along the Klamath. Hunting territories also were held privately over the long term, in contrast to tobacco-growing plots and acorn-gathering trees, which were claimed only for brief periods. Typical villages consisted of brush shelters, bark houses, sweathouses, assembly houses, and winter houses (Silver 1978). The major structures of a Shasta village included the dwelling house (umma), a big house (okwa-umma), the sweat house (wukwu), and the menstrual hut (wapsahumma) (Shasta Indian Nation 2018).

During the spring and summer, Shasta established temporary hunting and gathering camps in the foothills and mountains to make use of seasonally available resources in those ecological zones. Shasta relied on a subsistence pattern emphasizing gathering, hunting, and fishing, and use of a variety of plant and animal resources as they became seasonally available. For example, resources used by the Shasta included deer, brown bear, rabbit, and a variety of small mammals, fish, birds, insects, acorns, buckeye, pine nuts, manzanita berries, and a variety of other plants. Acorns were a staple of the Shasta diet. Regardless of the variety of resources available to the Shasta, the primary components of their diet were deer, Chinook salmon, and acorns (Dixon 1907, Silver 1978).

Individual hunters and communal hunting parties hunted deer using bows and arrows, snares, dogs, and drives (e.g., driving deer over cliffs). Waterfowl and quail were taken using nets, snares, and traps (Moratto 1984). Spring and fall salmon runs were important fishing times for the Shasta. Fishing techniques included a combination of techniques including nets, weirs, spears, and fish drives (Shasta Indian Nation 2018). In the spring, Klamath River Shasta waited to catch salmon until a member of another Shasta Group called the Kammatwa caught the first fish and performed a ritual. Klamath River Shasta could then catch and process the fish for storage but could not eat them until the Karuk performed the White Deerskin Dance ceremony. Salmon and trout were sun dried and stored in baskets for winter consumption (Silver 1978). Women and children also dove for mussels in the Klamath River during the spring.

Shasta traded pine nuts, obsidian blades, and juniper beads with their neighbors for obsidian from the Achumawi; pine nut necklaces from the Wintu; canoes from Karuk and Yurok; acorns, baskets, dentalia shells, haliotis shells, and other shells from the Karuk, Hupa[83], and Yurok; and beads from Wintu (Silver 1978). Shasta also acted as a middleman for the Achumawi, who acquired dentalia shells from groups in the Columbia River area. In addition, Shasta occasionally attended Karuk, Hupa, and Yurok dances.

Euro American settlement into Shasta lands accelerated as a result of the Gold Rush. Conflicts between Indian Tribes and Euro Americans resulted in the Rogue River Indian Wars of 1850–1857 that pushed Shasta from their traditional fishing, hunting, and village sites. A treaty in 1851 established a reservation in Scott Valley for Shasta, but conflict between Euro Americans and Shasta persisted. Consequently, in the 1870s Shasta welcomed cultural revivalist movements such as the Ghost Dance. From the 1870s through the 1940s most Shasta in the vicinity of the Proposed Project lived at the Frain Ranch or Bogus Tom Smith's Rancheria (Daniels 2006) and continued to practice their traditional subsistence activities. Currently, Shasta are represented in the Shasta Nation, Shasta Indian Nation, and the Etna Band of Indians otherwise known as the Ruffey Rancheria. Along with working on federal recognition, through the Ruffey Rancheria Restoration Act (HR 3535, La Malfa 2017), the Shasta people continue to preserve, protect, and maintain traditional cultural practices, including sites associated with those practices.

Northwest California Culture Area

King et al. (2016) identified six patterns or modes of adaptation (i.e., Post, Borax Lake, Berkeley, Mendocino, Tuluwat, and Augustine Patterns) for northwest California and the North Coast Ranges and assigned them to six time periods: Paleo-Indian (10,000–6,000 B.C.); Lower, Middle, and Upper Archaic (6,000 B.C.–A.D. 500); and Upper and Lower Emergent (A.D. 500–1800) periods. The patterns applicable to northwest California are the Post, Borax Lake, Mendocino, and Tuluwat (formerly Gunther).

The Post Pattern (12,000–8,000 BP) represents the earliest occupation of the area and is characterized by fluted, concave-base projectile points and crescents. Regardless, archaeological sites with well-defined assemblage of typical Post Pattern artifacts are not well represented in northwest California.

The Borax Lake Pattern (8,000–2,500 BP) represents a generalized hunting and gathering subsistence pattern. It is characterized by heavy, wide-stemmed points with indented bases, serrated bifaces, ovoid tools, hand stones, and milling slabs (King et al. 2016). The Borax Lake Pattern is identified at sites across a wide variety of environments in Humboldt and Trinity counties along Pilot Ridge and South Fork Mountain and along a river terrace adjacent to the

Trinity River. One archaeological site has a house floor and post holes dated over 7,000 BP (Fitzgerald and Hildebrandt 2001).

The Mendocino Pattern (5,000–1,500 BP) appears to represent a hunting and gathering subsistence pattern that is well adapted to local environments and typically exploits seasonally available resources across different ecological zones. It is characterized by side-notched, corner-notched, and concave base dart points, hand stones, milling slabs, and in some cases small numbers of cobble mortar and pestles. The Mendocino Pattern is not clearly defined in northwestern California, but it has been identified at sites on Point St. George, and along the Smith River, in Humboldt Bay, and in the northern mountains of Humboldt County (King et al. 2016).

The Tuluwat Pattern (beginning about 1,500 years BP) appears to be associated with the exploitation of marine and riverine resources. It is characterized by barbed projectile points, concave based points used for composite harpoons, spears, hooks ground and polished stone artifacts, flanged pestles, notched net sinkers, and steatite bowls. Sites representing this settlement pattern are associated with exploitation of marine mammals and fish and include locations in Del Norte and Humboldt Counties (King et al. 2016). The pattern appears to represent the earliest evidence of subsistence patterns associated with the exploitation of marine mammals and fish that is typical of the Yurok, Hupa, and Karuk that currently inhabit northwest California and the Klamath Basin.

Ethnography

Karuk

Bright (1978) summarizes ethnographic information regarding Karuk primarily from information presented by Gifford (1939a,b; 1940) and Kroeber and Barrett (1960). Karuk occupy territory west of the Shasta, which stretches along the Middle Klamath River near the western boundary of Siskiyou County from Seiad to Bluff Creek just west of Orleans (Bright 1978). Additionally information on Karuk ethnography include the works of John Salter and Craig Tucker (2010) and Thomas King (2004) In 1979, the Karuk Tribe re-established a government to government relationship with the United States (Karuk Tribe 2019). Karuk are members of the Hokan language family (Bright 1978). Karuk share similar cultural traits with the Yurok and Hupa and regularly interact with each other.

Karuk were organized in villages with a relatively loose political structure. The acquisition of wealth is an important part of Karuk culture, and wealthy men assumed leadership roles because of their prestige. Villages varied in size and consisted of rectangular cedar plank houses and sweat houses. Karuk focused on the use of fish and aquatic resources, but other terrestrial resources were also important supplements to their diet. Karuk also harvested acorns and hunted in upland areas around the Klamath River for deer, elk, birds, and fur bearing

mammals. The hides of mammals were used for a variety of clothing and bird feathers and pelts were used for ceremonial regalia.

Plentiful fish resources facilitated the occupation of numerous villages along the Klamath and Salmon Rivers (i.e., Salter [2003] reports that 100 villages existed along the two rivers). The villages were in advantageous locations on bends of the Klamath River and bluffs above it, such as near the mouths of Camp Creek (Tishawnik), the Salmon River (Mashuashav), and Clear Creek (Inam).

Archaeologically, Karuk tools reflect their emphasis on the acquisition of fish and other aquatic resources and include harpoons, nets, and hooks. Facilities constructed to harvest fish include weirs, dams, and fishing platforms. Karuk also constructed canoes from hollowed out logs for fishing and transportation along the Klamath River and its tributaries. Transportation along the river and streams was essential to Karuk ceremonial activity. Indeed, Karuk traditions state that the Klamath River was created to facilitate their interaction with Yurok and Hupa and with salmon.

The political and social organization and material cultural of the Karuk are important topics, but their religious and ceremonial practices highlight their relationship to the Klamath River and its associated resources. Of particular importance are world renewal ceremonies and ceremonies for bountiful harvests of fish and other resources (Bright 1978). World renewal ceremonies include the White Deerskin and Jump ceremonies at which the earth and the creator are honored for providing food and facilitating the prosperity of the tribes. These ceremonies were and continue to be conducted at sites along the Klamath River such as Panamnik (Drucker 1936, Verwayen and Hillman 2010). Ceremonies to insure harvests of fish include the First Fish, First Salmon, and Fish Dam ceremonies. Other ceremonies related to world renewal and curing are the Boat Dance and the Brush Dance. Karuk, Hupa, and Yurok regularly attend each other's ceremonies and the ceremonies are conducted for the benefit of all the groups.

The White Deerskin and Jump ceremonies honor the earth and the creator for providing food resources and maintaining the tribes. The White Deerskin ceremony is held from late August into September, depending on the river and its waters. The Jump ceremony is conducted after the conclusion of the White Deerskin ceremony and is also held for the "good" of the world. Both the White Deerskin and the Jump ceremonies depend on a healthy Klamath River system for fish, basket materials, and bathing. The First Fish ceremony is conducted in spring and the Fish Dam ceremony is conducted to in mid-summer to celebrate the harvesting of fish and to pray for continuing prosperity and access to subsistence resources, primarily fish resources. The Boat ceremony forms part of the White Deerskin ceremony, celebrating the flows and health of the rivers. The Brush Dance is held to cure the sick, particularly children.

Euro American settlement in the Area of Analysis for historical and tribal cultural resources accelerated as a result of the California Gold Rush. Conflicts between Indian Tribes and Euro Americans were commonplace across Karuk territory. Consequently, Karuk welcomed cultural revivalist movements in the 1870s such as the Ghost Dance, but traditional cultural practices and numbers of Karuk continued to decline. Regardless, the Karuk persisted and contemporary Karuk continue to practice their traditional activities and are actively engaged in programs related to improving the health of the Klamath River and its fishery.

Quartz Valley Indian Community

The Quartz Valley Community is a federally recognized tribe mainly representing people of Karuk and Shasta ancestry, with 174 acres of reservation lands in the Scott Valley, near Fort Jones, California. The Quartz Valley Indian Community's reservation lands are located near the community of Fort Jones. The Quartz Valley Indian Community initially filed their constitution and bylaws with the Office of Indian Affairs in 1939 (DOI 1939).

Yurok

Pilling (1978) summarizes ethnographic information regarding Yurok collected by Waterman (1920), Waterman and Kroeber (1934), and others. Sloan (2003, 2011) also presents a summary of the ethnography of the Yurok and the relationship to the tribe to the Klamath River. Yurok are members of the Algonquian language family. Per the Yurok Tribe's constitution (Yurok Tribe 1993), the Ancestral Lands of the Yurok Tribe extend unbroken along the Pacific Ocean coast (including usual and customary off-shore fishing areas) from Damnation Creek, its northern boundary, to the southern boundary of the Little River drainage basin, and unbroken along the Klamath River, including both sides and its bed, from its mouth upstream to and including Bluff Creek drainage basin. Included within these lands are the drainage basin of Wilson Creek, the drainage basins of all streams entering the Klamath River from its mouth upstream to and including the Bluff Creek and Slate Creek drainage basins, including the village site at Big Bar (except for the drainage basin upstream from the junction of Pine Creek and Snow Camp Creek), and the Canyon Creek (also known as Tank Creek) drainage basin of the Trinity River, the drainage basins of streams entering the ocean or lagoons between the Klamath River and Little River (except for the portion of the Redwood Creek drainage basin beyond the McArthur Creek drainage basin and except for the portions of Little River drainage basin which lies six miles up from the ocean) (Yurok Tribe 1993). The Yurok Tribe's reservation currently consists of a strip of land beginning at the Pacific Ocean and extending a mile along each side of the Klamath River approximately 45 miles.

The Yurok life, language, ceremonies, society, and economy are linked with the Klamath River. There are Yurok stories that reinforce the Yurok belief that the River was created in a distinct way in order to provide Yurok people with the best of worlds (Sloan 2003, 2011). Yurok refer to the river as HeL kik a wroi or

"watercourse coming from way back in the mountains." Contemporary Yurok often refer to the Klamath River as the "Yurok Highway" emphasizing its comparison to a blood vessel that provides the main flow of sustenance. Karuk, Yurok, and Hupa share similar cultural traits and traditional stories state that the Klamath River was created to facilitate their interaction with each other and with salmon.

The Yurok had permanent settlements with substantial architectural features including houses, smokehouses, and storage facilities (Kroeber and Barrett 1960, Pilling 1978). Pilling (1978) cites 44 villages, 97 fishing spots, 82 significant cultural places (e.g., places used for ceremonies, gathering, and hunting), and 41 places of cultural significance along the Klamath River in Yurok territory. The Yurok Tribe has documented over 70 villages in its ancestral territory

The Yurok represent a socially complex hunter-gatherer population in California (Fredrickson 1973, Kroeber 1925) that used marine and salmon resources. Organizing labor to capture the short-duration salmon runs, preserving fish by smoking, then packing and storing the fish suggests a high degree of sociopolitical differentiation. There is also evidence of a maritime expression to Yurok culture involving marine mammal hunting more than 10 miles offshore. The most telling argument for an open-ocean maritime adaptation comes from the presence of the large amount of northern fur seal fauna in the Stone Lagoon midden. Hildebrandt and Jones (1992) argued that pinnipeds were extirpated early on shore by Native Americans, who then developed watercraft to hunt offshore.

The material culture of the Yurok people includes, to this day, dugout redwood canoes, split-plank houses, storage boxes, sweathouse pillows and stools, many fishing devices, baskets and leather, shell, straw and feather garments and ceremonial regalia.

Transportation along the rivers and streams is essential to Yurok ceremonial activity. One of the most important aspects of Yurok technology was the river- and ocean-going canoe or yoch, which were carved from selected redwood trees (Sloan 2003, 2011). There are historic accounts of expeditions traveling up to 180 miles along the coast (Sloan 2003, 2011). A typical river canoe measured 16 to 20 feet in length and 3 to 4 feet in width. River canoes were customarily paddled and/or pushed with a long pole. Yurok technology and facilities do not only serve utilitarian functions, but also include ceremonial aspects of Yurok culture. For example, facilities, such as fishing weirs, were created specifically to signify the time of sacred ceremonies (e.g., the White Deerskin and Jump ceremonies).

Fishing places along the Klamath River are owned by individuals, families, or groups of individuals. Fishing places can be borrowed, leased, inherited, or

bought and sold (Sloan 2003, 2011). Some ownership rights at fishing places depended on species of fish caught at the site, while others depended on the water level (i.e., individuals owned the right to fish at a place if the river was below or above a certain level). Yurok still recognize this traditional form of resource management and use of the river. Families and individuals continue to use and own rights to fishing places on the Klamath River.

Like the Karuk, the religious and ceremonial practices highlight the Yurok relationship to the Klamath River and its associated resources. Of particular importance were the Jump, White Deerskin, Boat, and Brush ceremonies. The Jump and White Deerskin ceremonies were held in late fall to give thanks for food resources abundance collected during the year and to insure a continued abundance of food resources for the next year (Sloan 2003, 2011). Affluent individuals and religious leaders conduct most ceremonies, and wealthy individuals were expected to feed salmon to everyone attending the ceremonies.

The Boat Ceremony is part of the White Deerskin Ceremony. In this ceremony, several boats filled with participants travel down the Klamath River. The participants thank the river for continuing to flow and provide resources. The Brush Ceremony unfolds over a four-day period and highlights the importance of Klamath River resources to Yurok. For example, baskets made of plant materials collected at the water's edge are used to hold food and ceremonial medicine; acorns are cooked in the baskets using cooking stones gathered at specific river bars; ceremonial regalia is made from various plant and animals that live along the river; ceremonial bathing is performed; and participants listen to the sounds made by the Klamath River (King 2004).

The social and ceremonial significance of the Klamath River is evident in and reinforced by Yurok traditions. For example, there are at least 77 Yurok stories that make direct reference to the Klamath River (Sloan 2003, 2011). These Yurok stories reinforce the belief that the Klamath River was created to provide Yurok with a very good place to live.

Spanish explorers and vessels traveling from the Philippines may have interacted with Yurok along the coast in the late 1700s. According to the Yurok Tribe, both the Bodega and Vancouver expeditions visited the village of Tsuri (Yurok Tribe 2019). Other explorers such as Peter Skene Odgen and Jedediah Smith certainly encountered Yurok along the Klamath River in the early 1800s. Regardless, Euro American settlement and use of Yurok territory did not begin until after the discovery of gold in California in early 1850. With strikes along the Klamath and Trinity rivers, gold prospectors inundated the region affecting Yurok traditional culture (Pilling 1978).

In 1851 a "Treaty of Peace and Friendship" was signed between the United States Government and the Klamath River Indians, but the United States Congress did not ratify this treaty. Subsequently, on November 16, 1855, the

Klamath River Reserve, also known as the Klamath Indian Reservation, was established by Executive Order. The Order designated the reservation lands from the mouth of the Klamath River, one mile on each side extending approximately 20 miles upriver to Tectah Creek (Sloan 2003, 2011).

Escalating conflict between Yurok and Euro Americans during the 1860s and 1870s over encroachment onto the Klamath Indian Reservation resulted in the displacement of Lower Klamath Indians further upriver (Sloan 2003, 2011). Euro Americans on the reserve resisted attempts to remove them, including eviction in 1879 by the United States Army (Sloan 2003, 2011). After decades of struggle to regain their traditional homelands, the Yurok Tribe was re-organized and was granted its own reservation in 1988. As a result of the 1988 Hoopa-Yurok Settlement Act (PL-100-580), the Yurok Indian Reservation was established.

The ancestral lands of the Yurok Tribe extend unbroken along the Pacific Ocean coast (including usual and customary off-shore fishing areas) from Damnation Creek, its northern boundary, to the southern boundary of the Little River drainage basin, and unbroken along the Klamath River, including both sides to the associated tributary watershed boundaries from the mouth upstream to the Bluff Creek drainage basin. The Yurok Tribe considers cultural resources sites along and associated with the Klamath River to be part of a larger ethnographic riverscape (King 2004, Yurok Tribe 2012). Sites include fishing areas; a fish dam (weir) site; many different types of resource gathering sites, complex trail systems that connect villages, camps, the river, ceremonial sites, gathering areas, and other Tribes; and 47 villages with graves/cemeteries.

The Yurok Tribe is the largest tribe in California, with over 4,500 enrolled tribal members and over 200 tribal government employees. The Yurok Tribe is actively pursuing economic development and management of fisheries, forestry, and cultural programs, both on the reservation and Yurok ancestral lands.

Resighini Rancheria

The Resighini Rancheria is a federally recognized Tribe of Yurok people. Their reservation is located on the southern banks of the Klamath River Estuary. The tribe shares a cultural history to that of greater Yurok culture, as described above. Land known as the Resighini Rancheria was designated by Secretarial Order and was officially declared a reservation in 1939, within the original Klamath River Reservation. In 1975, a group of Yuroks stood together and formally created a non-traditional form of government with a constitution and bylaws which was approved and ratified by the Department of Interior of the United States. The Tribe asserts that it maintains fishing and water rights in the lower Klamath Basin and strive to protect fishing, wildlife, forestry, surface water, groundwater, and other trust resources. Please note that Volume II, Appendix V *KHSA 2012 EIS/EIR* Section 3.12 *Tribal Trust* does not include all asserted trust resources of the Resighini Rancheria (M. Van Pelt, Resighini Rancheria, pers. comm., March 2019)

Today, the tribal government consists of a General Council comprised of tribal members over age eighteen (18), with an elected Tribal Council to operate the governmental and private tribal affairs, as well as represent the tribal needs. The Tribal Council consists of five tribal members who are elected annually by staggered two-year terms of Chairperson, Vice Chairperson, Secretary, Treasurer and Councilperson. Their General Council serves on boards, committees, commission and corporations to assist the Tribal Council.

Hoopa Valley Tribe

Wallace (1978) summarizes ethnographic information regarding Hupa primarily collected by Goddard (1903). Hupa are members of the Athabascan language family and they call themselves Natinixwe. Hupa ancestral territory is centered in Hoopa Valley and the area surrounding the Trinity River near its confluence with the Klamath River. Hupa, Karuk, and Yurok share similar cultural traits and regularly interact with each other.

Hupa were organized in villages with a relatively loose political structure. Villages typically consisted of family groups (Wallace 1978). Villages varied in size and consisted of rectangular cedar plank houses. For substances, traditional Hupa people primarily used fish and aquatic resources, but also utilized terrestrial resources such as mammals, birds, reptiles, insects, and other fauna (Wallace 1978). Hupa also harvest acorns and hunted in upland areas around the Trinity and Klamath River for deer, elk, birds, and fur-bearing mammals. The hides of mammals were used for a variety of clothing and bird feathers and pelts are used for ceremonial regalia.

Hupa tools reflect their emphasis on the acquisition of fish and other aquatic resources and include harpoons, nets, and hooks. Facilities constructed to harvest fish include weirs and dams. The Hupa used canoes for fishing and transportation along the Trinity and Klamath rivers but obtained their canoes from the Yurok. Transportation along the river and streams was essential to Hupa ceremonial activity.

Like the Karuk and the Yurok, the Hupa's religious and ceremonial practices highlight their relationship to a river, the Trinity River, and its associated resources. Of particular importance are world renewal ceremonies and ceremonies for bountiful harvests of fish and other resources (Wallace 1978). World renewal ceremonies include the White Deerskin and Jump ceremonies at which the earth and the creator are honored for providing food and facilitating the prosperity of the tribes. Ceremonies to ensure harvests of fish and acorns include the First Salmon ceremony and Acorn Feast (Wallace 1978). Hupa, Karuk, and Yurok regularly attend each other's ceremonies and the ceremonies are conducted for the benefit of all the groups.

Euro American settlement of the as a result of the Gold Rush, ultimately resulting in the establishment of the original Hoopa Valley Reservation in 1864. President Harrison expanded the Hoopa Valley Indian Reservation in 1891 to include the Klamath River Reserve that extended one mile on either side of the Klamath River from the Pacific Ocean for 22 miles upstream, as well as the lands one mile on either side of the river between the two reservations (Salter 2003). The 1988 Hoopa-Yurok Settlement Act (PL-100-580) divided the reservation again, separating it into the Hoopa Valley Reservation and the Yurok Indian Reservation (Salter 2003).

The culture of Karuk, Hupa, and Yurok is closely tied to the Klamath and Trinity Rivers. These tribes subsist wholly or in large part on the resources acquired from the river, most of their sacred sites are located along it, and their cultural traditions are related to it (Bright 1978, Pilling 1978, Wallace 1978). Contemporary Hupa practice their traditional activities and are actively engaged in programs related to improving the health of the Trinity River and its fishery.

3.12.2.2 Historic Period

Euro American exploration of the Klamath region began in the early 19th century. Jedediah Strong Smith and Peter Skene Ogden explored current Siskiyou and Klamath County in 1826 and 1827 for beaver as part of fur trade, and in 1829 a party of Hudson Bay Company trappers and explorers, led by Alexander Roderick McLeod, also passed through the area (Klamath Hydroelectric Project 2004). The fur trade ended in the mid-1840s. Largely, the area remained sparsely occupied by Euro Americans until the mid-1800s, when mining and logging attracted settlers to the area.

The discovery of gold at Sutter's Mill in Coloma in 1848 was the catalyst that caused a dramatic alteration of both Native American and Euro American cultural patterns in California. A flood of immigrants entered the California and the Klamath region once news of the discovery of gold spread. Initially, the Euro American population grew slowly, but soon exploded as the presence of large deposits of gold were confirmed. The non-Native American population of California quickly swelled from an estimated 4,000 Euro Americans in 1848 to 500,000 in 1850 (Bancroft 1888). The discovery of gold and the large influx of primarily Euro American immigrants had a positive effect on the growth and economic development of California as a state, but a negative effect on Native American cultures. The discovery of gold in California marked the beginning of a relatively rapid decline of both Native American populations and culture. The influx of primarily European Americans displaced Native Americans from their traditional territory, discouraged the use of traditional languages and the practice of religious ceremonies, and Euro American economic pursuits (e.g., gold mining, logging, ranching, and farming) limited the practice of traditional subsistence activities.

Gold was discovered by Abraham Thompson and his party just north of the present-day location of the City of Yreka in 1851 (Hoover et al. 2002). Known as "Thompson's Dry Diggins", the population quickly exploded to 2,000 miners, and the town of Shasta Plains was established (Hoover et al. 2002). The town primarily included tents and brush shanties, but also included a saloon built out of shakes and canvas by Sam Lockhart. The first permanent house in the town was built by D.H. Lowry and his wife.

Euro American settlement in the Klamath River watershed continued to grow through the 1850s due to the completion of roads such as the Southern Emigrant Road, also known as the Applegate Trail, in 1846 (Klamath Hydroelectric Project 2004). These roads brought prospectors to the region and helped to establish communities such as Henley (Cottonwood), Gottville, Happy Camp, and Somes Bar. Fertile soil and plentiful water sources provided opportunities for homesteading and the private development of agriculture and ranching, particularly in the area around current Upper Klamath Lake, but also extending downriver, occupying the rich alluvial terraces along the river through the canyon. The expansion of Euro Americans in southeastern Oregon resulted in execution of treaties with the various Klamath River tribes and the relocation of these groups in the area (Klamath Hydroelectric Project 2004). Shasta women married into ranching families at this time and are recognized as being instrumental in the tribes' long-term survival today.

Logging began in the Klamath Basin in the 1860s and sustained logging enterprises appeared in the 1880s (Klamath Hydroelectric Project 2004). Early companies were generally small, family-run operations managed by ranching families trying to supplement their income. In 1867, President Ulysses S. Grant signed legislation to create a land-grant subsidy for the construction of the Oregon and California Railroad (Klamath Hydroelectric Project 2004). The grant allowed the Oregon and California Railroad Company to select off-numbered sections from the public domain for the construction of the railroad. In 1887, the Oregon and California Railroad Company claimed "lieu" lands on the Pokegama Plateau as compensation for other lands that had already been claimed by homesteaders or military and wagon road companies. Title to these lieu lands were immediately (and illegally) transferred to the Pokegama Sugar Pine Lumber Company. To move the logs from the Pokegama Plateau, the Pokegama Sugar Pine Lumber Company built a log chute on the rim of the Klamath River Canyon and the first railroad in Klamath County (Gavin 2003). During this period, larger scale logging companies such as Pokegama Sugar Pine Lumber Company and Klamath River Lumber and Improvement Company were established on the north rim of the Klamath River Canyon.

The end of the nineteenth and beginning of the twentieth centuries witnessed an ongoing and growing immigration into the area, which was facilitated by the construction of the railroad through the region. The railroad provided a reliable means of transportation in the area and stimulated regional cultural and

economic development. In addition to improving transportation, a railroad grade constructed at the northern end of Lower Klamath Lake functioned as a dike that facilitated drainage of wetlands for agriculture and control of the flow of water from the Klamath River.

The Oregon and California Railroad constructed in 1877 was the first railway through the region (Klamath Hydroelectric Project 2004). It extended from Siskiyou County, California, to Jackson County, Oregon, and facilitated travel and the transport of goods between Sacramento and Portland. Subsequently, the Southern Pacific Railroad Company acquired the Oregon and California Railroad, and by 1909 agricultural and lumber products of the Klamath Basin could be distributed to a nationwide market.

The first hydroelectric development in the Klamath Basin was established in 1891 in the Shasta River Canyon below Yreka Creek to provide electricity to the City of Yreka (Klamath Hydroelectric Project 2004). Four years later, in 1895, the Klamath Falls Light & Water Company built a power plant along the banks of the Link River and soon thereafter began power generation for the town of Klamath Falls (Klamath Hydroelectric Project 2004). The first decade of the 20th century brought a number of mergers and reorganizations of power companies in the specific project reach of Klamath River canyon currently under study. The California-Oregon Power Company (COPCO) was one of the companies that emerged from this period of reorganization (Klamath Hydroelectric Project 2004). The USBR's Klamath Irrigation Project, authorized in 1905, was developed by the DOI to supply farmers with irrigation water and farmland in the Klamath Basin. Link River Dam is the principal source of water for Reclamation's Klamath Project and the irrigation system and serviced areas are situated upriver of the Proposed Project.

COPCO proposed to develop hydroelectric power facilities along the Klamath River. Residents in the Klamath Falls area were divided over COPCO's proposal to dam and generate power on the river. Farmers feared the depletion of precious irrigation water while other businesses saw COPCO operations as an addition to the local economy. Regardless, with the increasing power needs of both irrigation and lumber mills and a huge influx of military personnel stationed at Medford and Klamath Falls, it was only a matter of time before additional power generation facilities were needed in the area. Envisioned in 1911, the Klamath Hydroelectric Project (Klamath Hydroelectric Project) was built in phases through 1962 (Kramer 2003a,b). Klamath Hydroelectric Project facilities were constructed by COPCO beginning with Copco No. 1 Dam (1918), followed by Copco No. 2 Dam (1925), and reconstruction of the old East Side facility in 1924. After World War II, regional population growth prompted a new round of hydroelectric power expansion highlighted by COPCO's Big Bend project (J.C. Boyle Dam and powerhouse) in 1958 and the construction of the Iron Gate facilities in 1962. While the Iron Gate facilities were still under construction,

COPCO merged with Pacific Power & Light, currently PacifiCorp. PacifiCorp currently owns and operates the Klamath Hydroelectric Project.

The development of the Klamath Hydroelectric Project played a significant role in the area's economic change, both as part of a regionally significant, locally owned and operated private utility and through the role that increased electrical capacity played in the expansion of the timber, agriculture, and recreation industries during the first six decades of the 20th century. Such, continuing industrial expansion in the region also contributed to the ongoing displacement of Native Americans from their traditional territory and the associated fishing, hunting and gathering economies, as previously noted. The Klamath Hydroelectric Project dams and associated facilities are recommended as eligible for inclusion on the National Register of Historic Places (NRHP) as the Klamath Hydroelectric Historic District (KHHD) under Criterion A for its association with the industrial and economic development of southern Oregon and northern California from 1903–1962 (Kramer 2003a,b; Cardno Entrix 2012). Economic development continues in the region, but it is now driven by tourism and recreation rather than gold mining, agriculture, or logging.

3.12.2.3 Known Tribal and Historical Resources in the Vicinity of the Proposed Project

Summary of California Historical Resources Information System Record Searches

In 2017, the KRRC conducted an updated records search at the California Historical Resources Information System's Northeast center at Chico, State University, for a study area that includes the length of the Klamath River from the Oregon-California state line, 40 miles downstream to Humbug Creek. The section of river below Iron Gate Dam (the most downstream Lower Klamath Project dam) was included in the records search since this 18-mile long area lies within the altered FEMA 100-year floodplain following dam removal, where cultural resources have the potential to be affected. The records search area included a 0.5-mile wide buffer, extending on either side of the shorelines of Copco No. 1 Reservoir and Iron Gate Reservoir, and from the center point of the Klamath River in all other areas.

The KRRC's 2017 record search compliments the cultural resource record searches previously performed as part of the Klamath Hydroelectric Project Relicensing (FERC 2007) and 2012 KHSA EIS/EIR studies (PacifiCorp [2004] and Cardno Entrix [2012]).

The records search included gathering archaeological site forms, survey and excavation reports, maps, and other records. Survey and site locations were hand plotted onto USGS topographic maps at the Northeast Information Center. Research of historic registers included the California Historic Landmarks, National Register of Historic Places (NRHP), California Register of Historical Resources, California Points of Historical Interest, California Inventory of Historic

Resources, and the California State Historic Resources Inventory. In April 2017, the KRRC visited the Klamath National Forest office and the Siskiyou County Museum, both in Yreka, California to collect additional historic information. Klamath National Forest Heritage Program Manager Jeanne Goetz conducted a search of records for Forest Service lands within or near the KRRC records search area and provided appropriate archaeological site record forms (Appendix B: *Definite Plan – Appendix L*).

The KRRC also conducted a background literature search to identify known cultural resources and also to determine the types of cultural resources likely to occur within the area of the Proposed Project. In addition, online newspaper archives were searched, including the National Digital Newspaper Program archives provided by the Library of Congress and National Endowment for the Humanities (https://chroniclingamerica.loc.gov/); Genealogy Bank newspaper archives provided by NewsBank, Inc. (www.geneaologybank.com); the California Digital Newspaper Collection repository provided by University of California, Riverside (https://cdnc.ucr.edu/); and newspaper archives provided by www.Ancestry.com.

In May 2017, the KRRC obtained cultural sources data from PacifiCorp, including GIS shapefiles with previous survey and resource locations, as well as a copy of the final cultural resources technical report prepared for Klamath Hydroelectric Project relicensing (PacifiCorp 2004). In addition, the KRRC contacted Dr. Joanne Mack, Professor Emeritus at Notre Dame University, a primary researcher in the Upper Klamath Basin, to discuss the Proposed Project and to learn of her on-going research in the area that might not be reflected in published or unpublished literature. The KRRC also consulted with Dr. Brian Daniels, Director of Research and Programs for the Penn Cultural Heritage Center at the University of Pennsylvania Museum, regarding ethnographic information, archival documents, and oral histories pertaining to tribal cultural resources within the California records search area.

The KRRC contacted the Native American Heritage Commission in June 2017, to secure a review of the Sacred Lands file for a 0.5-mile wide area on either side of the Klamath River corridor, extending from the California-Oregon state line downstream to the Pacific Ocean. In a June 14, 2017 letter, the Native American Heritage Commission stated that there was a positive result, with the recommendation to contact the Karuk Tribe, Yurok Tribe, and Shasta Nation. The Native American Heritage Commission also provided a consultation list of 29 tribes with traditional lands or cultural places located within the boundaries of Del Norte, Humboldt, and Siskiyou counties.

The KRRC records search and literature review (Appendix B: *Definite Plan – Appendix L*) identified that 58 previous cultural resources investigations have been conducted within the records search study area, with five studies (Kramer 2003a,b; Cardno Entrix 2012; Durio 2003; PacifiCorp 2004) completed

specifically for the Proposed Project (Appendix B: *Definite Plan – Appendix L*). Several of these studies are archaeological, ethnographic, or historical overviews, while others describe the findings of specific archaeological excavations.

The majority of the past surveys involve pedestrian field survey and cultural resources monitoring. Overall, an estimated 8,189 acres of federal, state, and/or private land have been previously surveyed within the records search area and except for some proposed disposal sites, encompasses the current boundaries of the Proposed Project.

The KRRC California record searches identified 206 previously recorded cultural resources, consisting of 120 archaeological sites,1 ethnographic property, 9 built environment resources, 68 isolated finds, and 8 resources of an undetermined resources type (Appendix B: *Definite Plan – Appendix L*). By type, these resources include 114 prehistoric, 59 historic-period, 23 multiple-component (prehistoric and historic period), 1 ethnographic property, and 9 resources whose temporal association is unknown.

Section 6.1.6 of Appendix L of Appendix B: *Definite Plan* states that KRRC will examine compiled data and assess them to identify missing information such as gaps in survey coverage within the Limits of Work. Section 6.2.2 of Appendix L of Appendix B: *Definite Plan* indicates that disposal site areas that were not previously surveyed were subject to pedestrian surveys in 2017. More specifically, in July 2017, KRRC conducted a cultural resources pedestrian survey inventory of approximately 27 acres at the Iron Gate Dam disposal site. The inventory identified one historic-period archaeological site (LKP-RB-1) and one historic-period isolated find (LKP-EN1-IF). In addition, the KRRC will identify any other land-based areas within the limits of work that were not previously inventoried for cultural resources and subject them to pedestrian surveys to provide intensive coverage of all direct impact areas associated with the Limits of Work. The CRWG also may identify additional survey areas located outside the limits of work for pedestrian surveys as part of its ongoing efforts to develop the Proposed Project Area of Potential Effects (APE) (Section 106). Conducting pedestrian surveys to encompass the entire area of analysis and updating any pedestrian surveys that were not conducted within the last 5-10 years would be unduly burdensome and is not required by CEQA.

Archaeological Sites

The known archaeological sites on file at the Northeast Information Center represent roughly 60 percent of the previously recorded resources along the Klamath River from the Oregon-California state line to Humbug Creek. The sites consist of 49 prehistoric, 48 historic-period, and 23 multiple-component (both historic and pre-historic at the same location) sites. Identified prehistoric period sites include villages; campsites; lithic scatters; lithic scatters with associated

cultural features; toolstone quarries; a possible ceremonial site with multiple features; and a human burial site.

The historic-period archaeological sites consist of late-nineteenth or early-twentieth century properties associated with the development of agriculture, including settlements or features such as homesteads; logging; mining; commercial; public works (hydroelectric); and transportation. Agricultural-related sites include settlements (homesteads), irrigation ditches, rock features, and artifact scatters.

Logging-related sites focus on elements of the former Klamathon townsite, including the town and lumber mill and the associated Pokegama log chute and ditch flume. Mining related sites, located in the Klamath River area below Hornbrook, include two quartz mines and four placer mines with ditches and/or tailings. The Beswick Hotel, ranch, and Klamath Hot Springs area represents the single commercial property. An extensive refuse scatter associated with the Copco No. 1 Village is the sole public works site. Finally, transportation-related sites consist of an abandoned segment of the Klamath Lake Railroad, a collapsed trestle and segment of railroad grade, a segment of Topsy Road, a road leading to Horseshoe Ranch, and a segment of the California-Oregon Stage Road.

The multiple component sites include both prehistoric and historic-period components. Prehistoric components associated with these sites include housepit villages, a housepit village with a documented historic-period cemetery, lithic scatters, a toolstone quarry, and a rockshelter. Historic-period components comprise mining camps and/or tailings features, agricultural related resources such as historic ranches and artifact scatters, and a possible commercial property associated with a former saloon.

Table 3.12-1. Non-confidential Historic–period Cultural Resources within the Area of Analysis.[1]

Primary No.	State Trinomial	Resource Type	Site Type	General Vicinity	NRHP Eligibility
P-47-000522	CA-SIS-522	Site	Empire Quartz Mine	below IGR	7
P-47-000536	CA-SIS-536H, CA-SIS-1315H	Site	Klamathon Townsite and Lumber Mill	below IGR	7
P-47-001671	CA-SIS-1671H	Site	Klamath Lake Railroad Grade	on hillslope	7
P-47-002129	CA-SIS-2129H	Site	Grieve-Miller-DeSoza Ditch	on hill slope	3
P-47-002239	CA-SIS-2239H	Site	COPCO II Ranch Features	on hill slope	4S2
P-47-002266	CA-SIS-2266H	Built Environment	Copco II Powerhouse	Copco Dam	3S
P-47-002267	CA-SIS-2267H	Built Environment	COPCO I Powerhouse and Dam	Copco dam	3S
P-47-002268	CA-SIS-2268H	Built Environment	Fall Creek Powerhouse	Fall Creek	3S
P-47-002823	CA-SIS-2823H	Built Environment	COPCO II Wooden Stave Penstock	In between Copco and IGR	3S
P-47-002824	CA-SIS-2824H	Site	COPCO Guest House	Copco dam	3S
P-47-003917	CA-SIS-3917H	Site	Refuse Scatter	Copco Dam	7
P-47-003922	CA-SIS-3922H	Site	COPCO Village Dump	Copco Dam	7
P-47-003934	CA-SIS-3934H	Site	Historical Cairns	edge of IGR	7
P-47-003937	CA-SIS-3937H	Site	Rock Wall	below IGR	7
P-47-003940	CA-SIS-3940H	Site	Franklin Homestead	edge of IGR	7
P-47-003942	CA-SIS-3942H	Site	Rock wall	edge of IGR	7
P-47-003943	CA-SIS-3943H	Site	Rock Wall	on hill slope	7
P-47-003945	CA-SIS-3945H	Site	Historical Cairns	edge of IGR	7
P-47-004212	N/A	Built Environment	Bridge	below IGR	7
P-47-004427	N/A	Site	Habitation with Artifact Scatter and Features	below IGR	7

Primary No.	State Trinomial	Resource Type	Site Type	General Vicinity	NRHP Eligibility
N/A	N/A	District	Klamath River Hydroelectric Project District	Lower Klamath Project facilities and associated structures	7
LKP-RB-1[2]	--	Site	Historic-period Archeological Site	Iron Gate Dam Disposal Area	
LKP-EN1-IF[2]	--	Isolated Find	Historic-period Isolated Find	Iron Gate Dam Disposal Area	

[1] Table 3.12-1 was developed based on Table 3.5-3 3 Previously Recorded Archaeological Sites and Built Environment Resources in the KRRC's September 30 CEQA Technical Submittal. Table 3.5-3 is included as Appendix W of this EIR, and is available online at: https://www.waterboards.ca.gov/waterrights/water_issues/programs/water_quality_cert/docs/lower_klamath_ferc14803/table3.5_3.pdf

[2] Based on KRRC 2017 pedestrian surveys (Appendix B: *Definite Plan*, Section 6.2.2 of Appendix L.

* National Register of Historic Places (NRHP) Eligibility from Cardno ENTRIX (2012) and/or NEIC site records:

- 3: Appears eligible for listing in the National Register of Historic Places;
- 3S: Appears eligible for separate listing;
- 4S2: May become eligible for separate listing in the National Register of Historic Places when more historical or architectural research is performed on the property;
- 7: Not evaluated.
- 8. Eligibility determinations were not made for all historic-period cultural resources listed in this table, but all historic-period cultural resources listed in this table are considered during impact analysis evaluation.

The site recorded solely as an ethnographic property consists of a natural rock landform in the Iron Gate area that features prominently in the cultural history of Shasta tribes. A group of eight sites, termed the Pollock Sites, represents undetermined site components.

Information provided in Table 6-8 in Appendix B: *Definite Plan – Appendix* L regarding the National Register of Historic Places eligibility of the archaeological sites is based on recommendations provided by Cardno Entrix (2012), or by eligibility information noted on site records that were not part of the Cardno Entrix study. Overall, one site is listed in the National Register of Historic Places as a contributor to a district, one site is individually eligible, three sites are contributors to a district, determined eligible, 29 sites appear eligible for listing, 2 sites might become eligible for listing when more historical research is performed; 4 sites have been found ineligible, and the remaining 80 sites have not been evaluated for National Register of Historic Places eligibility.

The information described above addresses resource eligibility for the NRHP. For the purposes of this analysis, with the exception of isolated occurrences of cultural material, all known and unknown prehistoric archaeological resources in the Project area are also considered significant (historical) resources, eligible for the CRHR. This includes known resources that have not been evaluated under CRHR criteria, resources that may be present in areas not yet surveyed, and potentially unique archaeological resources.

During State Water Board AB 52 consultation with the Shasta Indian Nation and Shasta Nation it was agreed that tribal cultural resources reflected in PacifiCorp (2004) and Daniels (2006), qualify as tribal cultural resources. Additionally, the Shasta Indian Nation provided updated tribal cultural resources information which is included in Confidential Appendix Q. There are 47 known Shasta Nation and/or Shasta Indian Nation tribal cultural resources in the Project area. These resources are primarily associated with villages, cairns, and burial sites, as well as fishing, hunting, and other resource extraction sites. A process to evaluate tribal cultural resource eligibility for previously unknown cultural resources or refine understanding of existing tribal cultural resources following Proposed Project activities is discussed in Potential Impact 3.12-1. Please note, known and as of yet unknown tribal cultural resources are covered by mitigation measures TCR-1 through TCR-8, which were developed in consultation with the Shasta Indian Nation, Shasta Nation, and Yurok Tribe.

Historical Built Environment Resources

The KRRC records search (Appendix B: *Definite Plan – Appendix L, Table 6-3*) identified nine historic-period built environment resources associated with the historic themes of commerce, settlement, transportation, and public works, as described below. The single commerce-themed resource includes a former service station converted to residence (Klamath Kamp). Two settlement-related sites have been recorded, consisting of a post-1930s duplex residence with

associated structures and the Frank Wood cabin, a late 1890s to 1950s era homesite. Transportation-related sites consist of a one-lane, wooden and steel beam truss bridge over the Klamath River (Ash Creek Bridge) west of Interstate 5, and the concrete State Route 263, T-beam bridge over the Klamath River at the confluence of Shasta River. Public works sites include four recorded elements of the Klamath Hydroelectric Project, including Copco No.1 Hydroelectric Powerhouse and Dam; Copco No. 2 Hydroelectric Powerhouse; Fall Creek Hydroelectric Powerhouse; and the Copco No. 2 Wooden Stave Penstock.

Besides these nine built environment resources, standing historic-period structures have been identified at several archaeological sites, including a ranch house and bunkhouse at the Beswick Hotel site (CA-SIS-513-H) and a shed at Copco II Ranch (CA-SIS-2239-H). The historic Spannaus Barn was noted at prehistoric/ethnographic site CA-SIS-2574, but was not recorded as an element of the site.

National Register of Historic Places eligibility information for these nine sites indicates that the two Klamath River bridges have been determined eligible for listing in the National Register of Historic Places. The four hydroelectric related sites were noted by Cardno Entrix (2012) as appearing eligible for separate listing, but these sites have also been documented as contributing elements to the Klamath Hydroelectric historic district (Kramer 2003b) which has yet to be concurred upon by the California and Oregon State Historic Preservation Officers. Also recommended as National Register of Historic Places eligible is the Frank Wood cabin. The final two resources, composed of a residence and a former service station, have been found ineligible for the National Register of Historic Places.

Isolated Finds

The KRRC records search (Appendix B: *Definite Plan – Appendix L, Table 6-3*) identified 68 individual resources not directly associated with sites (i.e., isolated finds or individual low-density concentrations of artifacts or features that do not appear to be associated with a larger site but could indicate Native American use of the area), including 65 prehistoric resources, 2 historic-period resources, and 1 isolated feature of unknown age. Prehistoric isolates include a rock cairn, bedrock milling feature, possible cupule boulders, an incised cobble, ground/battered stone and flaked stone artifacts. Forty-one isolate locations were found to contain flakestone manufacturing debris (debitage) ranging from 1 flake to as many as 13 flakes in a single location. Debitage includes obsidian, chert, and basalt. Eleven isolates contain both tools and debitage.

The historic-period isolates consist of one rusted horseshoe and the remains of a wagon. The isolate of unknown age is described as a rocky depression measuring 8.2 feet in diameter.

Potential Archaeological Districts

As part of the Klamath Hydroelectric Project relicensing study (FERC 2007), five areas containing multiple prehistoric sites were identified along the same section of the Klamath River which was considered as a potential National Register of Historic Places District (PacifiCorp 2004, FERC 2007). This potential district includes four groups of multiple sites in Oregon located at the head of Link River and the mouth of Upper Klamath Lake, Teeter's Landing, Spencer Creek/mouth of upper Klamath River Canyon, and near Frain Ranch. In California, a cluster of three villages near the headwaters to Iron Gate Reservoir, comprised the fifth potential district group. The National Register of Historic Places eligibility of this district has not been finalized.

A historic-period archaeological district was also considered for the Frain Ranch, in Oregon (PacifiCorp 2004). Due to their association with early homesteading and the beginning of ranching and agriculture within the upper Klamath River, four Frain Ranch area sites were envisioned for this district. The National Register of Historic Places eligibility of this district has not been finalized at this time.

Potential Klamath River Hydroelectric Project District

The Klamath River Hydroelectric Project District comprises seven hydroelectric generation facilities and their related resources located along the Klamath River and its tributaries in Klamath County, Oregon and Siskiyou County, California. Beginning at the Link River Dam, in Klamath Falls, Oregon, the Project boundary continues southwest along the Klamath River to include the Keno Dam Complex and the J.C. Boyle Complex in Oregon. Within California, the Klamath Hydroelectric Project boundary includes the Fall Creek, Copco No. 1 and Copco No. 2 complexes, and terminating at Iron Gate Dam. The Klamath Hydroelectric Project facilities were constructed between 1903 and 1958 by the California Oregon Power Company (COPCO) and its predecessors and are now owned and operated by PacifiCorp under FERC License Nos. 2082 (Kramer 2003a,b) and 14803.

The proposed Klamath River Hydroelectric Project District includes the hydroelectric facilities and various diversion dams; support structures; linear elements such as flumes, canals, and tunnels; and other related buildings and structures. A historic context statement (Kramer 2003a) and Determination of Eligibility (Kramer 2003b) developed for the Klamath Hydroelectric Project notes its eligibility to the National Register of Historic Places as a District under Criterion A for its association with the industrial and economic development of southern Oregon and northern California (Kramer 2003b). The California and Oregon State Historic Preservation Officers have not concurred with this eligibility recommendation. Table 6-11 of Appendix B: *Definite Plan – Appendix L*, identifies key features of the three hydroelectric complexes located in California that are part of the Proposed Project in reference to the National Register of Historic Places eligibility recommendations.

Upper Klamath River Stateline Archaeological District

The newly designated Upper Klamath River Stateline Archaeological District (BLM 2016) is located along the Klamath River, in California, less than 0.5-miles from the Oregon-California state line. The district encompasses three pre-contact village sites that contribute to the district's significance and one lithic scatter that does not contribute. Archaeological research indicates site use in the district extended from circa 1,000 years ago or earlier to possibly as late as the 1840s (BLM 2016). The district was determined eligible for the National Register of Historic Places at the local level of significance under Criterion D in the areas of Prehistoric Archaeology, Native American Ethnic Heritage, Commerce, Economics, Religion, and Politics/Government. The California State Historic Preservation Officer and the Keeper of the National Register of Historic Places have concurred with the district's eligibility, and it would therefore qualify as an Historical Resource for the purposes of CEQA.

Ethnographic Information and Tribal Cultural Resources

The ethnographic information presented here for the California portion of the Lower Klamath Project identified tribal cultural resources, and other culturally sensitive areas along the Klamath River in the Proposed Project area are based on ethnographic inventory reports prepared by the Klamath Tribes (Deur 2004), Shasta Nation (Daniels 2003, 2006), Karuk Tribe (Salter 2003), and Yurok Tribe (Sloan 2003) for the FERC Relicensing study, the 2012 KHSA EIS/EIR, and during AB 52 consultation meetings between the State Water Board the Shasta Indian Nation and the Shasta Nation (Confidential Appendices P and Q).

The Klamath Tribes identified several culturally important locations in the Klamath Basin, and noted that tribal fisheries were impacted as a result of impediment of anadromous fish passage due to Klamath River dams (Deur 2004). The Klamath Tribes also identified places along the Klamath River between J.C. Boyle Dam (Oregon) and the Scott River (California) that have tribal cultural value (Theodoratus et al. 1990).

The Shasta Nation reports (Daniels 2003, 2006) present a list of village sites recorded in ethnographic literature, a list of locations that the Shasta consider traditional cultural properties, and another inventory of 11 locations, drawn from the first two listings, that are eligible for the National Register of Historic Places.

The Karuk (Salter 2003) and Yurok (Sloan 2003) ethnographic reports draw upon oral interviews, other writings, ethnographical literature, and a review of natural and cultural resources within the Klamath River to discuss each tribe's traditional and historical relationships with the river, and its resources, to subsistence, spiritual culture, and identity. These tribes recognized the entire Klamath River as part of an important cultural (ethnographic) riverscape.

Klamath Cultural Riverscape

The Klamath River Inter-Tribal Fish and Water Commission incorporated information from existing ethnographic studies, in addition to information provided by the Hoopa Valley Tribe, into a report that focused on the Klamath River (King 2004). The entire length of the river was then identified as a type of cultural or ethnographic landscape, termed the Klamath Riverscape, due to the relationship between The Klamath Tribes, Shasta, Karuk, Hoopa, and Yurok tribes and the river and its resources (Gates 2003, King 2004). The characteristics that contribute to the riverscape's cultural character include natural and cultural elements such as the river itself; its anadromous and resident fisheries; its biological diversity; and its cultural sites, sacred places, uses, and perceptions of value by the tribes (King 2004). Gates (2003) and King (2004) recommend the Klamath Riverscape as eligible for the National Register of Historic Places based on its association with broad patterns of tribal environmental stewardship, spiritual life, and relationships between humans and the non-human world. The ethnographic reports for the riverscape and its eligibility determination have not been submitted to the Oregon and California State Historic Preservation Officers for national or state register for concurrence (USBR and CDFG 2012). This EIR recognizes the Klamath Cultural Riverscape as a Tribal Cultural Resource under Public Resources Code, section 21074.

The Klamath Riverscape's contributing elements include the resources described in the 2012 KHSA EIS/EIR's discussion of tribal trust resources and resources traditionally used by tribes (see Appendix V – 2012 KHSA EIS/EIR *Section 3.12 Tribal Trust*). It is clear from formal consultation under AB 52 with the Yurok Tribe that the health of the Klamath River as a whole, as well as the fishery in particular, are of critical importance to the Tribe's well-being and identity, forming a core for cultural, spiritual, and economic life, and that the Klamath River as a whole constitutes a vital Tribal Cultural Resource. Formal and informal consultation, and comments from tribal representatives from the Karuk Tribe, Hoopa Valley Tribe, and the Klamath Tribe, also underscore the high degree to which the Klamath River's water quality and fisheries are important cultural resources.

Historical Landscape Analysis

As part of the Project Area records search, a historical landscape analysis was conducted to identify locations where post 1850s era settlement and resource developments occurred within the records search area (AECOM 2018). The sources for this study included the review of the General Land Office records, including California plat maps (1856, 1876, 1880, and 1881) and surveyor's notes; a variety of published and manuscript resources (Beckham 2006, Boyle 1976, Kramer 2003a, PacifiCorp 2004, USDI 1989); and USGS maps available at http://historicalmaps.arcgis.com/usgs. Other map searches included the David Rumsey collection, Northwestern California map collection at Humboldt State University, Library of Congress digital collections, and Online Archive of California. Historical landscape information was digitized into a GIS format and a

table prepared with site-specific information annotated by Township/Range/Section (Appendix B: *Definite Plan – Appendix L,* Table 6-12). In summary, this research indicated roads, railroads, bridges, logging features, ditches, fence lines, buildings, homesteads, ranches, sites associated with military encampments, and several townsites.

KRRC also completed the review of the J.C. Boyle Collection (MI 165306) housed at the Southern Oregon Historical Society in Medford, Oregon. This archive contains photo albums, newspaper clippings, maps, manuscripts, financial records, and Copco annual reports belonging to Copco Engineer J.C. Boyle, and pertaining predominately to construction of Copco No. 1 Dam and Reservoir. This archive is a valuable source of information concerning the pre-inundation historical landscape of the Copco No. 1 area and provides important information regarding cultural and historical resources that may be encountered during reservoir drawdown. In addition, archival and historical landscape research was conducted at local County repositories and historical societies to provide information regarding cultural and historical resources that may be anticipated during reservoir drawdown at J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate reservoirs. The Historical Landscape Analysis conducted by KRRC found no Historical Landscape in the Area of Analysis for the Proposed Project.

3.12.3 Significance Criteria

Criteria for determining significance of impacts on historical and tribal cultural resources are based upon consultation, referenced texts, the Appendix G of the CEQA Guidelines (California Code of Regulations title 14, section 15000 et seq.), and professional judgment. As such, these criteria are specific to the Proposed Project.

Impacts to historical and tribal cultural resources are significant if they include the following:

- Physical demolition, destruction, relocation, or other alteration of the historical or tribal cultural resource or its immediate surroundings such that the significance of the historical or tribal cultural resource would be materially impaired.
- Exposure or substantial movement of human remains or associated funerary items[84].
- Exposure of, substantial movement of or increased access to other historic tribal cultural resources leading to increased access and looting[85] of tribal cultural resources above levels occurring under existing conditions.

[84] Substantial movement is defined as movement that would displace tribal cultural resources completely or predominantly outside of existing cultural context in a manner that would impair its cultural significance.
[85] Refers to the illicit collection of artifacts or other tribal cultural resources.

- Elimination or substantial restriction[86] of access of tribal members to their respective tribal cultural resources above levels occurring under existing conditions.

Tribal cultural resources are defined in Public Resources Code Section 21074(a)(1) as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:

1. Listed or eligible for listing in the California Register of Historical Resources (which includes all resources eligible for listing on the National Register of Historic Places), or in a local register of historical resources, or
2. A resource that the lead agency determines is a tribal cultural resource, as further described below.

A lead agency has discretion in identifying unlisted resources as tribal cultural resources, but such a determination requires substantial evidence under the criteria used to determine listings in the historical register and considering the significance of the resource to a California Native American tribe (Public Resource Code, Sections 5024.1, 21074). Tribal cultural resources are, by definition, historical resources. California Native American tribes traditionally and culturally affiliated with the geographic area of a project may have expertise concerning their tribal cultural resources (Public Resource Code, Section 21080.3.1(a)).

Historical Resources are defined consistent with Public Resources Code section 21084.1 which includes a resource listed in, or determined to be eligible for listing in, the California Register of Historical Resources (CRHR), included in a local register of historical resources, or determined to be significant by the lead agency (Public Resc. Code section 21084.1, CEQA Guidelines Section 15064.5 (a)). While not all CRHR-eligible resources are also eligible for the National Register of Historic Places (NRHP), resources listed on or evaluated as eligible for the NRHP are considered historical resources under CEQA. The fact that a resource does not meet these criteria does not preclude a lead agency from determining that the resource may be an historical resource under the criteria in Public Resources Code Section 5024.1(c). Historical resources may be prehistoric or historic in age and may be archaeological resources, part of the existing built environment, other important historic resources, or a tribal cultural resource such as a sacred place. Additionally, CEQA recognizes the possibility that an archaeological site may not meet the definition of an historical resource but may meet the definition of a “unique archaeological resource” (Pub. Resc. Code,

[86] Substantial restriction is defined as loss of access during ceremonial windows or periods of hunting and gathering or other traditional activities associated with a particular tribal cultural resource.

section 21083.2 (g)). Similar to historical resources, unique archaeological resources are afforded protection under CEQA.

3.12.4 Impact Analysis Approach

The historical and tribal cultural resources impact analysis is based on a review of existing information, such as the results of the California Historical Resources Information System confidential record searches, KRRCs identification efforts (Appendix B: *Definite Plan – Appendix L*) and the AB 52 process with Native American tribes and representatives. Additionally, information received during public scoping was also used to identify potentially important cultural resources (Appendix A).

Known tribal cultural resources within the Proposed Project Area of Analysis include archaeological sites and districts, ethnographic villages, historic period Shasta communities, cemeteries, and cultural landscapes associated with the historical uses of the environments surrounding Iron Gate and Copco No. 1 reservoirs.

Parts of AB 52 (Gatto 2014) amended Public Resources Code to require consultation with California Native American tribes, when requested, and consideration of tribal cultural resources in the CEQA environmental review process. Following the public scoping meetings, the State Water Board conducted a series of confidential consultation meetings with the Shasta Indian Nation, Yurok Tribe, and Shasta Nation. During consultation, the State Water Board sought information regarding the identification of areas with religious or cultural importance to these tribes, potential impacts of the Proposed Project on such resources, and mitigation measures to avoid, minimize or mitigate adverse effects to identified resources. Information discussed as part of AB52 consultation is incorporated into the impact analyses for historical and tribal cultural resources, as appropriate. AB 52 consultation resulted in development of, and agreement on, mitigation measures with the Shasta Indian Nation and the Yurok Tribe. Consultation with the Shasta Nation informed development of mitigation measures, but the AB 52 process concluded without agreed-upon mitigation measures.

The impact analysis approach for historical and tribal cultural resources also considered existing studies related to reservoir inundation and drawdown with respect to resources located within the Iron Gate and Copco No. 1 reservoir footprints, as described below.

For purposes of this analysis, with the exception of isolated occurrences of cultural material, all known and unknown prehistoric archaeological sites within the Project area are considered to be tribal cultural resources, and thus significant resources under CEQA. Additionally, this document acknowledges that (1) not all of the required cultural resources inventory and significance analyses will be completed prior to certification of this EIR and (2) overseeing

development and implementation of the Cultural Resources Plan does not fall within the scope of the State Water Board's water quality certification authority. Therefore, for the purposes of this impact analysis, all known and unknown cultural resources within the Project area are considered to be significant, i.e., historical resources under CEQA. This includes the historic built environment; historic-period archaeological resources; and prehistoric archaeological resources, which as stated above are considered TCRs herein.

3.12.4.1 Studies on Effects of Reservoir Inundation on Cultural Resources

Lenihan et al. (1981), conducted an interagency, interdisciplinary study on the effects of freshwater reservoirs on cultural resources in order to address conservation management of inundated resources. A hierarchical scheme composed of three levels of cultural resources was assessed for inundation effects: artifacts and artifact assemblages; archaeological site or loci; and regional environmental data base, settlement and resource utilization patterns. The use of the hierarchical scheme was intended to include cultural values beyond discrete sites or artifacts that include spatial, temporal, and organizational relationships between the entities within an environmental and cultural context.

This approach is particularly applicable to landscape level resources such as traditional cultural properties and ethnographic landscapes, even though these property type names came into use after the Lenihan et al. (1981) study. When a river with a long history of cultural use is dammed and water is impounded, the cultural landscape is adversely affected through direct impacts to the archaeological or historical sites themselves and to the relationships of these properties to their environment and to each other on local and broader scales. Besides the changes to the environmental setting, processes of inundation that could affect cultural resources are sediment transport and deposition, erosion processes of wave action along shorelines, and saturation and slumping of submerged strata (Lenihan et al. 1981). Note that slumping, or short-term hillslope instabilities, as may occur during reservoir drawdown are discussed in Section 3.11 *Soils, Geology, and Mineral Resources*, Potential Impact 3.11-3, as well as below for tribal cultural resources (Potential Impact 3.12-2) and historical resources (Potential Impact 3.12-13). Erosion of sediment stored within the Lower Klamath Project reservoirs during reservoir drawdown and the potential for downstream sedimentation due to the released sediment is discussed in Section 3.11 *Soils, Geology, and Mineral Resources*, Potential Impact 3.11-5.

Four factors regarding the extent of impacts to archaeological sites by these processes include the characteristics of the reservoirs themselves (size and operation-fill rate and drawdown frequency); location of sites within the impoundment; geological foundation of a site; and characteristics of the site itself (Lenihan et al. 1981). Erosion processes are most damaging along the edges of the reservoirs in wave action zones that vary vertically with reservoir operations.

In general, cultural resource sites located within the wave action zone are most heavily affected, while inundated sites beyond the shore are less affected by erosion and may be capped with sediment. A multitude of other factors, such as, slope, vegetation coverage, substrate, soil and water chemistry, also influences the extent of the impacts to a cultural resource site from inundation. Surface artifact displacement from water movement results in an overrepresentation of heavier weight artifacts (such as, groundstone) and an underrepresentation of lighter weight artifacts (such as, lithic flakes). Damage from vandalism, both intentional and unintentional, increases to sites exposed through erosion and reservoir fluctuations. All of these impacts limit the ability to reconstruct human behavior through artefactual, paleoenvironmental, and site analyses; through direct dating techniques and relative dating of vertical and horizontal placement; and through contextual relationships.

Surveys for previously inundated ancestral Puebloan archaeological sites being exposed due to lowering lake levels as a result of drought at Lake Mead, the reservoir behind Hoover Dam, in Southern Nevada resulted in situations where inundation preserved the sites (Haynes 2008). Sites in shoreline locations were eroded as water regressed, resulting in extensive damage to architectural remains and in the removal of the surface artifact assemblages. In lower energy situations, inundation resulted in capping of the sites with sediment that enhanced preservation. Both architectural and non-architectural features and surface artifacts remained. In other situations, effects of inundation and drawdown resulted in differential artifact removal and secondary re-deposition. Factors contributing to impacts from inundation and later exposure include: energy levels of the reservoir at the site location; terrains upon which the sites sit; weight of artifacts; and artifact collecting once sites were exposed. The results of these surveys on lands exposed from natural drawdown at Lake Mead, a man-made reservoir, are directly applicable to the proposed drawdown of the reservoirs along the Klamath River.

3.12.5 Potential Impacts and Mitigation

3.12.5.1 Potential Impacts to Tribal Cultural Resources

For the purposes of the mitigation measures TCR-1 through TCR-7, the following definitions apply:

Affected Tribes: Tribes on the Native American Heritage Commission list that (1) have expressed interest in participating in further development of the Tribal Cultural Resources (TCRs) measures for the Lower Klamath Project (Project) within 60 days of the Klamath River Renewal Corporation's (KRRC) January 8, 2018, notice and (2) are traditionally and culturally affiliated with the Area of Potential Effect or otherwise affected by the Project. As of August 13, 2018, the following Native American tribes have expressed interest in participating in further development of such mitigation measures: Cher-Ae heights Indian Community of the Trinidad Rancheria, Karuk Tribe, Klamath Tribes, Modoc Tribe

of Oklahoma, Quartz Valley Indian Reservation, Shasta Indian Nation, Shasta Nation, and the Yurok Tribe.

Consultation: Consultation with Affected Tribes in a manner consistent with applicable law. KRRC intends to implement these requirements consistent with California Environmental Protection Agency's "Policy on Consultation with California Native American Tribes," CIT-15-01 (August 20, 2015).

Project Implementation: Project implementation is defined as pre-construction activities, reservoir drawdown, dam removal, restoration activities, and other ground-disturbing activities that comprise the Project, as stated in the Definite Plan.

Potential Impact 3.12-1 Pre-dam-removal activities that involve disturbance of the landscape, including construction or improvement of associated roads, bridges, water supply lines, staging areas, disposal sites, hatchery modifications, recreation site removal and/or development, and culvert construction and improvements could result in potential exposure of or damage to known Tribal Cultural Resources through ground-disturbing construction and disposal activity and increased access to sensitive areas. Pre-dam removal activities involving ground disturbance, construction or improvement of associated roads, bridges, water supply lines, staging areas, disposal sites, hatchery modifications, recreation site removal and/or development, and culvert construction and/or improvements would occur within the Area of Analysis *Subarea 1* (Figure).

Tribal cultural resources are known to be present within Area of Analysis *Subarea 1* (Figure). Cultural resource sites identified at the edges of Copco No. 1 Reservoir include prehistoric archaeological sites with habitation debris and several contributing elements of the ethnographic landscape (Cardno Entrix 2012, Daniels 2006, Heizer and Hester 1970, PacifiCorp 2004). In addition, ethnographic village sites have been identified within Copco No. 1 Reservoir (Heizer and Hester 1970, Daniels 2006). Native American burials and traditional use areas (for ceremonies) within the Copco No. 1 Reservoir footprint have also been identified through ethnographic research and consultations with the Shasta people. At least one ethnographic village site has been identified within Iron Gate Reservoir by PacifiCorp (2004) and Daniels (2006). Specific TCR locations known to the Shasta people, which include TCRs as reflected in PacifiCorp (2004) and Daniels (2006), and as updated by Confidential Appendix Q, Attachment 4, are cataloged in Confidential Appendices P and Q. Resources identified as villages, cairns or burial sites, or other sites eligible for the National Register of Historic Places (NRHP) in a subsequent compilation by Cardno ENTRIX (2012) were also considered as part of this analysis.

Due to the nature of ground-disturbing activities and a general increase in the level of activity (e.g., construction, surveys) within the Area of Analysis *Subarea*

1, pre-dam removal activities that would involve ground disturbance have the potential to result in the following significant impacts to known TCRs identified in Confidential Appendices P and Q, as well as unknown TCRs:

- Physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of the TCR would be materially impaired; and/or
- Exposure or substantial movement of TCRs leading to increased access and looting above levels occurring under existing conditions.

Note that TCR sites located within the reservoir fluctuation zones (Confidential Appendices P and Q) may be periodically at risk of looting during low water periods under existing conditions and may have suffered significant degradation in the existing condition.

Implementation of mitigation measures TCR-1 (TCRMP), TCR-2 (LVPP), TCR-3 (IDP), TCR-4 (Endowment)[87] would reduce these impacts considerably, and, for many resources is expected to avoid impacts completely, through the design and implementation of construction plans to completely avoid impacts, or on-the-ground modifications to Proposed Project implementation to avoid impacts. For impacts for which it is not feasible to completely avoid impacts, these impacts may be reduced to a less-than-significant level. The measures (listed fully, below) include among other requirements, field worker training, limits to worker and public access, tribal monitors, surveys, and identification of protocols and best practices upon discovery or disturbance of TCRs during implementation of the Proposed Project. With timely discovery and appropriate steps to address exposure or damage, many TCRs can maintain their current level of cultural significance. Additionally, providing a means for the long-term protection or enhancement of affected TCRs can mitigate for some impacts.

However, the impact of exposing, disturbing or otherwise damaging tribal human remains, or associated funerary items, is itself profound. While the mitigation measures are expected to considerably reduce impacts, they cannot reasonably be expected to eliminate such exposure or disturbance, particularly where, as here, the number of potentially affected burials is high. While treating remains and associated funerary objects with the appropriate respect and procedures can reduce and avoid compounding the harm from the initial damage, it cannot do so fully. Additionally, in light of the high density of TCRs within the Limits of Work, and the nature of the construction involved, significant risk remains that other TCRs may sustain damage that results in a material impairment of the resource's significance. In light of the particular harm of exposing human remains even where they are treated appropriately after exposure, and the likelihood of

[87] Mitigation Measures TCR-6, TCR-7, and TCR-8 could also further reduce the potential impact. However, at this point it is not clear whether the measures are feasible (see Potential Impact 3.12-9.) Therefore, this EIR does not rely on implementation of these measures, in reaching its significance determinations.

significantly impairing other types of TCRs in light of the type of construction actions and the density of resources, the impact would remain significant and unavoidable.

Mitigation Measure TCR-1 − Develop and Implement a Tribal Cultural Resources Management Plan.
The KRRC shall develop a Historic Properties Management Plan (HPMP). The HPMP shall include measures to avoid, minimize, or mitigate the Project's adverse impacts to TCRs. The HPMP shall include a Tribal Cultural Resources Management Program (TCRMP), which will state such measures.

KRRC shall develop the TCRMP in consultation with Affected Tribes. The KRRC shall finalize the HPMP during FERC's hearing on the license surrender application for the Project. The KRRC shall propose the HPMP for FERC's approval as a term of the license surrender order.

In developing the TCRMP, KRRC shall engage in good faith consultation with the Affected Tribes that are traditionally and culturally affiliated with a specific portion of the APE or with potentially affected TCRs. Where a particular tribe has identified a specific TCR, the primary consultation about that TCR shall be with the affected tribe. All such consultation shall be subject to the schedule for HPMP development. If consensus cannot be reached during TCRMP development, KRRC shall record the disputed issues, positions on the disputed issues, and KRRC's proposed resolution, in the HPMP that is submitted to FERC.

The TCRMP shall include the following elements consistent with applicable law:

1. The TCRMP shall include an inventory of known and potential TCRs that could be affected by the Project. Appendix B: *Definite Plan – Appendix L* includes a preliminary inventory of such resources. KRRC will continue to develop the inventory through the consultation process for the license surrender application under authority of the National Historic Preservation Act (NHPA) Section 106.

   Based on AB 52 consultation, KRRC acknowledges that the Shasta Indian Nation and Shasta Nation are primarily concerned with TCRs associated with Iron Gate, Copco No. 1, and Copco No. 2 reservoirs, and tributary sub-watersheds such as Fall Creek, Bogus Creek, and Deer Creek. The TCRMP shall include TCRs known to the Shasta Indian Nation, which include TCRs as reflected in PacifiCorp (2004) and Daniels (2006) and as updated by Attachment 4 of the Confidential Appendix Q. The TCRMP shall include TCRs known to the Shasta Nation, which include the TCRs identified in the Confidential Appendix P. The TCRMP shall include TCRs known to other Affected Tribes.
2. The TCRMP shall include provisions to protect the confidentiality of known TCRs. The TCRMP shall also include provisions to share information collected by the KRRC with: Affected Tribes that are traditionally and

culturally affiliated with the known TCR(s); regulatory agencies that have authority over protecting such resources, as necessary; or as necessary with the permission of such tribes in order to implement appropriate protective or enhancement measures. These provisions will be consistent with California Public Resources Code Section 21082.3(c).

3. The TCRMP shall assure that the Project will avoid, minimize, or mitigate adverse impacts to TCRs, consistent with California Public Resources Code section 21084.3(a). In developing the plan, the KRRC will consider measures listed in California Public Resources Code section 21084.3(b) that, if feasible, may be appropriate to avoid, minimize, or mitigate adverse impacts:
   (1) "Avoidance and preservation of the resources in place, including, but not limited to, planning and construction to avoid the resources and protect the cultural and natural context, or planning greenspace, parks, or other open space, to incorporate the resources with culturally appropriate protection and management criteria.
   (2) Treating the resource with culturally appropriate dignity taking into account the tribal cultural values and meaning of the resource, including, but not limited to, the following:
      (A) Protecting the cultural character and integrity of the resource.
      (B) Protecting the traditional use of the resource.
      (C) Protecting the confidentiality of the resource.
   (3) Permanent conservation easements or other interests in real property, with culturally appropriate management criteria for the purposes of preserving or utilizing the resources or places in a manner consistent with the KHSA.
   (4) Protecting the resource."
4. The TCRMP shall require a training program for KRRC's field personnel associated with the Project. The training program will be designed to train KRRC field personnel to work collaboratively with tribal monitors and will focus on field procedures (across the range of field personnel) as necessary for appropriate and respectful treatment of TCRs; and will be intensive and systematic, in light of the scale, complexity, and schedule of the Project undertakings.
5. The TCRMP shall identify TCR areas that will have limited or no public access during Project implementation. During that period, the KRRC shall: install adequate signage to clearly mark areas with limited or no public access areas; install fencing where necessary and feasible to reduce access; and provide appropriate training to field personnel. Upon the recommendation of a tribe that has identified the TCR area, the KRRC may consider, and the TCRMP may include, other equally effective measures to reduce public access in lieu of (or in addition to) those identified immediately above.

6. The TCRMP shall include site-specific mitigation measures for potentially affected TCRs. The TCRMP shall provide for ongoing consultation or site-specific mitigation refinement with the relevant Affected Tribe(s) with a traditional and cultural affiliation to an impacted TCRs, as appropriate and feasible consistent with the schedule for Project implementation.
7. The TCRMP shall identify any areas where the KRRC, before Project implementation, shall conduct any additional cultural resource surveys, consistent with California Public Resources Code section 21074.
8. The TCRMP shall provide that the KRRC, following reservoir drawdown and dam removal, shall undertake intensive surveys of TCRs, archaeological, and other historical resources within the area of analysis, using joint teams of archaeologists and tribal monitors. The TCRMP shall specify the methods for such surveys. It shall also specify the process by which Affected Tribes will nominate, and KRRC will select and compensate tribal monitors. During this process, an Affected Tribe that is traditionally and culturally affiliated with the area may nominate tribal monitor(s) for KRRC's consideration; and KRRC shall make the selection after consultation with Affected Tribes. KRRC shall select and pay tribal monitor(s) for the purpose of Project implementation. In the event that KRRC does not select a tribe's recommended monitor, an Affected Tribe that is traditionally and culturally affiliated with the area may request participation of its recommended tribal monitor in these surveys at its own cost. KRRC's field personnel, in consultation with tribal monitors, shall record these surveys in a manner consistent with applicable law. KRRC shall provide recorded survey data pertaining to a known TCR to the Affected Tribes that are traditionally and culturally affiliated with that TCR.
9. The TCRMP shall state a range of appropriate measures, and a protocol to select from such range, to address the disturbance or exposure of known TCRs during Project implementation. The KRRC shall implement measures necessary to ensure the protection of disturbed or exposed TCRs.
10. The TCRMP shall provide that the KRRC will identify and avoid TCRs during the siting and construction of new recreational sites, to the extent feasible. The KRRC shall address potential conflicts consistent with California Public Resources Code section 21084.3(a) and (b).
11. The TCRMP shall provide for restoration actions associated with any ground disturbances such as grading and manual or machine excavation, so as to protect TCRs. The KRRC shall consider limiting or completely avoiding mechanical weed control activities (e.g., mowing, hand-weeding) or herbicide use to protect TCRs in areas identified by Affected Tribes, as necessary. In revegetation efforts, the KRRC shall incorporate specific plant species that are important to Affected Tribes with a traditional and cultural affiliation to the area at issue, to the extent that doing so is feasible and complies with the requirements of the federal and state

approvals of the Project. The KRRC shall provide training regarding these actions to its field personnel.

12. The TCRMP shall incorporate the results of the KRRC's Bathymetric Survey, and specifically, the refined understanding of sediment thickness in Iron Gate and Copco No. 1 reservoirs, to inform monitoring efforts for potential exposure of TCRs during and following reservoir drawdown. Information from this review shall inform the Inadvertent Discovery Program (described below), which will be part of the TCRMP.
13. The KRRC shall consult with Affected Tribes in the planning process for the redesign and relocation of the water supply line for the City of Yreka to identify, avoid if feasible, or mitigate effects to TCRs during the siting and construction of the water supply line. The KRRC shall address potential conflicts consistent with California Public Resources Code section 21084.3 (a) and (b).
14. Consistent with KHSA Section 7.6.6, the TCRMP shall include recommended measures to identify, avoid, minimize, or mitigate effects to TCRs during modifications of Iron Gate Hatchery, consistent with California Public Resources Code section 21084.3 (a) and (b).
15. Consistent with KHSA Section 7.6.6, the TCRMP shall also include recommended measures to identify, avoid, minimize, or mitigate adverse impacts to TCRs during rehabilitation and expansion of Fall Creek Hatchery, consistent with California Public Resources Code section 21084.3 (a) and (b).
16. The TCRMP shall include a dispute resolution process in the event that, during Project implementation, Affected Tribes dispute which measures to apply to avoid, minimize, or mitigate the Project's adverse impacts to a specific TCR with which the Affected Tribes are traditionally and culturally affiliated. The process shall include neutral mediation to be undertaken consistent with the schedule for Project implementation. In consultation with Affected Tribes, the KRRC shall engage a standing mediator who is available to resolve disputes about which measures to apply.

Mitigation Measure TCR-2 − Develop and Implement a Looting and Vandalism Prevention Program.

In consultation with Affected Tribes and jurisdictional law enforcement, the KRRC shall develop and implement a Looting and Vandalism Prevention Program (LVPP), specifically to deter looting and vandalism to TCRs associated with the Project. The LVPP, which may be part of the TCRMP, shall include the following elements consistent with applicable law:

1. The LVPP shall include appropriate measures to deter looting and vandalism during Project Implementation. The KRRC shall implement these measures for a minimum of 3 years following completion of dam removal, or until KRRC has transferred applicable Parcel B lands to the States or third parties under the terms of the KHSA Section 7.6.4.

2. The LVPP shall specify the frequency of monitoring efforts of known TCR areas and other areas subsequently identified by the KRRC or tribal monitors during Project implementation. Monitoring frequency shall not be less than quarterly, with allowances for additional targeted monitoring that is triggered by natural or opportunistic events, such as a large magnitude flood event. The LVPP shall provide that monitoring need and frequency will vary depending on the level of risk associated with various activities during Project implementation.
3. The LVPP shall include a training program on looting and vandalism prevention and site documentation, for the benefit of KRRC's field personnel as well as tribal monitors.
4. The LVPP shall include protocols for communications and reporting to law enforcement and other relevant state and federal agencies, consistent with applicable law.
5. The LVPP shall include appropriate measures to restrict public access to specific Project areas where known TCRs, or those identified through inadvertent discovery, are located. KRRC shall implement these measures until it has transferred the Parcel B lands to the states or third parties under KHSA Section 7.6.4. Specific measures to be considered shall include: fencing; posting of signs; strategic plantings; strategic routing of access roads, boating access points and trails; specific recommendations for land use or land transfer in the KHSA Section 7.6.4 process or other means determined necessary and feasible to protect TCRs from opportunistic looting and public access (authorized and unauthorized).
6. The LVPP shall include appropriate measures to prevent or restrict public access to reservoir areas during reservoir drawdown and dam removal.
7. The LVPP shall include appropriate measures to prevent or restrict public access to newly exposed reservoir areas following reservoir drawdown. Such measures shall limit use of off-road vehicle paths and informal roads and tracks, and unauthorized use of developed and dispersed recreation sites. KRRC shall implement these measures until it transfers Parcel B lands to the states or third parties pursuant to KHSA Section 7.6.4, subject to an assignment of continuing responsibilities by the transferee.

Mitigation Measure TCR-3 − Develop and Implement Inadvertent Discovery Plan (IDP).

In consultation with Affected Tribes, the KRRC shall develop and implement an Inadvertent Discovery Program (IDP), which shall be a part of the TCRMP. The IDP shall establish protocols for the discovery of unanticipated or previously unknown TCRs, including human burials or human remains discovered during Project implementation. The IDP shall provide for compliance with applicable law regarding cultural resources and human remains; state work site protocols to be followed in the event of an inadvertent discovery; and identify appropriate point of contacts associated with the protocols. The IDP shall include protocols for work in areas known to have a high chance of inadvertent discoveries, including the

Iron Gate, Copco No. 1, Copco No. 2 reservoir areas, as well as the altered FEMA 100-year floodplain area between Iron Gate Dam and Humbug Creek following dam decommissioning.

The IDP shall include the following specific elements:

1. The IDP shall acknowledge that there may be unknown TCRs in association with TCRs known to the Shasta Indian Nation, which include TCRs as reflected in PacifiCorp (2004) and Daniels (2006) and as updated by Confidential Attachment 4 of the Confidential Appendix Q.
2. The IDP shall state protocols that KRRC shall implement for sites that are addressed under California Public Resources Code 5097.993 and/or for sites found to contain TCRs, human burials, or human remains during and after drawdown activities. These protocols shall identify appropriate agency and tribal contacts for such situations. In the case of human remains in California, the KRRC shall also notify the county coroner and follow the procedures stated in California Health and Safety Code section 7050.5(b) to the extent feasible. Upon discovery, the KRRC's environmental monitor shall notify the KRRC's qualified archaeologist of the discovery, and the KRRC's qualified archaeologist shall complete a letter report to assess and document the discovery. The KRRC shall circulate the letter report to Affected Tribes, the Native American Heritage Commission for inadvertent discoveries on private and state lands in California, and other appropriate land management agencies, within 72 hours of the discovery.
3. The IDP shall state protocols that KRRC will implement for reservoir drawdown or restoration activities following an inadvertent discovery. Such protocols shall be consistent with the Definite Plan and shall take into account potential downstream environmental impacts; cultural resource impacts in the Iron Gate, Copco No. 1, Copco No. 2 reservoir areas; mitigation and stabilization for tribal and cultural resources found in the APE outside of the reservoirs; and mitigation in the altered FEMA 100-year floodplain area between Iron Gate Dam and Humbug Creek following dam decommissioning. The IDP shall identify the measures that the KRRC will follow to protect TCRs following an inadvertent discovery.
4. The IDP shall provide for tribal monitors to participate in monitoring during Project implementation. The tribal monitors shall be present as feasible and appropriate pursuant to the schedule for different phases of Project implementation, to address unknown TCRs that are exposed. Pursuant to item (6), the monitoring schedule for tribal monitors shall consider that monitoring frequency and duration may differ by geographic area or Project phase or activity.
5. The IDP shall provide for the development and implementation of a training program regarding the inadvertent discovery of cultural resources and human remains during Project activities. All of KRRC's field personnel and tribal monitors shall be instructed on site discovery, avoidance, and

protection measures, including information on the statutes protecting cultural resources.

6. The IDP shall establish the frequency of specific monitoring efforts during Project implementation in identified areas where the discovery of unidentified TCRs may be likely given currently available information and other known archaeologically or culturally sensitive areas that may be identified by the tribal monitors. Monitoring locations will be specified during the development of the Inadvertent Discovery Program in the HPMP. Monitoring frequency during Project activities that cause ground disturbance shall not be less than quarterly, with allowances for additional targeted monitoring that is triggered by natural or opportunistic events during the reservoir drawdown or a subsequent large magnitude flood event. Such monitoring efforts shall be led by KRRC's archaeologists in consultation with tribal monitors and shall include the field reconnaissance of newly exposed sediments for surface features, to include, but not be limited to intensive, pedestrian survey for areas with relatively low slopes (<30 percent) and that are sufficiently dried to permit for safe access for pedestrian survey and to permit safe access for survey vehicles. In areas where intensive, pedestrian survey is not possible, KRRC in consultation with tribal monitors may use low-elevation aerial survey methods (e.g., unmanned aerial vehicles) or barge surveys to accomplish monitoring.
7. The IDP shall include a timeline, in consultation with Affected Tribes, for completing treatment measures and assessing California Register significance for discovered cultural resources and human burials or remains.
8. The IDP shall include dispute resolution procedures in the event that Affected Tribes disagree on which measures to apply to protect TCRs following inadvertent discovery. When the inadvertent discovery occurs on private or state lands in California, the procedures set forth in California Public Resources Code section 5097.98 will be followed where feasible, including mediation pursuant to California Public Resources Code section 5097.94. To the extent that inadvertent discoveries occur on federal or tribal lands, appropriate procedures under tribal or federal law will apply.

Mitigation Measure TCR-4 − Endowment for Post-Project Implementation. The TCRMP shall include a provision for the KRRC to provide funding for an endowment or other appropriate organization (e.g., a non-profit mutual benefit organization) to protect and enhance TCRs that are exposed due to the Project implementation on state and private lands in California, on a long-term basis following license surrender. This endowment shall include funding for monitoring, including supplementing or enhancing law enforcement resources, and shall also be available to cover measures that will be implemented following license surrender, including measures related to looting and vandalism protections. The endowment shall be governed in a manner that is representative of Affected Tribes that are traditionally and culturally affiliated with the TCRs impacted by Project Implementation. The KRRC shall consult with

Affected Tribes, with the assistance of the standing mediator during development of the TCRMP, to develop the specifications for funding and governance.

Significance
Significant and unavoidable with mitigation

Potential Impact 3.12-2 Drawdown of Iron Gate, Copco No. 1, and Copco No. 2 reservoirs could result in shifting, erosion, and exposure of known or unknown, previously submerged Tribal Cultural Resources.
The Proposed Project would draw down Iron Gate, Copco No.1, Copco No. 2 and J.C. Boyle reservoirs at a rate between 2 and 5 feet per day (i.e., 1 to 2.5 inches per hour). Drawdown of Copco No. 1 would begin November 1 of dam removal year 1 at a maximum rate of 2 feet per day, and drawdown of all reservoirs would occur at a maximum rate of 5 feet per day beginning January 1 of dam removal year 2 and continue until March 15 of the same year. The analysis for Potential Impact 3.12-2 focuses on the California Lower Klamath Project reservoirs, including Copco No.1, Copco No. 2, and Iron Gate, which are contained within Area of Analysis *Subarea 1* (Figure).

Since the Lower Klamath Project reservoirs were constructed, fine sediments composed primarily of organic material (including dead algae), but also including some silts and clays, have accumulated along the reservoir bottoms. The distribution of sediment deposits varies within each reservoir (Figure 2.7-8 and 2.7-9). Because the accumulated sediments are primarily fine material, they would be easily eroded and flushed out of the reservoirs into the Klamath River during reservoir drawdown. The degree of sediment erosion would vary, with the majority of the erosion focused in the historical river channel that is currently submerged in Copco No. 1 and Iron Gate reservoirs (see Figures 2.7-5 and 2.7-6).

Following drawdown, 40 to 60 percent of the existing sediment deposits would remain in place in each of the former reservoir beds, primarily on terraces located above the historical river channel. The sediments that remain in the reservoir footprints would consolidate (dry out and decrease in thickness) (USBR 2012a), making them less subject to erosion. Further, during the drawdown period, aerial seeding of pioneer mixes would occur as the reservoir water level drops before the exposed reservoir sediments dry and form a surface crust. Pioneer seed mixes would contain a variety of riparian and upland common native species, and possibly a small amount of sterile non-native species to enhance initial erosion protection. Aerial seeding during reservoir drawdown would not result in any further disturbance of soil on the exposed reservoir terraces and the establishment of vegetation on the terraces would potentially reduce erosion of fine sediments. Recent laboratory tests of reservoir sediments showed vegetated sediments produced less erodible fine particles and aggregates during cycles of wetting and drying than unvegetated sediments (Appendix B: *Definite Plan – Appendix H*).

Although not currently anticipated by KRRC, the Proposed Project may also include hydroseeding from a barge on exposed reservoir terraces as the water recedes during reservoir drawdown. Hydroseeding from a barge would be accomplished by placing a ground rig on one barge with another boat used to ferry materials from shore. A moveable pier or other engineered method of accessing the supply boat as the water level recedes would also be needed. If it occurs, barge hydroseeding would occur in the higher elevation portion of the reservoir shoreline, until the reservoir levels become too low to operate (i.e., March of dam removal year 2).

The Proposed Project also includes barge-mounted pressure spraying during reservoir drawdown that would target six locations in Copco No. 1 Reservoir and three locations in Iron Gate Reservoir within which to maximize erosion of sediment deposits and subsequently excavate to the historical floodplain elevation to create wetlands, floodplain areas and off-channel habitat features (see Appendix B: *Definite Plan – Appendix H Figures 5-4 and 5-7*).

Tribal cultural resources are known to be present within Area of Analysis *Subarea 1* (Figure). Cultural resource sites identified at the edges of Copco No. 1 Reservoir include prehistoric archaeological sites with habitation debris and several contributing elements of the ethnographic landscape (Cardno Entrix 2012, Daniels 2006, Heizer and Hester 1970, PacifiCorp 2004). In addition, ethnographic village sites have been identified within Copco No. 1 Reservoir (Heizer and Hester 1970, Daniels 2006). Native American burials and traditional use areas (for ceremonies) within the Copco No. 1 Reservoir footprint have also been identified through ethnographic research and consultations with the Shasta Nation and Shasta Indian Nation. At least one ethnographic village site has been identified within Iron Gate Reservoir by PacifiCorp (2004) and Daniels (2006). Specific TCR locations known to the Shasta people, which include TCRs as reflected in PacifiCorp (2004) and Daniels (2006), and as updated by Confidential Appendix Q, Attachment 4, are cataloged in Confidential Appendices P and Q. Resources identified as villages, cairns or burial sites, or sites eligible for the National Register of Historic Places in a subsequent compilation by Cardno ENTRIX (2012) were also considered as part of this analysis.

It is unknown whether adverse effects have already occurred to known or unknown, previously submerged TCR sites due to saturation within reservoir sediments and overlying water currents. However, impacts to these sites would likely result from shifting and exposure of reservoir sediment deposits during and after drawdown. Some TCR sites within the reservoir footprints may remain covered in sediment, or capped, resulting in some degree of preservation and protection.

Tribal cultural resource sites located in areas of steep or perched slopes, such as those along the steeper edges in the reservoir fluctuation zones[88], may experience shifting and slumping as a result of the underlying strata not being able to support the weight of overlying saturated soils. This is of particular concern for diatomaceous deposits located along the rim and below the Copco No. 1 Reservoir water level (see also Section 3.11.2.2 *Geomorphology* and Potential Impact 3.11-3). While the Proposed Project maximum drawdown rates (i.e., between 2 and 5 feet per day) are intended to minimize the potential for shifting and slumping of sediment deposits during reservoir drawdown, some sediment movement could still occur and could displace tribal cultural resources located in areas of steep or perched slopes that have relatively less thick sediment deposits. Note that some of the tribal cultural sites located within the reservoir fluctuation zones may be experiencing macro-scale wave-induced erosion impacts as part of existing conditions. Existing damage to exposed tribal cultural resources at some of these sites may be evident as wave cut terraces (beachlines) and other areas of accelerated erosion or scouring, as well as pedestaled and redeposited artifacts within the reservoir fluctuation zones. Given the proposed drawdown rates (2 to 5 feet per day), the reservoir shoreline would move below the normal fluctuation zone for each reservoir within 1 to 3 days of beginning drawdown. As this is a relatively short time frame compared to the continuous wave action that happens in this zone under existing conditions, reservoir drawdown alone is not expected to result in additional erosion-induced destruction or material alteration of the known tribal cultural resource sites in a way that would undermine their current or historical tribal significance relative to existing conditions. If it occurs, barge hydroseeding within the reservoir fluctuation zone would not result in additional wave-induced shoreline erosion outside of the range of existing conditions because barges tend to generate low wave heights due to their wide, flat bottoms and low operating speeds. Further, any concentrated additional wave-induced erosion from barge hydroseeding would be limited to a shorter duration (i.e., over several hours within a single day) than that of wind-action on the slowly downward-moving reservoir surface. Therefore, barge hydroseeding would be unlikely to exacerbate erosion impacts beyond that of reservoir drawdown itself, which would be within the range of existing conditions.

Additional potential impacts to TCR sites within the reservoir footprints, including short-term erosion, surface/shallow subsurface disturbance (i.e., sediment slumping), artifact displacement, and precipitation-induced runoff disturbance are discussed in Potential Impact 3.12-7. Increased potential for looting of exposed

[88] For Copco No. 1 Reservoir, the normal maximum and minimum reservoir operating levels are between 2,607.5 and 2,601.0 feet mean sea level (MSL), respectively, or a range of 6.5 feet for the reservoir fluctuation zone (PacifiCorp 2004b). For Iron Gate Reservoir, levels are between 2,330.0 and 2,324.0 feet MSL, respectively, or a range of 4 feet for the fluctuation zone (PacifiCorp 2004b).

TCRs at Iron Gate, Copco No. 1, and Copco No. 2 reservoirs during and following reservoir drawdown activities is discussed in Potential Impact 3.12-6.

Overall, the increased likelihood of impacts to known or as-yet unknown previously submerged TCRs due to drawdown of Iron Gate, Copco No. 1, and Copco No. 2 reservoirs would be a significant impact in light of the following:

- Increased potential for shifting, erosion, and/or exposure of TCRs that results in destruction or material alteration of the resources in a way that would undermine current or historical significance, in light of an existing condition in which the TCRs are under water.
- The large number of known TCRs, and the high potential for the presence of as-yet unknown TCRs, that are currently submerged by Copco No.1, Copco No. 2, and/or Iron Gate reservoirs.

Implementation of Mitigation Measures TCR-1 (TCRMP), TCR-2 (LVPP), TCR-3 (IDP), and TCR-4 (Endowment)[89] would reduce these impacts considerably, and, for many resources is expected to avoid impacts completely or to reduce the impact to less than significant. The measures (listed fully, below) include, among other requirements, timely surveys of exposed land, on-side tribal monitors, limits to public access, and identification of protocols and best practices upon discovery or disturbance of TCRs in project implementation. With timely discovery and appropriate steps to address exposure, shifting or erosion impacts, many TCRs can maintain their current level of cultural significance. Additionally, providing a means for the long-term protection or enhancement of affected TCRs can mitigate for certain impacts.

However, the impact of exposing or disturbing tribal human remains, or associated funerary items, is itself profound. While the mitigation measures are expected to considerably reduce impacts, they cannot reasonably be expected to eliminate such exposure or disturbance, particularly in light of evidence that the number of submerged burial sites is high. Thus, while drawdown is not generally anticipated to have large effects on material below the earth's surface at the time of reservoir inundation, where slumping is a risk and where so many sites are involved (including some sites that have been subject to wave action with an erosive effect) material risk remains that some burials may be affected. While treating remains and associated funerary objects with the appropriate respect and procedures can reduce and avoid compounding the harm from the initial exposure or movement, it cannot do so fully. In light of the particular harm of exposing human remains even where they are treated appropriately after exposure, the impacts would remain significant and unavoidable.

[89] Mitigation Measures TCR-6, TCR-7 and TCR-8 could also further reduce the potential impact. However, at this point it is not clear whether the measures are feasible (see Potential Impact 3.12-8). Therefore, this EIR does not rely on implementation of these measures in reaching its significance determinations.

Significance
Significant and unavoidable with mitigation

Potential Impact 3.12-3 Reservoir drawdown could result in short-term erosion or flood disturbance to tribal cultural resources located along the Klamath River.
Hydroelectric Reach
The Hydroelectric Reach from the California-Oregon state line to Copco No. 1 Reservoir includes prehistoric archaeological riverside sites with habitation debris, house pits and rock features and cemeteries; as well as ethnographic places and other features of the cultural landscape (PacifiCorp 2004, Daniels 2006). Historic period refuse scatters, historical hotel ruin sites, historical ranching sites, and historic roads are also present (Cardno Entrix 2012). There are known TCR sites located within the Area of Analysis *Subarea 4* (Figure) along the Klamath River between J.C. Boyle Dam and Copco No.1 Reservoir (Confidential Appendices P and Q). Certain of these sites may be impacted by increased flows during drawdown of J.C. Boyle Reservoir in Oregon because they are situated along the river's edge. It is a profound concern of the Shasta Nation that particular TCR sites along this reach would be flooded, and possibly destroyed, during drawdown (see also Confidential Appendix P as well as Shasta Nation consultation letter [2/1/2017] and public scoping letter [2/1/2017]).

As the Copco No. 1, Copco No. 2, and Iron Gate dams and associated facilities are located below this section of the Klamath River, the TCRs in this area would only be affected by the drawdown of J.C. Boyle. J.C. Boyle Reservoir has a relatively small storage capacity (3,495 acre-feet) and is not operated by PacifiCorp as a flood control reservoir. PacifiCorp operates J.C. Boyle Reservoir to produce hydroelectric power. Under current operations, when the inflow to J.C. Boyle Reservoir is below approximately 2,800 cfs, water is typically stored at night and released for power generation during the day which coincides with peak energy demand. When the inflow to the reservoir is greater than approximately 2,800 cfs, water does not need to be stored to generate power since the maximum capacity of the two turbine units in the J.C. Boyle Powerhouse is 2,850 cfs and any additional inflow to the reservoir spills over the dam. Spillage over the dam and flow through the J.C. Boyle Bypass reach in excess of the typical 100 cfs bypass flows generally occurs during the months of January through May when the Klamath River inflow to J.C. Boyle Reservoir tends to be greater than 2,800 cfs (Appendix B: *Definite Plan*). All flows diverted for power generation are returned to the Klamath River downstream stream of the J.C. Boyle Powerhouse in the J.C. Boyle Peaking Reach. Flows in the Klamath River between J.C. Boyle Reservoir and the upstream end of Copco No. 1 Reservoir vary by season and year, ranging from a daily mean value of less than 1,000 cfs during summer low flow periods to as high as 10,800 cfs in the spring of 1972 (Figure 3.12-7).

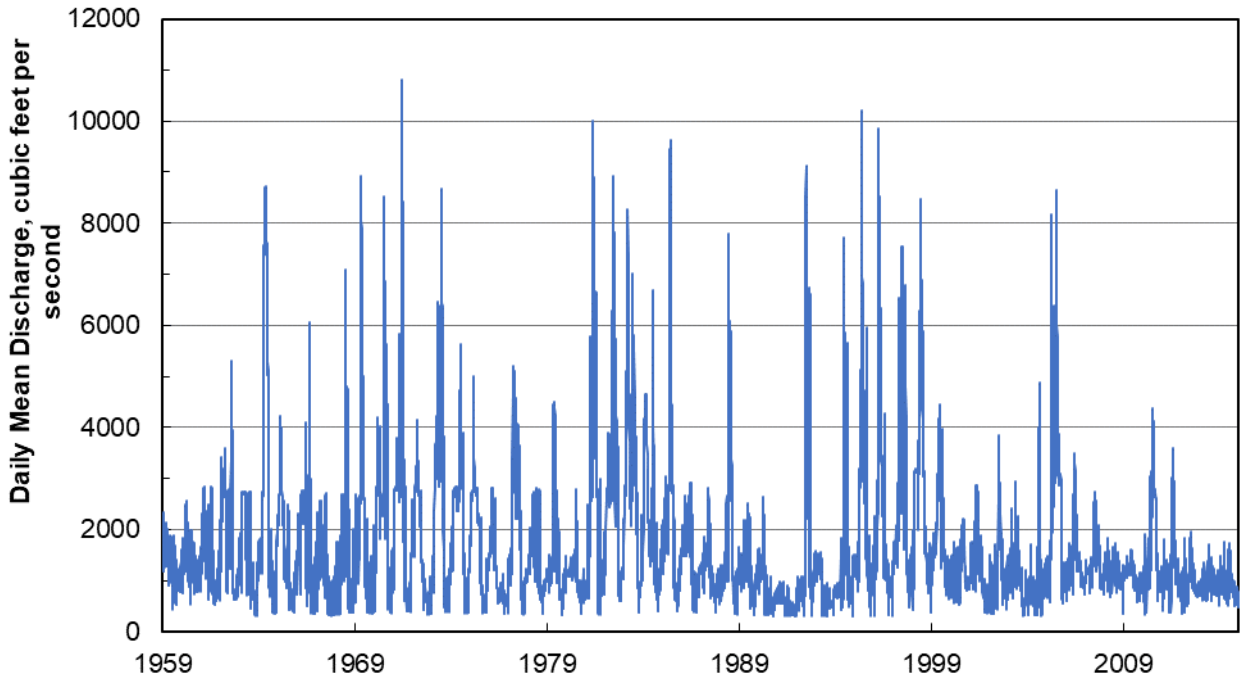

Figure 3.12-7. Discharge (flow) for Klamath River Downstream from J.C. Boyle Powerhouse, 1959–2015. Source: USGS 2016.

The proposed drawdown of the Lower Klamath Project reservoirs is designed to minimize potential flood risks, including carefully drawing down the reservoirs using controlled flow releases and the increased storage availability in J.C. Boyle, Copco No. 1, and Iron Gate reservoirs once drawdown has begun to accommodate for potential winter flow events. Drawdown of J.C. Boyle Reservoir would occur from January 1 to March 15 of dam removal year 2. During drawdown, release flows at J.C. Boyle Dam would range from 1,000 to 3,000 cfs for short durations (1−2 days) (Appendix B: *Definite Plan*). As shown in Figure , flows of this magnitude are typical for the Klamath River upstream of Copco No. 1 Reservoir and downstream from J.C. Boyle Powerhouse and are well below maximum flows (close to 11,000 cfs). Accordingly, the average increase in Klamath River flow due to drawdown of J.C. Boyle Reservoir is expected to be small, from less than 1 percent up to 8 percent during the months of January and February of dam removal year 2 (Appendix B: *Definite Plan*). Thus, the Proposed Project would not result in drawdown flows that are out of the normal range of flows experienced under existing conditions. Since drawdown releases from J.C. Boyle Dam would not cause flooding of the river between the dam and Copco No. 1 Reservoir, the Shasta TCR sites located along this reach of the Klamath River would not be subject to short-term erosion and/or flood disturbance related to the removal of J.C. Boyle Dam.

Many of the Shasta TCR sites located along the river in this reach are located within the current FEMA 100-year floodplain. Because J.C. Boyle Reservoir is not a flood control reservoir, the FEMA 100-year floodplain extent in the Klamath

River between J.C. Boyle Dam and Copco No. 1 Reservoir would not change with dam removal (see Appendix K). Thus, there would be no long-term change in the flooding potential for Shasta TCR sites due to removal of J.C. Boyle Dam. Overall, there would be no significant impact of the Proposed Project on Shasta TCR sites located between J.C. Boyle Dam and Copco No. 1 Reservoir.

Middle Klamath River

Known TCRs within the Area of Analysis *Subarea 2* (Figure) include resources identified in PacifiCorp (2004) and Daniels (2006), as updated by Confidential Appendix Q, Attachment 4, and are cataloged in Confidential Appendices P and Q. Resources identified as villages, cairns or burial sites, or sites eligible for the National Register of Historic Places in a subsequent compilation by Cardno ENTRIX (2012) were also considered as part of this analysis.

Under the Proposed Project, drawdown of the four reservoirs would occur simultaneously beginning in January of dam removal year 2 (Copco No. 1 Reservoir would also experience early drawdown starting November of dam removal year 1 at a lower rate) (see also Section 2.7.2 *Reservoir Drawdown*). Drawdown of Copco No. 2 may occur later, at the start of May of dam removal year 2. The reservoir releases would be controlled and would vary by reservoir depending on the type of dam, discharge capacity, water year type, and the volume of water and sediment within the reservoir (Appendix B: *Definite Plan*). The proposed drawdown of the Lower Klamath Project reservoirs is designed to minimize potential flood risks, including drawing down the reservoirs using controlled flow releases and the increased storage availability in J.C. Boyle, Copco No. 1, and Iron Gate reservoirs once drawdown has begun to accommodate for winter flow events. If a flood event occurred during drawdown, the flood flows would be retained using the newly available storage capacity in each reservoir and drawdown would continue after flood risks have ended. Current conditions do not allow the Lower Klamath Project reservoirs to assist in flood prevention in this manner as the reservoirs' current operations occur within a narrow reservoir storage rage and do not provide adequate space for storage of winter flows. The Proposed Project drawdown rates are consistent with the historical discharge rates from the reservoirs, where flow rates downstream of the dams would not increase substantially above median historical rates, if at all. Discharges from Copco No. 1 and Iron Gate reservoirs would be similar to, or less than, seasonal 10-year flood flows from the reservoirs (see also Potential Impact 3.6-1).

Thus, drawdown releases from the Lower Klamath Project dams would not cause flooding of the Middle and Lower Klamath River, riverside TCR sites located in Area of Analysis *Subarea 2* (Figure), downstream of Iron Gate Dam either along the reach from Iron Gate Dam (RM 193) to Humbug Creek (RM 174) or further downstream (which is captured in Area of Analysis *Subarea 4* [Figure]). Therefore, these resources would not be subject to increased short-term erosion or flood disturbance as a result of reservoir drawdown that could destroy or

materially alter TCRs in a way that would undermine current or historical cultural significance.

However, hydrologic and hydraulic modeling of floodplain inundation shows that removal of the Lower Klamath Project dams could result in minor alterations to the FEMA 100-year floodplain inundation area downstream of Iron Gate Dam, along the 18-river mile stretch of the Middle Klamath River between RM 193 and 174 (i.e., from Iron Gate Dam to Humbug Creek) (USBR 2012b). Changes in the extent of the floodplain inundation area in Area of Analysis *Subarea 2* (Figure) could increase the risk of flood damage to TCRs that are not currently located within the FEMA 100-year floodplain but would be following dam removal, where flood damage could involve physical destruction or relocation of TCRs such that the significance of the TCR would be materially impaired. This would be a significant impact in the short term and long term. Implementation of TCR-1, TCR-2, and TCR-3 would reduce impacts, although for the reasons described in Potential Impact 3.12-1, the impacts would remain significant and unavoidable.

Lower Klamath River and Klamath River Estuary
Because drawdown is not expected to increase flood risk and because dam removal is not expected to alter the floodplain downstream of Humbug Creek, no increased erosion or flooding-related risk of damage to cultural resources in Area of Analysis *Subarea 4* (Figure) is expected over the current conditions along the Klamath River downstream of Humbug Creek and in the Klamath River Estuary in either the short term or the long term.

There is the potential for the morphology of the Klamath River Estuary to change in light of sediment releases from the drawdown of the reservoirs (see Potential Impact 3.2-3). These changes to the estuary have a low-risk potential to affect estuary-based Yurok Tribe TCRs; however, there is some risk of potential impacts that would not occur absent implementation of the Proposed Project. The Yurok Tribe has adopted ordinances and policies to address impacts to cultural resources on the Yurok Reservation, which includes the Klamath River Estuary. In the unlikely event that such Proposed Project-related impacts would occur to resources in the area of the Klamath River Estuary, implementation of Mitigation Measure TCR-5 would reduce the potential impacts to less than significant.

Mitigation Measure TCR-5 − Implementation on Yurok Reservation.
Mitigation Measures TCR-1, TCR-2, and TCR-3 do not apply on the Yurok Reservation. The Yurok Tribe's Cultural Resource Ordinance and Inadvertent Discovery Policy shall apply to such TCRs on the Yurok Reservation.

Significance

No significant impact in the short term or long term for the Hydroelectric Reach between J.C. Boyle Dam and Copco No. 1 Reservoir

Significant and unavoidable with mitigation in the short term and long term for the Middle Klamath River from Iron Gate Dam to Humbug Creek

No significant impact in the short term or long term for Middle Klamath River downstream of Humbug Creek and Lower Klamath River excluding the Yurok Reservation (approximately RM 0 to RM 45)

No significant impact with mitigation on the Yurok Reservation (approximately RM 0 to RM 45) along Lower Klamath River and Klamath River Estuary

Potential Impact 3.12-4 Project activities associated with removal of Iron Gate, Copco No. 1, and Copco No. 2 dams could result in physical disturbance to known or unknown tribal cultural resources from blasting or other removal techniques.

Blasting and other dam removal techniques could cause significant adverse impacts to known or unknown TCRs located in the immediate vicinity[90] of Iron Gate, Copco No.1 and Copco No. 2 dams. While minor ground vibration and sounds from blasting and other dam removal techniques may extend throughout the 0.25-mile distance from each of the dams, the vibration and sounds would not result in significant impacts to TCRs because they would not result in physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of the TCR would be materially impaired.

However, direct physical disturbance associated with blasting and other removal techniques could significantly impact those TCR sites that directly overlap with the blasting locations. The KRRC proposes complete removal of dam facilities, including, in some instances, excavation of concrete below the existing streambed level, in order to prevent future development of fish barriers as the river morphology changes. Removal of the concrete dam structures would require blasting and drilling which could destroy, relocate, or alter those TCRs sites that directly overlap with the blasting locations or their immediate surroundings such that the significance of these TCRs would be materially impaired.

There is at least one TCR that was present at Copco No. 1 before dam construction that would be potentially impacted. It is unknown the extent to which the resource survives currently as it is no longer accessible. To the extent the site still exists, removal of the dam has a high likelihood of significantly

[90] For the purposes of this analysis, “immediate vicinity” is defined as within 0.25 miles of Copco No. 1, Copco No. 2, and Iron Gate dams.

degrading the site. There is also the potential for as-yet unknown sites to be impacted within the blasting zone, or by other techniques associated with the removal of these features, in light of the density of sites in the Hydroelectric Reach.

Implementation of mitigation measures TCR-1 (TCRMP), TCR-2 (LVPP), TCR-3 (IDP), and TCR-4 (Endowment)[91] would reduce impacts to TCRs associated with dam removal activities, but impacts would remain significant and unavoidable.

Significance
Significant and unavoidable with mitigation

Potential Impact 3.12-5 Ground disturbance associated with reservoir restoration, recreation site removal and/or development, and disposal site restoration could physically disturb known Tribal Cultural Resources. Additionally, ongoing road and recreation site maintenance has the potential to disturb known Tribal Cultural Resources.
The proposed Reservoir Area Management Plan includes restoration activities that would occur both within the reservoir footprint and in upland areas (i.e., disposal, staging, and hydropower infrastructure demolition areas, access roads, former recreational areas) within the Area of Analysis *Subarea 1* (Figure). Known TCR locations include those reflected in PacifiCorp (2004) and Daniels (2006), and as updated by Confidential Appendix Q, Attachment 4, which are cataloged in Confidential Appendices P and Q. Resources identified as villages, cairns or burial sites, or sites eligible for the National Register of Historic Places in a subsequent compilation by Cardno ENTRIX (2012) were also considered as part of this analysis.

After reservoir drawdown, the following ground-disturbing activities would be implemented in the former reservoir areas to stabilize remaining sediments over time and to restore riparian, floodplain, and wetland habitats:

[91] Mitigation Measures TCR-6, TCR-7 and TCR-8 could also further reduce the potential impact. However, at this point it is not clear whether the measures are feasible (see Potential Impact 3.12-9). Therefore, this EIR does not rely on implementation of these measures, in reaching its significance determinations.

- Active seeding[92] via ground equipment to revegetate reservoir areas with native grasses, sedges, rushes and forbes immediately after reservoir drawdown and planting of acorns, shrub seedlings, and pole cuttings as early as feasible;
- Manual removal/treatment of invasive exotic vegetation, which may include manual weed extraction, solarization (covering round areas with black visqueen), tilling, and use of herbicides;
- Planting of woody riparian trees and shrubs along the river banks in the former reservoir areas; and
- Installation of floodplain and off-channel habitat features such as large wood, roughening of the floodplain to enhance establishment of vegetation, and rectifying any non-natural fish passage barriers in mainstems and tributaries.

Within the reservoir footprint portions of the Area of Analysis *Subarea 1*, numerous TCR sites have been identified, including prehistoric archaeological sites with habitation debris, village sites, house pits and rock features and burial sites; as well as ethnographic places and other features of the cultural landscape (Confidential Appendices P and Q). Additionally, there may be many as-yet unknown TCRs located within the footprints of Copco No. 1, Copco No. 2, and Iron Gate reservoirs. Artifacts within the reservoir footprint may be materially impaired through physical demolition, destruction, relocation, or alteration by construction equipment (e.g., tilling) or hand tools (e.g., shovels for planting trees) during the aforementioned reservoir restoration activities. The proposed Reservoir Area Management Plan also includes long-term monitoring of vegetation growth, invasive exotic vegetation, and fish passage to ensure objectives are accomplished; however, these activities are not expected to be ground-disturbing.

Within the upland portions of the Area of Analysis *Subarea 1* (i.e., outside of the Copco No. 1 and Iron Gate reservoir footprints, including the fluctuation zone), known TCRs include those reflected in PacifiCorp (2004) and Daniels (2006), and as updated by Confidential Appendix Q, Attachment 4, and are cataloged in Confidential Appendices P and Q. Resources identified as villages, cairns or burial sites, or sites eligible for the National Register of Historic Places in a

[92] The Reservoir Area Management Plan includes aerial pioneer seeding using helicopters during the winter/early spring during and following reservoir drawdown (Appendix B: *Definite Plan – Appendix H*). Aerial seeding is not a ground-disturbing activity. Fall overseeding, which is potentially ground-disturbing, would be completed with a ground-based broadcast seeder over the mowed or rolled vegetation remaining from the pioneer seeding (Appendix B: *Definite Plan – Appendix H*). Hydroseeding via barge during reservoir drawdown is potentially a ground-disturbing activity, although this activity is not currently anticipated by KRRC. Potential impacts due to barge hydroseeding are discussed in Impact 2.

subsequent compilation by Cardno ENTRIX (2012) were also considered as part of this analysis. Proposed upland restoration activities include active management of invasive exotic vegetation species, which may include ground-disturbing activities such as manual weed extraction, solarization (covering of ground areas with black visqueen), tilling, and planting (Appendix B: *Definite Plan − Appendix H*) (see also Section 2.7.5 *Restoration of Upland Areas Outside of the Reservoir Footprint*). These activities may result in material impairment of TCRs located within upland portions of the Area of Analysis *Subarea 1* from physical demolition, destruction, relocation, or alteration by construction equipment (e.g., tilling) or hand tools (e.g., shovels for planting trees). Non-ground-disturbing, proposed upland restoration activities include the possible use of herbicides for controlling invasive exotic vegetation; collecting seeds for local nurseries to grow trees and shrubs; and implementing a short-term Storm Water Pollution Prevention Plan (SWPPP)/Erosion Control Plan.

Ground-disturbing activities associated with ongoing road and recreation site maintenance within the Area of Analysis *Subarea 1* (Figure) include grading and excavating, which may also result in material impairment due to physical demolition, destruction, relocation, or alteration of TCRs located in both upland and reservoir footprint locations.

In summary, several known and potentially many as-yet unknown TCRs could be significantly adversely impacted due to the aforementioned ground-disturbing activities associated with revegetation and restoration of riparian, floodplain, and wetland habitat within former reservoir areas and upland areas, as well as ongoing road maintenance and potential recreation site construction and maintenance, if any.

Implementation of Mitigation Measures TCR-1 (TCRMP), TCR-2 (LVPP), TCR-3 (IDP), and TCR-4 (Endowment)[93] would reduce these impacts considerably, and, for most resources is expected to avoid impacts completely, through designing restoration plans to completely avoid impacts, or by on-the-ground changes to implementation to avoid impacts. Using hand tools to restores sensitive areas will reduce the risk and severity of potential damage as compared to use of heavy equipment. For impacts that it is not feasible to completely avoid, the impacts may be reduced to a less than significant level. The measures include, among other requirements, field worker training, limits to worker and public access, tribal monitors, surveys, and identification of protocols and best practices upon discovery or disturbance of TCRs in project implementation. With timely discovery and appropriate steps to address exposure or damage, many TCRs can maintain their current level of cultural significance. Additionally, providing a

[93] Mitigation Measures TCR-6, TCR-7, and TCR-8 could also further reduce the potential impact. However, at this point it is not clear whether the measures are feasible (see Potential Impact 3.12-9.) Therefore, this EIR does not rely on implementation of these measures, in reaching its significance determinations.

means for the long-term protection or enhancement of affected TCRs can mitigate for some impacts.

However, the impact of exposing or disturbing tribal human remains, or associated funerary items, is itself profound. The mitigation measures are expected to considerably reduce—but cannot be reasonably be expected to completely avoid—such exposure or disturbance, particularly in light of the density of villages in the reservoir bed areas. While treating remains and associated funerary objects with the appropriate respect and procedures can reduce and avoid compounding the harm from the initial damage, it cannot do so fully.

Additionally, in light of the high density of TCRs in the restoration areas, and because some of the contemplated restoration involves significant earth-moving with heavy equipment, such as potentially regrading areas and enhancing wetlands, significant risk remains that other TCRs may sustain damage that results in a martial impairment of the resource's significance. In light of the particular harm of exposing human remains even where they are treated appropriately after exposure, and the likelihood of significantly impairing other resources in light of the type of construction actions and the density of resources, the impact would remain significant and unavoidable.

Significance
Significant and unavoidable with mitigation

Potential Impact 3.12-6 During and following reservoir drawdown activities at Iron Gate, Copco No. 1, and Copco No. 2 reservoirs there is an increased potential for looting of Tribal Cultural Resources (short-term and long-term).
During and immediately following reservoir drawdown[94], TCRs located within the footprints of Copco No. 1, Copco No. 2, and Iron Gate reservoirs would no longer be partially or completely covered by reservoir waters and thus would be more accessible and at greater risk for looting. For these known TCR sites, plus as-yet unknown sites, some tribal representatives assert that the reservoirs offer the best protection against looting because the reservoir waters currently prevent looter access.

Known TCRs within the Area of Analysis *Subarea 1* (Figure 3.12.2) include resources identified in PacifiCorp (2004a) and Daniels (2006), as updated by Confidential Appendix Q. Resources identified as villages, cairns or burial sites, or sites eligible for the National Register of Historic Places in a subsequent

[94] Consideration of exposure or substantial movement of tribal cultural resources during pre-dam removal ground-disturbing activities that could lead to increased access and looting above levels occurring under existing conditions is discussed in Potential Impact P-1.

compilation by Cardno ENTRIX (2012) were also considered as part of this analysis. Within the footprints of Copco No. 1, Copco No. 2, and Iron Gate reservoirs, which is the focus of this Potential Impact 3.12-5 analysis, numerous TCR sites have been identified. Additionally, there may be many as-yet unknown TCRs located within the footprints of the California reservoirs. Note that many of the known TCR sites are located within the reservoir fluctuation zones and several of these are associated with relatively shallow sediment deposits (approximately 0.2 to 2 feet deep). Tribal cultural resource sites located within the reservoir fluctuation zones may be periodically at risk of looting during low water periods under existing conditions.

Within the reservoir footprints, Proposed Project restoration activities would occur during and immediately following reservoir drawdown (i.e., dam removal years 1 and 2) as well as post-dam removal year 1, including active seeding to revegetate reservoir areas with native grasses, sedges, rushes and forbes, and planting of acorns, shrub seedlings, and pole cuttings, all of which would stabilize sediments remaining in the reservoir footprints (see also Potential Impact 3.12-4). Revegetation activities would reduce erosion of fine sediments (Appendix B: *Definite Plan – Appendix H*) and would physically cover the remaining sediment deposits with a variety of vegetation, thus decreasing the potential for exposure and looting of TCRs located within the reservoir footprints. However, in general, sensitive areas located within the reservoir footprints would be subject to exposure and increased access since they would no longer be partially or completely covered by reservoir waters. This could increase the potential for looting of TCRs above levels occurring under existing conditions. The potential severity of this impact is underscored by significant anecdotal evidence of an extensive looting problem in the area, and by statements made by tribal members regarding the deep impact of past and ongoing looting, particularly in light of a history of repeated dispossession in the area.

Implementation of Mitigation Measure TCR-2 (LVPP) and TCR-4 would significantly reduce the impacts of looting in the short term and long term. However, illegal looting remains a pervasive problem in the vicinity, as related through extensive anecdotal evidence by tribal members and archaeologists with experience in the area. Therefore, although it is likely that the LVPP would be effective in protecting most resources through the intensive monitoring and broad range of tools to address the concern, it would be unlikely to be completely effective. The impact of looting of certain resources is profound, and could result in material impairment of a resources' significant or result in the exposure or disturbance of human remains. Therefore, the increased risk of looting remains significant and unavoidable.

Significance

Significant and unavoidable with mitigation in the short term and long term

Potential Impact 3.12-7 Short-term erosion caused by high-intensity and/or duration precipitation events could cause exposure of or disturbance to known or unknown tribal cultural resources within the reservoir footprints immediately following reservoir drawdown and prior to vegetation establishment/full stabilization of sediment deposits.
Immediately following reservoir drawdown[95], high-intensity and/or long-duration precipitation events could occur that would result in surface erosion of remaining reservoir sediment deposits and cause exposure of or disturbance to TCRs located within the reservoir footprints. Known TCRs to be within the Area of Analysis *Subarea 1* include resources identified in PacifiCorp (2004a) and Daniels (2006), as updated by Confidential Appendix Q. Resources identified as villages, cairns or burial sites, or sites eligible for the National Register of Historic Places in a subsequent compilation by Cardno ENTRIX (2012) were also considered as part of this analysis. Within the footprints of Copco No. 1, Copco No. 2, and Iron Gate reservoirs, which is the focus of this analysis for Potential Impact 3.12-7, numerous TCR sites have been identified (Confidential Appendices P and Q). Additionally, there may be many as-yet unknown TCRs located within the footprints of Copco No. 1, Copco No. 2, and Iron Gate reservoirs.

Since the Lower Klamath Project reservoirs were constructed, fine sediments composed primarily of organic material (including dead algae), but also including some silts and clays, have accumulated along the reservoir bottoms (see Section 2.7.3 *Reservoir Sediment Deposits and Erosion During Drawdown*). The distribution of sediment deposits varies within each reservoir (Figure 2.7-8 and 2.7-9). Because the accumulated sediments are primarily fine material, a percentage of them would be easily eroded and flushed out of the reservoirs into the downstream Klamath River during reservoir drawdown, with the majority of the erosion focused in the original river channel (Figures 2.7-5 and 2.7-6). However, following drawdown, 40−60 percent of the sediment deposits accumulated behind the dams would remain in place in each of the former reservoir beds, primarily on terraces located above the original river channel. The sediments that remain in the reservoir footprints would consolidate (dry out and decrease in thickness) (USBR 2012a), making them less subject to erosion. Further, during the drawdown period, seeding (by helicopter and potentially barge) of pioneer mixes would occur as the reservoir water level drops and before the exposed reservoir sediments dry and form a surface crust. The seeded native grasses are expected to become well established within weeks after application (January to March of dam removal year 2), which would reduce erosion of the remaining reservoir sediment deposits during cycles of wetting (i.e., from precipitation events) and drying (Appendix B: *Definite Plan – Appendix H*). During the first summer and fall following reservoir drawdown (dam removal

[95] Consideration of potential shifting-, erosion-, and exposure-related impacts to tribal cultural resources during reservoir drawdown is discussed in Potential Impact 3.12-2.

year 2), additional seeding application would occur including grasses and ground cover, with monitoring and targeted revegetation for areas that do not meet vegetation cover goals (Appendix B: *Definite Plan – Appendix H*).

During the period of weeks when seeded native grasses have not yet become well established within the reservoir footprints, high intensity and/or long-duration precipitation events could increase erosion of remaining reservoir deposits through sediment cracking and gully erosion, and destroy or materially impair TCRs in a way that would undermine current or historical cultural significance, including through substantial movement of human remains. This could increase disturbance impacts to TCRs that were already affected during drawdown (see Potential Impact 3.12-4), or impact additional TCRs that were not affected by erosion during drawdown. The risk of this occurring would be higher for TCRs located in areas where post-reservoir sediment deposition was relatively thin (i.e., areas where sediment deposits are less than 2 feet deep) and would be limited to TCRs that were located above ground prior to reservoir inundation[96].

However, since 40−60 percent of the reservoir sediment deposits are predicted to remain in place following drawdown, many TCRs that were located above ground at the time of reservoir inundation are expected to remain substantially covered, even those located within reservoir sediment deposits that are less than 2 feet deep (see Confidential Appendices P and Q). For those sites located within deeper reservoir sediment deposits, the overlying sediment layer would offer protection from surface cracking and gully erosion that may result from high intensity and/or duration precipitation events and these deeper sites would not be likely to be destroyed or materially impaired in a way that would undermine current or historical cultural significance.

The risk of continued erosion and subsequent exposure of or disturbance to TCRs located in the reservoir footprints, particularly for those associated with relatively shallow (e.g., less than 2 feet deep) sediment deposits (see Confidential Appendices P and Q), would decrease within weeks to months following reservoir drawdown as revegetation stabilizes the remaining sediments. Monitoring and targeted revegetation activities included in the proposed Reservoir Area Management Plan (Appendix B: *Definite Plan – Appendix H*) would reduce the risk of impacts to TCRs located in areas of large crack or gully formation. As the system returns to riverine conditions within the reservoir footprints, with revegetated terraces along the river and sides of the former

[96] For tribal cultural resources that were located below ground prior to inundation, the Proposed Project is not expected to result in exposure or disturbance impacts because sediment erosion would be limited to the fine materials accumulated since the reservoirs were constructed (see Potential Impact 3.12-2). These tribal cultural resources would remain buried, their significance to the Shasta Nation would not be materially impaired, and there is no anticipated impact.

reservoirs, long-term erosion and sediment transport rates would return to natural rates for this portion of the watershed (USBR 2012b).

Implementation of Mitigation Measures TCR-1 (TCRMP), TCR-2 (LVPP), and TCR-3 (IDP)[97] would reduce these impacts, overall they would remain significant and unavoidable for the reasons described for the erosion related to reservoir drawdown (Potential Impact 3.12-2).

Significance
Significant and unavoidable with mitigation in the short term

Potential Impact 3.12-8 Long-term (post-removal) impacts to Tribal Cultural Resources as a result of dam removal from increased looting opportunities and from surface and subsurface erosion of Tribal Cultural Resources.
Following drawdown of Iron Gate, Copco No.1, and Copco No. 2 reservoirs, 40−60 percent of the reservoir sediment deposits would remain in place, primarily on areas at higher elevation than the active river channel within the reservoir footprints (see also Potential Impacts 3.12-4 and 3.12-8). During tribal consultations, some tribal representatives expressed strong concerns that long-term erosion of remaining sediment deposits within the Lower Klamath Project reservoirs would disturb or destroy TCRs that are located there (see also Confidential Appendix P). In addition, the Proposed Project includes transfer of PacifiCorp lands immediately surrounding the Lower Klamath Project ("Parcel B lands") from PacifiCorp to the KRRC prior to dam removal, where Parcel B lands contain all of the Copco No. 1 Reservoir footprint and the majority of the Iron Gate Reservoir footprint (Figure). The Proposed Project then provides that the KRRC would transfer Parcel B lands to the respective states (i.e., California, Oregon), as applicable, or to a designated third-party transferee, following dam removal. The lands would thereafter be managed for public interest purposes (KHSA Section 7.6.4.A).

The potential for increased looting opportunities and surface erosion to result in long-term impacts to known or unknown TCRs due to the Proposed Project is discussed below for resources located within the reservoir footprints and within Parcel B lands.

Tribal Cultural Resource Sites Within the Reservoir Footprints Prior to Land Transfer
Tribal cultural resources known to the Shasta people to be within the Area of Analysis *Subarea 1* include resources identified in PacifiCorp (2004a) and Daniels (2006), as updated by Confidential Appendix Q, Attachment 4.

[97] Mitigation Measures TCR-6, TCR-7 and TCR-8 could also further reduce the potential impact. However, at this point it is not clear whether the measures are feasible (see Potential Impact 3.12-8). Therefore, this EIR does not rely on implementation of these measures, in reaching its significance determinations.

Resources identified as villages, cairns or burial sites, or sites eligible for the National Register of Historic Places in a subsequent compilation by Cardno ENTRIX (2012) were also considered as part of this analysis. Within the footprints of Copco No. 1, Copco No. 2, and Iron Gate reservoirs, numerous TCR sites have been identified including village and cairn sites (Confidential Appendices P and Q). Additionally, there may be many as-yet unknown TCRs located within the footprints of Copco No. 1, Copco No. 2 and Iron Gate reservoirs.

As described in Potential Impacts 3.12-2 and 3.12-6, following reservoir drawdown, the remaining sediment deposits would consolidate through air drying and would decrease in thickness (USBR 2012a). Revegetation efforts under the Proposed Project would support re-establishment of native species on newly exposed reservoir sediments, including grasses and woody riparian species, where the latter would be planted at densities of several hundred plants per acre. It is expected that former wetland areas within the reservoir footprints would revert to wetland vegetation without long-term active revegetation inputs (Appendix B: *Definite Plan – Appendix H*).

While a portion of the fine sediments that have deposited since the dams were constructed would erode rapidly during reservoir drawdown (see Potential Impacts 3.12-4 and 3.12-8), erosion rates would decrease over weeks to months, as the remaining sediment deposits are stabilized by drying and by active and passive revegetation. As the system returns to riverine conditions within the reservoir footprints, long-term erosion and sediment transport rates would also return to natural rates for this portion of the watershed (USBR 2012b). Previous wave action within the reservoir fluctuation zone would cease as the reservoir shoreline would no longer exist, with a long-term benefit over current conditions to the known and as-yet unknown TCR sites located within the reservoir fluctuation zone (Confidential Appendices P and Q).

Thus, in the long term, drying, consolidation, and stabilization (due to re-vegetation) of the remaining sediment deposits would substantially limit the potential for erosion to result in exposure or substantial movement of TCRs buried within the deposits, or those that were located below the ground surface prior to construction and inundation of Copco No.1, Copco No. 2, and/or Iron Gate dams, such that increased access and looting above levels occurring under existing conditions would be unlikely. Instead, long-term drying, consolidation, and stabilization of the sediment deposits remaining in the reservoir footprints have the potential to preserve and protect known or as-yet unknown TCRs within or beneath the deposits. The potential for long-term erosion-related impacts on TCRs within the reservoir footprints is therefore different from and significantly less than the potential for erosion-related impacts to these resources in the periods during and immediately following reservoir drawdown (Potential Impact 3.12-4). However, despite the protection offered from the remaining sediment deposits, the vulnerability of existing TCRs to long-term exposure due to natural

rates of erosion and sediment transport for the watershed would still increase as compared to existing conditions where the reservoir waters offer almost complete protection from access and looting (with the exception of resources located within the reservoir fluctuation zone). The potential impact of this increased potential is underscored by significant anecdotal evidence of an extensive looting problem in the area, and by tribal members' testimony regarding the deep impact of past and ongoing looting, particularly in light of a history of repeated dispossession in the area.

Implementation of Mitigation Measure TCR-1 (TRMP), TCR-2 (LVPP), and TCR-3 (IDP), would reduce long-term impacts to TCRs from increased looting opportunities and surface and subsurface erosion, however, these impacts would remain significant.

Tribal Cultural Resource Sites Within Parcel B Lands After Transfer
Known TCRs within the Area of Analysis *Subarea 3* (Figure) include resources identified in PacifiCorp (2004a) and Daniels (2006), as updated by Confidential Appendix Q, Attachment 4. Resources identified as villages, cairns or burial sites, or sites eligible for the National Register of Historic Places in a subsequent compilation by Cardno ENTRIX (2012) were also considered as part of this analysis. Numerous TCR sites have been identified completely inside or partially inside Parcel B lands (Confidential Appendices P and Q).

It is unknown what public use the lands in Parcel B would ultimately serve. The California Natural Resources Agency (CNRA) and California Department of Fish and Wildlife (CDFW) have begun speaking with interested stakeholders on various recreation, water quality, tribal, resource protection, conservation, and economic uses of the land, including with tribal governments and Siskiyou County representatives. While the lands would be managed for public interest, this could include a range of uses, including open space, active wetland and riverine restoration, river-based recreation, grazing, and potentially other uses. Certain future land uses (e.g., open space) would presumably result in less potential for impacts to TCRs.

However, certain land uses, if undertaken in areas with TCRs, would have the potential to increase public access to TCRs beyond the level of simply removing the reservoirs, and it could therefore result in additional impacts due to construction, looting, illegal excavation, vandalism, and other destruction or damage within the Area of *Subarea 3* (Figure). Existing and potentially new recreation facilities along the river corridor may also direct the public to favorable landforms (e.g., flat topography, close to tributary confluences and other water sources) that coincide with locations chosen by tribal ancestors for habitation and other cultural uses. Increased access to TCRs due to land transfer has the potential to lead to looting above levels occurring under existing conditions or to land uses that result in material alteration of TCRs in a way that would undermine their current or historical tribal significance.

Further, future Parcel B land transfer could result in uses of lands currently not submerged that eliminate or substantially restrict access of tribal members to TCRs during ceremonial windows or periods of hunting and gathering or other traditional activities associated with a TCR. It is unclear what public use of Parcel B lands could result in such an increased barrier over the existing private ownership by PacifiCorp. For currently submerged lands, there is currently no access such that future land use decisions for the reservoir footprint portions of Parcel B would likely result in access-related benefits as compared with existing conditions.

In 2017, the Kikaceki Land Conservancy was formed, which includes representation of Shasta people with ancestry in the area affected by the Proposed Project. In the ongoing consultation process under NHPA section 106, KRRC will address whether this existing land conservancy, or other entities which represent Affected Tribes, could continue to implement measures for TCR protection and enhancement after the KRRC has completed Project implementation. The express mention of the Kikaceki Land Conservancy in this EIR in no way excludes the claims of any other traditionally and culturally affiliated tribes, or harms any other tribes' rights.

The process for determining future land use under the KHSA Section 7.6.4 has the potential to offer TCRs appropriate protection through a variety of land use strategies: that process remains unaltered by this EIR. Implementation of TCR-6 (Land Transfer), TCR-7 (Land Easement and Transfer Stipulations), and TCR-8 (Off-site Land Transfer) have the potential to reduce the impact of future land use decisions to less than significant. These measures are in alignment with the general proposed measures for consideration to mitigate impacts to TCRs described in Public Resources Code section 21084.3, subdivision (b)(3).

However, the ultimate feasibility of these measures is uncertain. The process for determining future land uses under KHSA Section 7.6.4 has not advanced to the point at which competing uses, financial limitations, parcel access requirements, or other constraints have become clear. Additionally, because the KRRC has a set amount of funding with which to implement the Proposed Project, its ability to undertake purchase of lands outside Parcel B as a mitigation measure is also uncertain, and thus the feasibility of Mitigation Measure TCR-8 (Off-site Land Transfer) is also uncertain. Because the ultimate feasibility of these measures is uncertain, and the State Water Board lacks the authority to impose them through its Clean Water Act section 401 certification, this EIR does not rely on implementation of these measures, although it is disclosing them because it is likely that the protections would be viable for at least some portion of the identified lands, and because they represent a potentially feasible path to protect TCRs.

Mitigation Measure TCR-6 − Land Transfer.
The State Water Board has determined, and KRRC has acknowledged, that transfer of some Parcel B lands to an entity representative of Affected Tribes which are traditionally and culturally affiliated with TCRs on such lands, could foster tribal cultural and conservation practices and promote tribal identity; and further, that such transfer could be an appropriate measure to address past disturbance of TCRs caused during construction of Iron Gate Dam, Copco No. 1 Dam, and Copco No. 2 Dam, and to mitigate the impacts to TCRs caused by Project implementation.

Pursuant to KHSA Section 7.6.4, the California Natural Resources Agency (CNRA) and CDFW have begun the process to determine the disposition of Project-related (or "Parcel B") lands, totaling approximately 8,000 acres, for public interest purposes. In California, that process is anticipated to involve the following steps: (1) inspections and preliminary due diligence regarding the condition of the Parcel B lands; (2) consultation with KHSA parties and other stakeholders regarding disposition; (3) for each parcel, a proposal by CNRA and CDFW regarding proposed transferee and other terms; (4) actual transfer of Parcel B lands from PacifiCorp to KRRC, upon KRRC's notice that it has secured all necessary permits for dam removal; and (5) subsequent transfer from KRRC to California or the third-party transferee, by parcel.

Based on AB 52 consultation, the State Water Board has identified the following potential mitigation measure, which is dependent on the outcome of the process required by KHSA Section 7.6.4. The Shasta Indian Nation has proposed the transfer of selected Parcel B lands (as identified in Confidential Appendix Q they have identified as possessing the most significant tribal cultural value to the Shasta Indian Nation and also having central importance to other Shasta peoples. The Shasta Indian Nation has proposed transfer to an entity, such as the Kikaceki Land Conservancy, that includes representation of the several bands of Shasta peoples. While it is too early in the process to determine the feasibility of such transfer, this measure is included for analysis in the Environmental Impact Report. In the process required by KHSA Section 7.6.4, the KRRC shall support consideration of transfers of selected lands to an entity representative of Affected Tribes that are traditionally and culturally affiliated with the TCRs on such lands, in circumstances where the lands have resources of critical tribal importance and such transfer would be a cost-effective approach to protect such resources.

Mitigation Measure TCR-7 − Proposal for Land Easement and Transfer Stipulations.
The CNRA and CDFW have begun initial discussions in a stakeholder process for determining land disposition as described in KHSA Section 7.6.4, including discussions with Shasta people.

1. For TCRs and such sites that are protected under Public Resources Code 5097.993, land easement and transfer stipulations could ensure that protection measures described in the TCRMP encumber the title for all subsequent owners for other lands not returned to the Shasta people. Any such land easement or transfer stipulations shall be consistent with KHSA Section 7.6.4 and other applicable terms.
2. There is also the potential to coincide public wildlife conservation management areas with lands that contain tribal cultural values to restrict public access where feasible and promote protection of cultural sites.
3. These mechanisms can also provide the opportunity for Shasta people to access TCRs through creation of tribal conservation easements.

Mitigation Measure TCR-8 − Off-site Land Transfer.
At any time prior to completing the TCRMP, the KRRC may identify parcels of land not subject to the process under KHSA Section 7.6.4, that may be appropriate for transfer to an entity representative of Affected Tribes (such as the Kikaceki Land Conservancy), as off-site mitigation for Project-related impacts to TCRs. Any such transfer involving the KRRC is subject to funding availability consistent with the terms (including funding authorities) of the KHSA.

Significance
Significant and unavoidable prior to land transfer

No significant impact with mitigation after land transfer

Potential Impact 3.12-9 Klamath Cultural Riverscape Contributing Aspect – Combined effects on the Klamath River fishery of dam removal, changes in hatchery production, and increased habitat for salmonids.
Many California Native American tribes located in the Klamath River Basin historically relied on fish (such as salmon, steelhead, and Pacific lamprey) for food, currently use fish in their diet, including some members at a subsistence level of reliance, and have and continue to consider fish to be an important part of their culture (Section 3.12.2 *[Historical Resources and Tribal Cultural Resources] Environmental Setting* and Appendix V – 2012 KHSA EIS/EIR *Section 3.12 Tribal Trust*). Under existing conditions, these fish may include adult Chinook and coho salmon returns to Iron Gate Hatchery. CDFW operates Iron Gate Hatchery with an annual production goal (CDFW and PacifiCorp 2014) (see also Section 3.3.2.3 *Habitat Attributes Expected to be Affected by the Proposed Project – Fish Hatcheries*) of 75,000 coho salmon smolts, and six million fall-run Chinook salmon yearlings and smolts.

The ability to meet the above production goals varies annually based on adult returns and hatchery performance. Coho salmon production has averaged 75,000 yearlings (achieving production goals). From 1991 through 2017 actual fall-run Chinook salmon yearling production has averaged 973,574 (exceeding production goals), and actual smolt production from 1991 through 2018 has

averaged 4,593,220 (around a half-million fewer smolts than the goal on average) (K. Pomeroy, CDFW, pers. comm., 2018). The fall-run Chinook salmon hatchery spawner return goal is 8,000 fish. Total Chinook salmon returns to Iron Gate Hatchery between 1978 and 2016 ranged from 2,558 to 72,474 and averaged 16,206 fish (CDFW 2017). Recent returns of adult Chinook salmon to Iron Gate Hatchery have been similar to the long-term average, with an average of 15,625 adult Chinook salmon returning over the period of 2009–2018 (CDFW 2019).

Adult steelhead (fall- and spring-run) returns to Iron Gate Hatchery averaged 1,064 fish for the period of 1963–2016 (CDFW 2016b). More recent returns have been much lower with an average of 82 adult steelhead returning to Iron Gate Hatchery for the period of 2007–2016 (CDFW 2016b). Returns have been declining, and in 2016 no adult steelhead returned to the hatchery (CDFW 2016b). The low adult returns of steelhead have resulted in no production of steelhead yearlings from Iron Gate Hatchery since 2013.

It appears that progeny from Iron Gate Hatchery releases have contributed appreciably to in-river tribal harvest since the late 1960s (PacifiCorp 2004a). PacifiCorp (2004a) estimates that based on smolt-to-adult survival studies conducted on Iron Gate fall Chinook salmon, the Iron Gate Hatchery production contributes about 50,000 fish annually to the Chinook and coho salmon fisheries (including commercial, tribal and recreational fisheries), in addition to escapement back to the hatchery.

The Proposed Project includes the continued operation of Iron Gate Hatchery and the reopening of Fall Creek Hatchery. The Iron Gate and Fall Creek hatcheries would be operated for eight years following dam removal (Section 2.7.6 *Hatchery Operations* and Section 3.3.5.6 *Fish Hatcheries*). The total production goals for both hatcheries would be reduced from the current production at Iron Gate Hatchery. Under the Proposed Project fall-run Chinook salmon smolt releases will decrease by 8 percent relative to current production (2009 through 2017), and yearling releases will decrease by 88 percent relative to current production (2008 through 2017), coho yearling production would remain the same, and steelhead production would continue to be zero.

As described in Potential Impact 3.3-7, operation of the hatcheries at a combined reduced capacity following dam removal would be likely to reduce average annual hatchery Chinook salmon returns (by around 3,552 fewer fish) compared with existing conditions between post-dam removal years 3 and 10 (Table 3.3-11). There would be no change to the coho salmon population through dam removal year 9 relative to existing conditions as a result of shifting all coho production to Fall Creek Hatchery (Potential Impact 3.3-9) and there would be no change to steelhead production relative to existing conditions since steelhead have not been released since 2012.

No reduction in hatchery adult returns would be evident until post-dam removal year 3 (Section 3.3.5.6 *Fish Hatcheries*), by which time the first adult returns from the progeny of naturally spawning Chinook salmon in newly accessible habitat upstream of the prior location of Iron Gate Dam would occur (Potential Impact 3.3-7). Between post-dam removal years 3 and 10, both hatchery returns and returns from newly accessible habitat would occur, offsetting reductions due to lower hatchery capacity in the early years of the Proposed Project, as total adult returns of Chinook salmon, and the associated tribal fishery resource, increase towards overall higher levels.

The elimination of hatchery production after eight years following dam removal under the Proposed Project would eliminate the congregation of returning hatchery adults to the reach downstream of the prior location of Iron Gate Dam. Combined with the removal of the dams, which would increase the likelihood that adults would disperse further upstream, these factors would be likely to reduce the incidence of fish disease and parasites in the Klamath River (see Section 3.3.5.5 *Fish Disease and Parasites*). Further, since hatchery juveniles would no longer be released after post-dam removal year 7, fish disease would be less likely to affect outmigrating smolts. Higher smolt survival would result in an increase in adult returns available for in-river tribal harvest (PacifiCorp 2004a). Overall, it is anticipated that the Proposed Project would help to reduce the incidence of fish disease and parasites in the Klamath River and thus would be beneficial.

As described in Section 3.3.5.9, Potential Impact 3.3-7, quantitative modeling of fall-run Chinook salmon populations predict that the Proposed Project would increase Chinook salmon abundance. Median escapements to the Klamath Basin are predicted to be higher (median increase greater than 30,000) with the Proposed Project than under existing conditions. The potential for tribal harvest is therefore also predicted to be greater with the Proposed Project due to increased numbers of Chinook salmon adults (affecting the number of fish available annually), and the decrease in the probability of low escapement leading to fishery closures (affecting the number of years in which fishing will be available for more than ceremonial purposes).

While a reduction (around 3,552 fish on average) in total fall-run Chinook salmon returns for up to four years under the Proposed Project would constitute a potential short-term alteration in Chinook salmon as a tribal fishery resource, it is within the existing degree of annual variability in hatchery-origin Chinook salmon returns (2,558 to 72,474 for the period 1980 to 2001 [CDFW 2016b]) and natural Chinook salmon returns (6,957 to 91,757 for the period 1980 to 2001 [CDFW 2016a]). The Proposed Project would be unlikely to represent a material impairment of the Klamath Riverscape as a resource or a substantial restriction of tribal access to the fishery relative to existing conditions, even in the short term. This assessment is bolstered by the lack of reduction in hatchery-origin coho adult returns that would occur under the Proposed Project and the lack of

change in hatchery operations from the existing condition for steelhead and spring-run Chinook (neither of which the hatchery produces) under the Proposed Project.

In addition, survival of natural and hatchery smolts is predicted to increase by post-dam removal year 1 from reduced incidence of disease (see Section 3.3.5.5 *Fish Disease and Parasites*) and increased natural production from newly accessible habitat is predicted to increase salmon abundance by post-dam removal year 3 (see Section 3.3.5.6 *Fish Hatcheries*). Thus, reduced hatchery production goals for eight years following dam removal would be a less than significant impact in the short term. In the long term, the loss of hatchery production would be more than replaced by increased natural production (Potential Impact 3.3-7), and the cessation of hatchery operations would be beneficial to the Klamath River fishery TCR by helping to reduce the incidence of fish disease and parasites.

As described in Section 3.3.5.9, the Proposed Project would not have a significant short-term impact and would have a long-term beneficial effect on spring-run Chinook salmon (Potential Impact 3.3-8), coho salmon (Potential Impact 3.3-9), steelhead (Potential Impact 3.3-10), Pacific lamprey (Potential Impact 3.3-11), and redband trout (Potential Impact 3.3-14). The tribal fishery resource is anticipated to benefit from the Proposed Project in the long term as a result of population improvements for these tribal trust species.

As described in Section 3.3.5.9, the Proposed Project would not have a significant short- or long-term impact on green sturgeon (Potential Impact 3.3-12), Lost River and shortnose suckers (Potential Impact 3.3-13), eulachon (Potential Impact 3.3-15), longfin smelt (Potential Impact 3.3-16), and freshwater mussel species *M. falcata* and *G. angulate* (Potential Impact 3.3-16). Freshwater mussel *Anodonta spp*. would experience a significant and unavoidable impact under the Proposed Project (Potential Impact 3.3-16).

As discussed under Section 3.12.2.3 *Known Tribal and Historical Resources in the Vicinity of the Proposed Project [Klamath Cultural Riverscape]*, the influence of the Proposed Project on the riverscape as a whole, and overall ecosystem health, are more important than the individual potential impacts on specific species. Based on the assessment that there would be a short-term, less-than-significant effect on most tribally significant species (with the exception of *Anodonta ssp.*) under the Proposed Project; the relatively short duration of a predicted measurable decline in fall-run Chinook adult returns from reduced hatchery operations that falls within the existing variation of hatchery returns; the lack of predicted impact from the closure of the hatchery after eight years as compared to the existing conditions (i.e., baseline); the predicted increases in fish production and health from dam removal; and the long-term benefits on much of the key tribal trust species (e.g., Chinook salmon, coho salmon, steelhead, and Pacific lamprey) resulting from improved river ecosystem function

and increased habitat access, the riverscape is anticipated to benefit under the Proposed Project.

Significance
No significant impact in the short term

Beneficial in the long term

Potential Impact 3.12-10 Klamath Cultural Riverscape Contributing Aspect: Ability of tribes to use the Middle and Lower Klamath River for ceremonial and other purposes due to alterations in riverine water quality and the extent of nuisance and/or noxious blue-green algae blooms.
California Native American tribes, such as Karuk, Yurok, Resighini Rancheria, Hoopa Valley, and Klamath, currently consume considerable amounts of fish and may ingest or contact water during fishing, bathing, collection and washing of basket and plant materials, and during tribal ceremonies such as the Boat Dance (DOI 2011) (see also Section 3.12.2.1 *Tribal Cultural Chronology and Ethnography (including Historic and Pre-Historic Periods – Northwest California Culture Area*). Under current conditions, seasonal blooms of nuisance blue-green algae regularly occur in Lower Klamath Project reservoirs and are released from Iron Gate and Copco No. 1 reservoirs into the Middle and Lower Klamath River. This can result in elevated concentrations of algal toxins in the water commonly exceeds public health advisory postings for water contact and inhibit the use of the Middle and Lower Klamath River for tribal purposes. Released blue-green algae can also clog fishing nets as well as result in elevated concentrations of algal toxins in the water, further interfering with tribal use of the river (see Section 3.2.2.7 *Chlorophyll-a and Algal Toxins*).

Based on available data, measured concentrations of the algal toxin microcystin in fish tissue have varied in the Middle and Lower Klamath River, but instances of microcystin bioaccumulation have been reported at levels that exceed public health guidelines (in addition to the water column exceedances mentioned above) (see Section 3.3.2.3 *Habitat Attributes Expected to be Affected by the Proposed Project – Algal Toxins*). Because of health risks associated with direct ingestion of fish tissue and water, as well secondary health risks due to dermal exposure to water containing elevated levels of algal toxins, tribes have had to adopt precautionary steps to avoid ingestion and water contact (DOI 2011).

Despite the slightly increased total nutrient concentrations anticipated under the Proposed Project in the Hydroelectric Reach (see Potential Impact 3.2-8), elimination of the reservoir environment that currently supports growth conditions for toxin-producing nuisance blue-green algal species such as *Microcystis aeruginosa* would result in decreases in high seasonal concentrations of chlorophyll-*a* (greater than 10 ug/L) and periodically high levels of algal toxins (greater than 8 ug/L microcystin) generated by suspended blue-green algae in the Hydroelectric Reach, the Middle and Lower Klamath River as well as the

Klamath River Estuary (see Potential Impact 3.2-12). The anticipated reductions in blue-green algae concentrations under the Proposed Project would support Cultural Use of Klamath River waters without risk of adverse health effects, which would improve tribal members' access to the river above levels occurring under existing conditions. This would be a beneficial effect. Since drawdown of the reservoirs would begin in winter and would be largely complete by March/April (i.e., the beginning of the algal growth season) of dam removal year 2, reductions in chlorophyll-*a* and algal toxins would be a short-term benefit as well as a long-term benefit since the reduction would begin during dam removal year 2 and it would continue beyond post-dam removal year 1 (Potential Impact 3.2-12).

Significance
Beneficial in the short term and long term

3.12.5.2 Potential Impacts to Built Environment and Historic-Period Archaeological Resources

Potential Impact 3.12-11 Facilities removal would result in significant impacts to Copco No. 1 Dam, Copco No. 2 Dam, and Iron Gate Dam, their associated hydroelectric facilities, and the Klamath River Hydroelectric Project District as a whole.
The Proposed Project would include removal of large-scale contributing elements of the Klamath River Hydroelectric Project District, an historical resource recommended eligible for listing to the California Register of Historical Resources for the role in early development of electricity and the economy of the southern Oregon and northern California regions (Cardno Entrix 2012; Kramer 2003a,b). Please refer to Tables 4.3-1, 4.3-3, and 4.3-5 for National Register eligibility recommendations for each of the features making up the Lower Klamath Project.

Under the Proposed Project, J.C. Boyle Dam, Copco No. 1 Dam, Copco No. 2 Dam, and Iron Gate Dam, and many of the associated hydroelectric facilities would be removed. (see Section 2 *Proposed Project*) Proposed Project activities would directly impact the historical significance of the dam structures and hydroelectric facilities and other associated properties. Removal of the three California dams (the major contributors of significance), would preclude the ability for the district to remain eligible for listing with the California Register of Historical Resources. Thus, facilities removal would be a significant impact on the resource.

As the core of the Proposed Project is removal of the Lower Klamath Project dams and associated facilities, historical restoration and "adaptive re-use" is simply not feasible as mitigation for these facilities. Dams and other hydroelectric facilities are not able to be relocated, making this form of mitigation not feasible. Maintaining some structures in place is considered in Section 4.3 *Partial Removal Alternative*.

Documentation measures that meet the National Park Services Secretary of the Interior standards for documentation of historical architectural and engineering properties are the only feasible form of mitigation because avoidance and minimization measures would not be possible.

The Proposed Project includes a Cultural Resources Plan (Appendix B: *Definite Plan – Appendix L*) that considers potential impacts to historic built environment resources, including the Klamath River Hydroelectric Project District. The Cultural Resources Plan proposes updating the Request for Determination of Eligibility for listing on the NRHP to include Iron Gate Dam (which has reached 50 years of age since the Request was first filed. Additionally, the Cultural Resources Plan sets forth a process for addressing potential impacts through avoidance and preservation in place as a first priority, then minimization, then resource-specific approaches where avoidance and minimization are not feasible. Where documentation is used, the Cultural Resources Plan recommends adopting protocols consistent with the Secretary of the Interior's Standards for Archaeological Documentation, Historical Documentation, and Architectural and Engineering Documentation; the ACHP Section 106 Archaeology Guidance; and other guidance from the appropriate SHPOs and/or THPOs, as applicable.

However, elements of the Cultural Resources Plan are not final. The Cultural Resources Plan would be further developed by KRRC working through the FERC process to comply with Section 106 of the National Historic Preservation Act of 1966, as codified in 36 CFR Part 800. As stated in the Cultural Resources Plan, mitigation measures and other protective measures would be developed and implemented to protect historic built environment resources.

Overseeing development and implementation of the Cultural Resources Plan does not fall within the scope of the State Water Board's water quality certification authority. While the KRRC has initiated a process through the Cultural Resources Working Group and FERC to develop a Historic Properties Management Plan and a Programmatic Agreement that will be finalized and implemented, at this time the Historic Properties Management Plan and the Programmatic Agreement are not finalized and the State Water Board cannot require their implementation. While the State Water Board anticipates that implementation of the Historic Properties Management Plan and the Programmatic Agreement would reduce impacts to the historical built environment, the core of the Proposed Project is removal the hydroelectric facilities and much of the context for these historic resources, such that historical restoration, "adaptive re-use," or relocation of the structures and buildings is not feasible. Even with the inclusion of documentation measures in conformance with the Secretary of the Interior's guidance, the impact to the resource and its context would be significant and the historic resource would be materially impaired. Thus, the impact to the Klamath Hydroelectric Historical District under

the Proposed Project would be significant and unavoidable even with inclusion of the KRRC's proposed mitigation measure.

Significance
Significant and unavoidable

Potential Impact 3.12-12 Pre-dam-removal activities that involve disturbance of the landscape, including construction or improvement of associated roads, bridges, water supply lines, staging areas, disposal sites, hatchery modifications, recreation site removal and/or development, and culvert construction and improvements could result in potential exposure of or damage to historic-period archaeological resources (identified in Table 3.12-1) through ground-disturbing construction and disposal activity and increased access to sensitive areas.
Historic-period cultural resources are known to be present within Area of Analysis *Subarea 1* (Figure) and are identified in Table 3.12-1. Pre-dam removal activities involving ground disturbance, construction or improvement of associated roads, bridges, water supply lines, staging areas, disposal sites, hatchery modifications, recreation site removal and/or development, and culvert construction and/or improvements would occur within the Area of Analysis *Subarea 1* (Figure).

Due to the nature of ground-disturbing activities and a general increase in the level of activity (e.g., construction, surveys) within the Area of Analysis *Subarea 1*, pre-dam removal activities that would involve ground disturbance have the potential to result in the following impacts to historic-period cultural resources through physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings; and/or exposure or substantial movement of the resources leading to increased illicit looting resulting in a significant impact.

To reduce impacts to historic-period cultural resources associated with pre-dam removal activities, the KRRC is developing a Historic Properties Management Plan to identify historic properties (including historical resources as defined in Public Resources Code, section 21084.1) and include measures to implement before and during drawdown and dam removal activities to protect significant historic, historical, cultural, and tribal resources during Proposed Project implementation. The Historic Properties Management Plan will be submitted to FERC for approval before the commencement of any ground disturbing activities (including reservoir drawdown).

Additionally, the KRRC has committed to implement a Looting and Vandalism Prevention Program (LVPP) to reduce looting and vandalism to TCRs and historic-period cultural resources (Mitigation Measure TCR-2), and an Inadvertent Discovery Plan (IDP) that would include actions to implement in the event an inadvertent discovery (e.g., human remains) (Mitigation Measure TCR-3), both of

which would provide for compliance with applicable laws regarding cultural resources and human burials.

Implementation of the Historic Properties Management Plan, Mitigation Measure TCR-2 (LVPP), and Mitigation Measure TCR-3 (IDP) would reduce these impacts considerably, and, for many resources is expected to avoid impacts completely through the design and implementation of construction plans or on-the-ground modifications to Proposed Project implementation. For impacts for which it is not feasible to completely avoid, these impacts may be reduced to a less than significant level with implementation of the Historic Properties Management Plan, Mitigation Measure TCR-2 (LVPP), and Mitigation Measure TCR-3 (IDP).

Overseeing development and implementation of the Historic Properties Management Plan does not fall within the scope of the State Water Board's water quality certification authority. While the KRRC has initiated a process through the Cultural Resources Working Group and FERC to develop the Historic Properties Management Plan and a Programmatic Agreement that will be finalized and implemented, at this time the Historic Properties Management Plan and the Programmatic Agreement are not finalized and the State Water Board cannot require their implementation. While the State Water Board anticipates that implementation of the Historic Properties Management Plan and the Programmatic Agreement, including any modifications developed through the FERC process that provide the same or better level of protection for historic-period cultural resources, would reduce impacts to less than significant, because the State Water Board cannot ensure implementation of the Historic Properties Management Plan and the Programmatic Agreement, it is analyzing the impact in this Draft EIR as significant and unavoidable.

Significance

Significant and unavoidable impact with mitigation

Potential Impact 3.12-13 Drawdown of Iron Gate, Copco No. 1, and Copco No. 2 reservoirs could shift, erode, or exposure historic-period archaeological resources resulting in increased potential for damage and looting.

The Proposed Project would draw down Iron Gate, Copco No.1, Copco No. 2 and J.C. Boyle reservoirs at a rate between 2 and 5 feet per day (i.e., 1 to 2.5 inches per hour). Drawdown of Copco No. 1 would begin November 1 of dam removal year 1 at a maximum rate of 2 feet per day, and drawdown of all reservoirs would occur at a maximum rate of 5 feet per day beginning January 1 of dam removal year 2 and continue until March 15 of the same year. The analysis for this potential impact focuses on the California Lower Klamath Project reservoirs, including Copco No. 1, Copco No. 2, and Iron Gate, which are contained within Area of Analysis *Subarea 1* (Figure).

Since construction of Lower Klamath Project reservoirs, fine sediments composed primarily of organic material (including dead algae), but also including some silts and clays, have accumulated on the reservoir bottoms covering the original topography and potentially historic-period cultural resources that were present prior to reservoir construction. The distribution of sediment deposits associated with sediment deposition following reservoir construction varies within each reservoir (Figures 2.7-8 and 2.7-9). Because the accumulated sediments are primarily fine material, they will be easily eroded and flushed out of the reservoirs into the Klamath River during reservoir drawdown. The degree of sediment erosion will vary, with the majority of the erosion focused in the former river channel that is currently submerged in Copco No. 1, Copco No. 2, and Iron Gate reservoirs (see Figures 2.7-5 and 2.7-6). The Proposed Project also includes barge-mounted pressure spraying during reservoir drawdown that would target six locations in Copco No. 1 Reservoir and three locations in Iron Gate Reservoir within which to maximize erosion of sediment deposits and subsequently excavate to the historical floodplain elevation to create wetlands, floodplain areas and off-channel habitat features (see Appendix B: *Definite Plan – Appendix H Figures 5-4 and 5-7*).

Following drawdown, approximately 40 to 60 percent of the sediment deposited since construction of Lower Klamath Project reservoirs would remain in the former reservoir footprints, primarily on terraces located above the historical river channel. The sediments that remain in the reservoir footprints would consolidate (dry out and decrease in thickness) (USBR 2012a), likely making them less subject to erosion. Further, during reservoir drawdown, aerial seeding of pioneer seed mixes would occur following the receding reservoir waters. Aerial seeding during reservoir drawdown would not result in any further disturbance of soil on the exposed reservoir terraces and the establishment of vegetation on the terraces would potentially reduce erosion of fine sediments. Recent laboratory tests of reservoir sediments showed vegetated sediments produced less erodible fine particles and aggregates during cycles of wetting and drying than unvegetated sediments (Appendix B: *Definite Plan – Appendix H*).

Although not currently anticipated by KRRC, the Proposed Project may also include hydroseeding from a barge on exposed reservoir terraces as the water recedes during reservoir drawdown. Hydroseeding from a barge would be accomplished by placing a ground rig on one barge with another boat used to ferry materials from shore. A moveable pier or other engineered method of accessing the supply boat as the water level recedes would also be needed. If it occurs, barge hydroseeding would occur in the higher elevation portion of the reservoir shoreline, until the reservoir levels become too low to operate (i.e., March of dam removal year 2). If barge hydroseeding occurred, additional disturbances of reservoir sediments would occur as wave action from the barge would increase disturbance of sediment adjacent to the receding reservoir's shoreline, potential increasing the chance for slope instability and exposure of historic-period archaeological resources.

Historic-period cultural resources associated with late-nineteenth and early-twentieth century settlement, agriculture, logging, mining, hydroelectric, and transportation facilities are known to be present within the proposed Limits of Work (Area of Analysis *Subarea 1)* (Figure). Known historic-period archaeological sites along the margin of Copco Reservoir include ruins of buildings (P-47-002824) and refuse dumps (P-47-003917 and P-47-003922). Other known but unrecorded historic period sites at Copco Reservoir included early homesteads[98], such as the lands of Ward, Keeton, Reimundo, and Pecard (Daniels 2017), and Spannaus, Lennox and Kempler. Additionally, there are references to railroads, irrigation ditches, buildings, camps, roads, trails, bridges, and agricultural fields in the historic record that are not attributed to a specific location but could be encountered during Copco Reservoir drawdown (see Appendix B: *Definite Plan – Appendix L, Table 6-12*).

Known historic-period cultural resources along the shoreline of Iron Gate Reservoir include a homestead site (P-47-003940), several stacked rock wall segments (P-47-003943, P-47-003942, and P-47-003937), and a location with dozens of historical rock cairns believed to be the result of field clearing (P-47-003945) (Cardno ENTRIX 2012, PacifiCorp 2004). Additionally, there are references to homesteads of Griever, Madero, and Spearing, rock walls, irrigation ditches, bridges, road trails, railroads, former gauge stations that could be encountered during Iron Reservoir drawdown.

Specific historic-period cultural resources located at the sites identified above include features, such as buildings, foundations, cellars, wood posts, rock stacks, refuse deposits, wells, privies, and orchards. Associated artifacts may include whole of fragmented glass or ceramic containers, table ware, lighting, or electrical artifacts. Metal artifacts may include fencing, wire, containers, fasteners, tools, and roofing. Other structural and personal artifacts may include brick or mortar, wood, rubber, some plastics, and textiles. These archaeological materials can be discovered in concentrations, such as in a refuse dump, or as isolated artifacts.

The condition of historic-period cultural resources inundated under the reservoirs is unknown, however it is anticipated that deposits of artifacts, features and sites are present and could be impacted from shifting and erosion of reservoir sediment deposits during and after drawdown. Some historic-period cultural resources within the reservoir footprints may remain covered in sediment, or capped, resulting in some degree of preservation and disturbance minimization.

Due to the nature of ground-disturbing activities during drawdown within the Area of Analysis *Subarea 1* that have the potential to result in physical demolition,

[98] Some historic-period resources may also be considered Tribal Cultural Resources and are included in Potential Impacts 3.12-1 through 3.12-10.

destruction, relocation, or alteration of the resource or its immediate surroundings; and/or exposure or substantial movement of the resources leading to increased illicit looting, the impact of drawdown to historic-period cultural resources would result in a significant impact. However, as discussed in Potential Impact 3.12-2, the KRRC is developing a Historic Properties Management Plan, LVPP, and IDP to identify historic properties and include measures to implement before and during drawdown and dam removal activities to protect historic, cultural, and tribal resources. Implementation of the Historic Properties Management Plan, Mitigation Measure TCR-2 (LVPP), and Mitigation Measure TCR-3 (IDP) would reduce significant drawdown impacts considerably, and, for many resources is expected to avoid impacts completely through the design and implementation of construction plans or on-the-ground modifications to Proposed Project implementation. For impacts that it is not feasible to completely avoid, the impacts may be reduced to a less than significant level with implementation of the Historic Properties Management Plan, Mitigation Measure TCR-2 (LVPP), and Mitigation Measure TCR-3 (IDP).

Overseeing development and implementation of the Historic Properties Management Plan does not fall within the scope of the State Water Board's water quality certification authority. While the KRRC has initiated a process through the Cultural Resources Working Group and FERC to develop the Historic Properties Management Plan and a Programmatic Agreement that will be finalized and implemented, at this time the Historic Properties Management Plan and the Programmatic Agreement are not finalized and the State Water Board cannot require their implementation. While the State Water Board anticipates that implementation of the Historic Properties Management Plan and the Programmatic Agreement, including any modifications developed through the FERC process that provide the same or better level of protection for historic-period cultural resources, would reduce impacts to less than significant, because the State Water Board cannot ensure implementation of the Historic Properties Management Plan and the Programmatic Agreement, it is analyzing the impact in this Draft EIR as significant and unavoidable.

Significance

Significant and unavoidable with mitigation

Potential Impact 3.12-14 Reservoir drawdown could result in short-term erosion or flood disturbance to historic-period cultural resources located along the Klamath River.

As discussed in Potential Impact 3.12-3, the proposed drawdown of the Lower Klamath Project reservoirs is designed to minimize potential flood risks, including carefully drawing down the reservoirs using controlled flow releases and the increased storage availability in J.C. Boyle, Copco No. 1, and Iron Gate reservoirs once drawdown has begun to accommodate for potential winter flow events and drawdown would not result in flows that are out of the normal range of flows experienced under existing conditions.

Hydrologic and hydraulic modeling of floodplain inundation shows that removal of the Lower Klamath Project dams could result in minor alterations to the FEMA 100-year floodplain inundation area downstream of Iron Gate Dam, along the 18-river mile stretch of the Middle Klamath River between RM 193 and 174 (i.e., from Iron Gate Dam to Humbug Creek) (USBR 2012b). Changes in the extent of the floodplain inundation area could affect potential historic-period cultural resources currently located within the FEMA 100-year floodplain (P-47-00522 [Empire Quartz Mine], P-47-00536 [Klamathon Townsite and Limber Mill], P-47-003937 [Rock Wall], P-47-004212 [Bridge], and P-47-004427 [artifact scatters]) which could result in a significant impact to historic-period cultural resources.

As discussed in Potential Impact 3.12-11, the KRRC is developing a Historic Properties Management Plan and an IDP to identify historic properties and include measures to implement before and during drawdown and dam removal activities to protect historic, cultural, and tribal resources. Implementation of the Historic Properties Management Plan and Mitigation Measure TCR-3 (IDP) may reduce impacts to resources identified in the 18-river mile stretch below Iron Gate Dam but given their proximity to Iron Gate Dam and their future inclusion in the altered 100-year floodplain following completion of the Proposed Project, impacts would remain significant and unavoidable.

As implementation of the Proposed Project is not anticipated to result in any other changes to the FEMA 100-year floodplain, or result in drawdown flows above historically recorded flows, potential impacts to historic-period cultural resources along other portions of the Klamath River would result in no significant impact.

Significance

Significant and unavoidable with mitigation for Middle Klamath River from Iron Gate Dam (RM 193) to Humbug Creek (RM 174)

No significant impact for Hydroelectric Reach excluding Iron Gate Dam, Middle Klamath River downstream of Humbug Creek, Lower Klamath River, Klamath River Estuary

Potential Impact 3.12-15 Project activities associated with removal of Iron Gate, Copco No. 1, and Copco No. 2 dams could result in physical disturbance to historic-period cultural resources from blasting or other removal techniques.

As described in Potential Impact 3.12-4, blasting and other dam removal techniques could cause significant adverse impacts to historic-period cultural resources located in the immediate vicinity[99] of Iron Gate, Copco No.1 and

[99] For the purposes of this analysis, “immediate vicinity” is defined as within 0.25 miles of Copco No. 1, Copco No. 2, and Iron Gate dams.

Copco No. 2 dams. The direct physical disturbance associated with blasting and other removal techniques could significantly impact historic-period archaeological resources that directly overlap with the blasting locations.

Though no data has identified historic-period cultural resources in the immediate vicinity of Iron Gate, Copco No. 1, and Copco No. 2 dams, but given the use of lands surrounding Proposed Project dams prior to construction of the Lower Klamath Project, this potential impact analysis assumes that historic-period archeological resources may be present in the immediate vicinity. For historic-period cultural resources that may be present in the immediate vicinity, impacts to these resources associated with dam removal would be significant and unavoidable.

As discussed in Potential Impact 3.12-11, the KRRC is developing a Historic Properties Management Plan and an IDP to identify historic properties and include measures to implement before and during drawdown and dam removal activities to protect historic, cultural, and tribal resources. Implementation of the Historic Properties Management Plan and Mitigation Measure TCR-3 (IDP) may reduce impacts to resources in the immediate vicinity of Iron Gate, Copco No. 1, and Copco No. 2 dams, but given construction activities and their potential for impacts to potential historic-period cultural resources, impacts would remain significant and unavoidable.

Significance
Significant and unavoidable with mitigation

Potential Impact 3.12-16 Ground disturbance associated with reservoir restoration, recreation site removal and/or development, and disposal site restoration could physically disturb historic-period cultural resources. Additionally, ongoing road and recreation site maintenance may have the potential to disturb known historic-period cultural resources.
As discussed in Potential Impact 3.12-5, the Proposed Project includes a Reservoir Area Management Plan that includes restoration activities that would occur both within the reservoir footprint and in upland areas (i.e., disposal, staging, and hydropower infrastructure demolition areas, access roads, former recreational areas) within the Area of Analysis *Subarea 1* (Figure 3.12-2). Historic-period archaeological resources are located within the footprints of Lower Klamath Project reservoirs.

Ground-disturbing activities associated with ongoing road, restoration, and recreation site maintenance within the Area of Analysis *Subarea 1* (Figure 3.12-2) include grading and excavating, which may result in material impairment due to physical demolition, destruction, relocation, or alteration of historic-period cultural resources located in both upland and reservoir footprint locations resulting in a significant impact.

However, as discussed in Potential Impact 3.12-11, the KRRC is developing a Historic Properties Management Plan, LVPP, and IDP to identify historic properties and include measures to implement before and during drawdown and dam removal activities to protect historic, cultural, and tribal resources. Implementation of the Historic Properties Management Plan, Mitigation Measure TCR-2 (LVPP), and Mitigation Measure TCR-3 (IDP) would reduce significant post-dam removal restoration impacts considerably, and, for many resources is expected to avoid impacts completely, through the design and implementation of construction plans or on-the-ground modifications to Proposed Project implementation. For impacts that it is not feasible to completely avoid, the impacts may be reduced to a less than significant level with implementation of the Historic Properties Management Plan, Mitigation Measure TCR-2 (LVPP), and Mitigation Measure TCR-3 (IDP).

Overseeing development and implementation of the Historic Properties Management Plan does not fall within the scope of the State Water Board's water quality certification authority. While the KRRC has initiated a process through the Cultural Resources Working Group and FERC to develop the Historic Properties Management Plan and a Programmatic Agreement that will be finalized and implemented, at this time the Historic Properties Management Plan and the Programmatic Agreement are not finalized and the State Water Board cannot require their implementation. While the State Water Board anticipates that implementation of the Historic Properties Management Plan and the Programmatic Agreement, including any modifications developed through the FERC process that provide the same or better level of protection for historic-period cultural resources, would reduce impacts to less than significant, because the State Water Board cannot ensure implementation of the Historic Properties Management Plan and the Programmatic Agreement, it is analyzing the impact in this Draft EIR as significant and unavoidable.

Significance
Significant and unavoidable impact with mitigation

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3.15 Agriculture and Forestry Resources

3.15.2 Environmental Setting

3.15.2.1 Important Farmland

Volume I Section 3.15.2.1 Agriculture and Forestry Resources – Environmental Setting – Important Farmland, new Table 3.15-1-A on page 3-890:

Table 3.15-1-A. Summary of Farmland Classification within the Area of Analysis.

Farmland Classification	Acreage in the Area of Analysis	Percentage of the Area of Analysis
Farmland of local importance	821	7.4
Farmland of statewide importance	22	0.2
Grazing land	7,014	62.9
Other land	1,355	12.2
Urban or built-up	41	0.4
Water	1,892	17.0
Total	11,145	100*

*Total exceeds 100 percent due to rounding.

Volume I Section 3.15.2.1 Agriculture and Forestry Resources – Environmental Setting – Important Farmland, paragraphs 2 and 3 on page 3-890:

Most of the land in the Area of Analysis is classified by the DOC as Grazing Land~~, with a small area of Unique Farmland located approximately two miles south of Copco No. 1 Reservoir~~ (Figure 3.15-~~1~~2).

Parcels zoned by Siskiyou County for Agriculture-Grazing are located within the Area of Analysis to the north and south of Copco No. 1 Reservoir (Figure 3.14-1). There are a number of parcels located immediately upstream of Copco No. 1 Reservoir AOA boundary that are used primarily for grazing and hay production. The DOC (2016c) identified these lands as Prime Farmland or Farmland of Statewide Importance (Figure 3.15-~~1~~2). The pastures/fields on these properties are flood-irrigated via direct diversions from the free-flowing Klamath River upstream of Copco No. 1 Reservoir. There are a few agriculture parcels with grazing land located between 1.2 and 3 miles north of Copco No. 1 Reservoir (Figure 3.15-~~1~~2).

Volume I Section 3.15.2.1 Agriculture and Forestry Resources – Environmental Setting – Important Farmland, Figure 3.15-2 Farmland classification along the Klamath River from Interstate 5 to the Oregon-California state line (Adapted from DOC 2016c) on page 3-893:

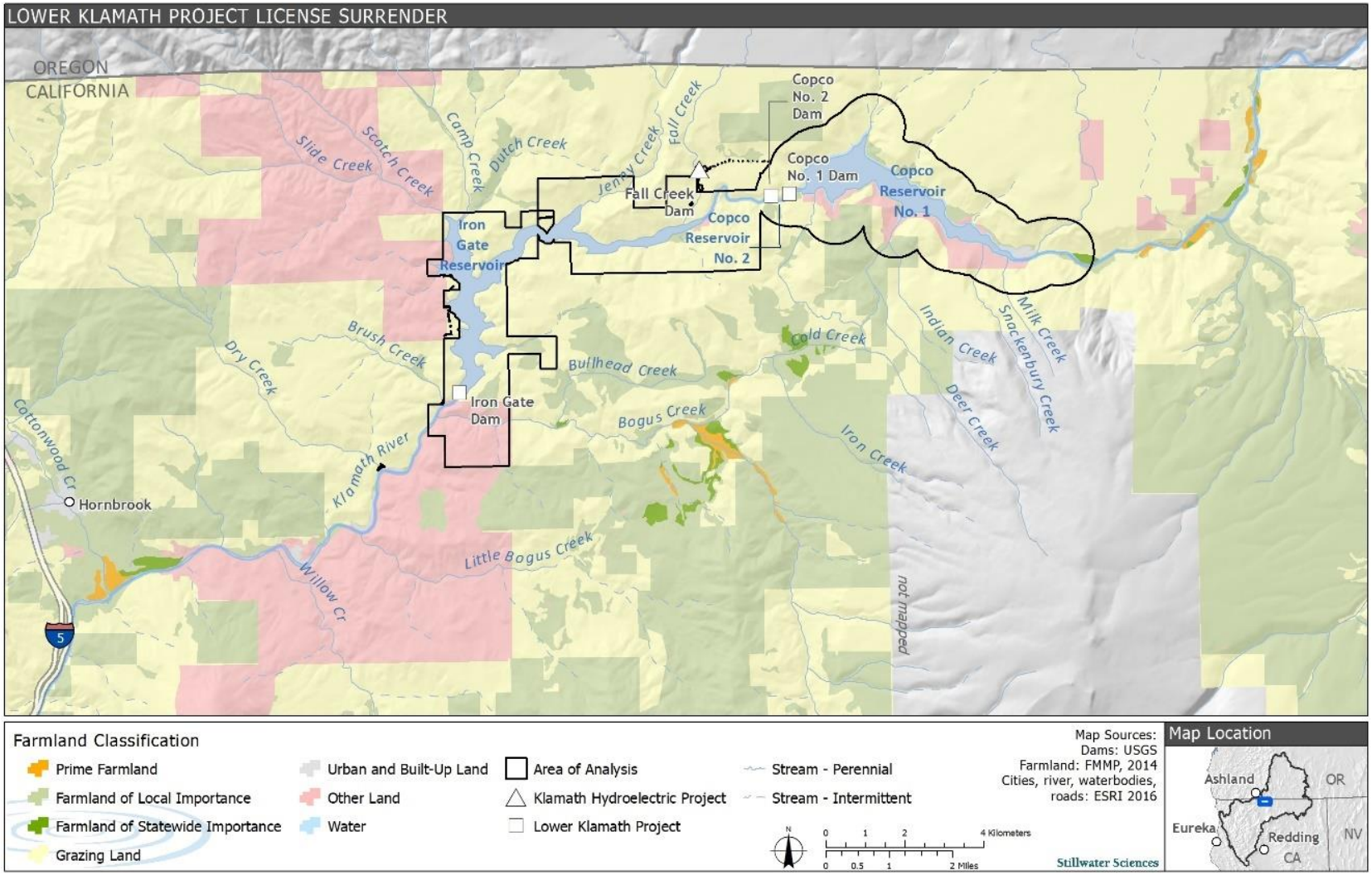

Figure 3.15-2. Farmland Classification along the Klamath River from Interstate 5 to the Oregon-California State Line (Adapted from DOC 2016c).

Volume I Section 3.15.2.4 Agriculture and Forestry Resources – Environmental Setting – Forestry Resources, paragraph 5 and Table 3.15-2 on pages 3-894 through 3-895:

PacifiCorp (2004) identified and mapped a variety of land cover types from the Link River Dam to the Shasta River. In addition, vegetation datasets are available through CALVEG (Classification and Assessment with Landsat of Visible Ecological Groupings) datasets available through the California Land Cover Mapping & Monitoring Program (USDA Forest Service 2017a) and data from USFWS (2017). These datasets were utilized to create the vegetation maps presented in Appendix G: *Vegetation Communities and Habitat Types* and provide summary acreages described in Table 3.5-1. The upland tree acreage within the Area of Analysis ~~between the Oregon-California state line and Iron Gate Dam and extending 0.25 miles on either side of the Klamath River~~ is presented below in Table 3.15-2. See Section 3.5.2.1 *Vegetation Communities* for a description of the vegetation types within the Area of Analysis.

Table 3.15-2. Upland tree habitats within the Area of Analysis ~~and mapped between the Oregon-California state line and Iron Gate Dam~~.

Upland Tree Habitats	Acres	~~Description, Dominant Species, and Location~~
Montane hardwood oak	2,175 ~~813~~	~~Moderately open tree canopy, moderately dense shrub layer, moderately dense herbaceous layer. Yellow starthistle and medusahead occur in about 25 percent of stands in the project vicinity. Most abundant around Copco No. 1 Reservoir.~~
Montane hardwood oak-conifer	2,831 ~~2,656~~	~~Dense tree cover, sparse shrub layer, moderately open herbaceous layer. Most abundant along the J.C. Boyle Peaking and Bypass reaches, at Copco No. 1 Reservoir, at Fall Creek, and along the Copco No. 2 bypassed reach.~~
Ponderosa pine	347 ~~68~~	~~Moderate canopy cover, relatively sparse shrub cover, moderately open herbaceous layer.~~
Juniper	702 ~~457~~	~~Open canopy, shrub layer varies from sparse to dense, herbaceous layer ranges from sparse to dense.~~

Upland Tree Habitats	Acres	~~Description, Dominant Species, and Location~~
Klamath ~~M~~mixed conifer	17 ~~9~~	~~Dense tree cover often is two-layered, open shrub layer, moderately sparse herbaceous layer.~~
Sierran mixed conifer	26	
Lodgepole pine	2	
Eastside pine	17	
Aspen	2	
Total of all upland tree habitats	6,119 ~~5,003~~	

Volume I Section 3.15.3 Agriculture and Forestry Resources – Significance Criteria, new paragraph 1 on page 3-896:

Substantial conversion is defined as the unnecessary and irreversible conversion of farmland to nonagricultural uses. Substantial loss is defined as the unnecessary and irreversible loss of forestland.

3.15.6 References

Volume I Section 3.15.6 Agriculture and Forestry Resources – References, pages 3-901 and 3-902, includes the following revisions:

USDA FOREST Service. 2017a. Vegetation Classification and Mapping. CALVEG Mapping Zones. Website. Available at: https://www.fs.usda.gov/detail/r5/landmanagement/resourcemanagement/?cid=stelprdb5347192 [Accessed March 2020].

USFWS. 2017b. Klamath EIR Scoping, CA only. IPaC trust resource report. Prepared by USFWS, Sacramento, California.

Other references cited as part of text included in the Section 3.15 list of revisions:

DOC. 2016c. Siskiyou County Important Farmland map. ftp://ftp.consrv.ca.gov/pub/dlrp/FMMP/pdf/2014/sis14.pdf [Accessed 12 May 2017].

PacifiCorp. 2004. Terrestrial Resources Final Technical Report. Klamath Hydroelectric Project (FERC Project No. 2082). Portland, Oregon.

3.16 Population and Housing

3.16.1 Area of Analysis

Volume I Section 3.16.1 Population and Housing – Area of Analysis, paragraph 3 on page 3-903:

The Area of Analysis for population and housing extends beyond the Project Boundary to encompass the following urban and rural communities in California: the community of Hornbrook, the City of Yreka, and the residential rural areas near Copco No.1, Copco No. 2, and Iron Gate reservoirs. The Area of Analysis includes communities with the potential to house workers migrating into the area for Proposed Project construction activities (see also Section 3.16.4 *Significance Criteria*). The Area of Analysis also includes the area where two residences downstream of Iron Gate Dam are noted to be affected by change in flood elevations (FEMA 100-year floodplain) as well as 34 habitable structures that are already affected by these flood elevations. Effects of slope failure along the rim of Copco No. 1 Reservoir from lowering of reservoir water levels that could affect up to eight habitable structures are analyzed in more detail in Section 3.11.5 *Geology, Soils, and Mineral Resources,* where it is determined that Mitigation Measure GEO-1 would reduce the impact to no significant impact with mitigation for Copco 1 No. Reservoir.

3.16.2 Environmental Setting

Volume I Section 3.16.2 Population and Housing – Environmental Setting, paragraph 6 on page 3-903:

As noted above, 36 residences downstream of Iron Gate Dam are affected by change in the FEMA 100-year floodplain elevations. The impacts to these residences are analyzed in Section 3.6 *Flood Hydrology*. An additional eight units could be affected by slope failure adjacent to Copco No. 1 Reservoir. Since these residences represent only ~~0.15~~ 0.18 percent of the total County housing stock, they are not considered a substantial loss and are not further addressed in the Population and Housing section.

3.17 Public Services

Volume I Section 3.17.5 Public Services – Potential Impacts and Mitigation Potential Impact 3.17-1, paragraph 2 on page 3-914 and paragraph 1 on page 3-915:

Mitigation Measure HZ-1 and ~~Recommended~~ Mitigation Measure TR-1 would reduce the potential impacts related to construction activities since these measures require that the KRRC and its contractor(s) for the Proposed Project submit the additional documentation/details included in the final Emergency Response Plan, Fire Management Plan, Traffic Management Plan, and a Hazardous Materials Management Plan, and they work with applicable agencies

prior to the start of construction. Implementation of these two measures would reduce the potential for a short-term increase in personal and public health and safety risks due to the Proposed Project as related to emergency response services. There would be no long-term impacts due to the Proposed Project construction-related activities since the construction would be completed in the short term.

Most of the roads within the Area of Analysis are currently owned or managed by PacifiCorp (Section 3.22.2.3 *Road Conditions*). PacifiCorp would continue to own and manage the roads contained within Parcel A and KRRC would own and manage the roads contained in Parcel B (see Figure 3.14-4). Section 3.21 *Hazards and Hazardous Materials* discusses the transport of hazardous materials, emergency, and wildfire potential and includes Mitigation Measure HZ-1 to address potential impacts to emergency response under the Proposed Project. As discussed in Section 3.22 *Traffic and Transportation*, the Proposed Project also includes an Emergency Response Plan. ~~Recommended~~ Mitigation Measure TR-1 includes coordination between the Traffic Management Plan and Emergency Response Plan and additional detail necessary to reduce impacts. ~~Overseeing development and implementation of the final Traffic Management Plan and final Emergency Response Plan does not fall within the scope of the State Water Board's water quality certification authority. While the KRRC has stated its intention to reach enforceable good citizen agreements that will be finalized and implemented, at this time the Traffic Management Plan and Emergency Response Plan are not finalized and the State Water Board cannot require their implementation. Accordingly, t~~The State Water Board anticipates that implementation of the final Traffic Management Plan and Emergency Response Plan, including the additional details in ~~Recommended~~ Mitigation Measure TR-1 and any modifications developed through the FERC process that provide the same or better level of protection for transportation and traffic would reduce impacts to a less than significant level. ~~However, because the State Water Board cannot ensure implementation of the final Traffic Management Plan and final Emergency Response Plan, it has determined the impact in this Draft EIR to be significant and unavoidable.~~

Significance
~~*Significant and unavoidable*~~ *No significant impact with mitigation*

Volume I Section 3.17.5 Public Services – Potential Impacts and Mitigation Potential Impact 3.17-2, paragraph 4 on page 3-918:

However, where suitable replacement water sources cannot be identified in close proximity to a fire in a location for which the reservoirs would otherwise have been the nearest water source, long-term impacts to the public's risk of loss from wildfires remain significant and unavoidable. This impact is further addressed under Potential Impact 3.21-8, as revised in Volume III Section 3.21.5 *Hazards and Hazardous Materials – Potential Impacts and Mitigation*.

3.18 Utilities and Service Systems

Volume I Section 3.18 Utilities and Service Systems, paragraph 1 on page 3-925:

This section describes the environmental setting for utilities and service systems, including wastewater, stormwater, and solid waste, as well as potential environmental impacts to utilities and service systems due to implementation of the Proposed Project.

3.18.5 Potential Impacts and Mitigation

Volume I Section 3.18.5 Utilities and Service Systems – Potential Impacts and Mitigation – Potential Impact 3.18-1 The Proposed Project could result in the construction of new wastewater treatment facilities, or expansion of existing facilities, due to inadequate capacity to serve the Proposed Project's anticipated demand, and the construction of such facilities could cause significant environmental impacts, page 3-928, paragraph 4:

Potential Impact 3.18-1 The Proposed Project could result in the construction of new wastewater treatment facilities, or expansion of existing facilities, due to inadequate capacity to serve the Proposed Project's anticipated demand, and/or where the construction of such facilities could cause significant environmental impacts.

3.19 Aesthetics

This section identifies and describes potential impacts to scenic resources of the Klamath River and adjacent landscape due to implementation of the Proposed Project.

Several comments were received during the NOP public scoping process relating to potential dam removal impacts on aesthetics, including the likelihood of adverse impacts due to the loss of scenic reservoir views. Several comments expressed concern that the reservoir footprints would be left as bare slopes with only mud and debris for an extended period of time prior to restoration, and that the loss of reservoir views after implementing the Proposed Project would adversely affect the viability of residential communities that currently surround Copco No. 1 and Iron Gate reservoirs. Individual public scoping comments are presented in Volume II Appendix A.

After circulation of the Draft EIR, numerous additional comments were received regarding aesthetics (see Volume III), and changes to the section in response to those comments are flagged in the comment responses and then printed in this Final EIR section. None of the changes result in significant new information in

the EIR under the meaning of CEQA Guidelines, section 15088.5, subdivision (a):

> New information added to an EIR is not 'significant' unless the EIR is changed in a way that deprives the public of a meaningful opportunity to comment upon a substantial adverse environmental effect of the project or a feasible way to mitigate or avoid such an effect (including a feasible project alternative) that the project's proponents have declined to implement.

However, the changes were numerous enough that reprinting the section rather than simply including a list of revisions was warranted to improve clarity and readability of the document.

3.19.1 Area of Analysis

Removal of the Lower Klamath Project could affect aspects of scenic quality throughout the Klamath River in California, including water clarity, fish viewing opportunities, and riparian and channel characteristics of the river downstream of the dams. However, potential aesthetic effects would decrease with distance downstream from the Lower Klamath Project as the river is affected more by tributary inputs and less by the dams and associated facilities. Therefore, the primary Area of Analysis for aesthetics is within the viewshed of the Lower Klamath Project reservoirs, which includes the proposed Limits of Work in California (i.e., Copco No. 1, Copco No. 2, and Iron Gate dams, reservoirs, and associated facilities, and the areas identified as construction/demolition areas and staging areas) plus a buffer to the ridgeline surrounding the reservoirs. The secondary Area of Analysis for aesthetics includes those areas within view of the Klamath River downstream from Iron Gate Dam to the confluence with the Shasta River (RM 179.5), as well as the portion of the Klamath River extending upstream from Copco No. 1 Reservoir to the Oregon-California border, because these river reaches may be affected by removal of the upstream dams.

The Primary and Secondary Areas of Analysis were generated in Geographic Information Systems (GIS) to approximate the viewshed visible from the Limits of Work and reaches of the Klamath River from the Oregon-California state line to the confluence with the Shasta River, respectively. Where the Primary and Secondary Areas of Analysis overlapped (e.g., at the upstream end of Copco No. 1 Reservoir, see Figure 3.19-1), precedence was given to the primary Area of Analysis. The viewshed was digitized to follow ridgelines of steep slopes visible using a 10-meter digital elevation model (DEM) hillshade and USGS topographic maps. The area visible from the ground was confirmed using the terrain and ground-level view tools in Google Earth©. The viewshed only includes land that is anticipated to be continuously visible from the Limits of Work or the Klamath River. For example, when ridgelines or peaks appeared to be visible in the distance, but the land between the Limits of Work or Klamath River did not appear to be visible, those areas were not included. The viewshed is meant to be all- encompassing of views from anywhere within the Limits of Work, and

viewshed limits are approximate and generalized. The primary Area of Analysis was expanded into Oregon where the viewshed from the Limits of Work in California extended beyond the state line, but it was truncated at the state line along the Klamath River based on the assumption that an on-the-ground viewer would only be looking downstream toward California for the assessment of potential aesthetics impacts in California.

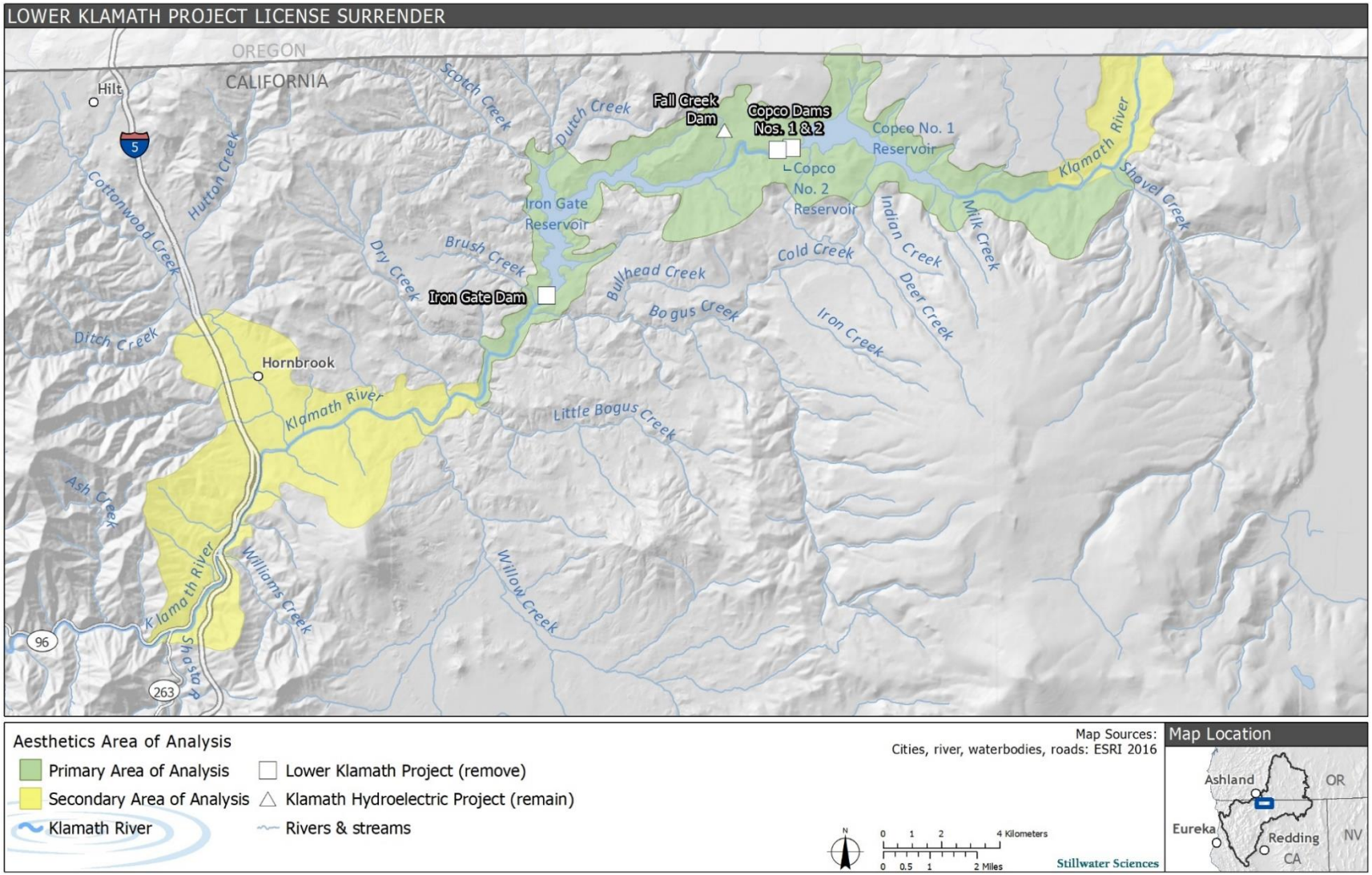

Figure 3.19-1. Aesthetics Primary and Secondary Area of Analysis.

3.19.2 Environmental Setting

The Klamath Basin as a whole contains widely varied scenic resources, including wetlands, uplands, rangelands, National Wildlife Refuges, farmlands, timberlands, and small urbanized areas in Yreka and along the Interstate 5 corridor. The Klamath Basin also supports vegetation communities including, but not limited to, montane hardwood and annual grasslands, as described in Section 3.5.2 *Environmental Setting*. Sightseeing opportunities to enjoy the scenic resources are widely available in the Klamath Basin generally, and more specifically within the primary and secondary Area of Analysis for aesthetics. Section 3.20 *Recreation* lists recreation resources, including Wild and Scenic River (WSR) segments, and locations in the surrounding region that offer wildlife viewing as well as opportunities for sightseeing, leisure drives, photography, and other forms of recreation.

This section describes the environmental setting for scenic resources in the primary and secondary Area of Analysis.

3.19.2.1 PacifiCorp Analysis and Bureau of Land Management Methodology

PacifiCorp conducted a detailed visual evaluation of the project vicinity (FERC 2007) in 2002 and 2003 and documented it in the Land Use, Visual, and Aesthetic Resources Final Technical Report (PacifiCorp 2004a). This evaluation involved identifying and photographing key observation points during different seasons and documenting views of the reservoirs at different water levels. Photographs taken from these viewpoints portray typical scenic/landscape character along the Klamath River, including such features as canyon walls, channel configuration, water clarity, and bank and riparian appearance. Additional photographs were taken from selected locations in October 2010 (CDM 2010) and were compared to the 2003 photographs to verify the continued existence of earlier-documented conditions (Appendix R).

For their visual analysis, PacifiCorp used the Bureau of Land Management's (BLM) Visual Resource Management (VRM) process. Within their visual resource study area, PacifiCorp evaluated the way in which project features and operations fit into the overall visual landscape using the following three-step process: (1) identify the VRM classifications applicable within the study area; (2) define viewpoints from which Lower Klamath Project dams and associated facilities and operations could be seen; and (3) evaluate whether project facilities and operations, when seen from the viewpoints, conform to the objectives of the management classification in which they are found (PacifiCorp 2004a). The VRM process is described in detail below.

The following discussion describes the scenic resources found in the primary and secondary Area of Analysis for aesthetic resources. PacifiCorp (2004a) identified multiple key observation points associated with the Lower Klamath Project. The

following points are located within the aesthetics primary and secondary Area of Analysis: two in the Hell's Corner Reach (HC7 and HC-8); seven in the Copco No. 1 Reservoir area (C1 to C7); twelve in the area of Iron Gate Reservoir (IG1 to IG12); five in the Fall Creek area (FC1 to FC5); and, three downstream of Iron Gate Dam (BG1 to BG3) (Figure 3.19-2, Table 3.19-1).

These key observation points are not intended to be comprehensive but were selected to represent typical views (including scenic overlooks) for members of the public from riverside and/or reservoir communities and residences, recreational access sites, campgrounds, as well as scenic byways, and state highways 96, 263, and US Interstate 5.

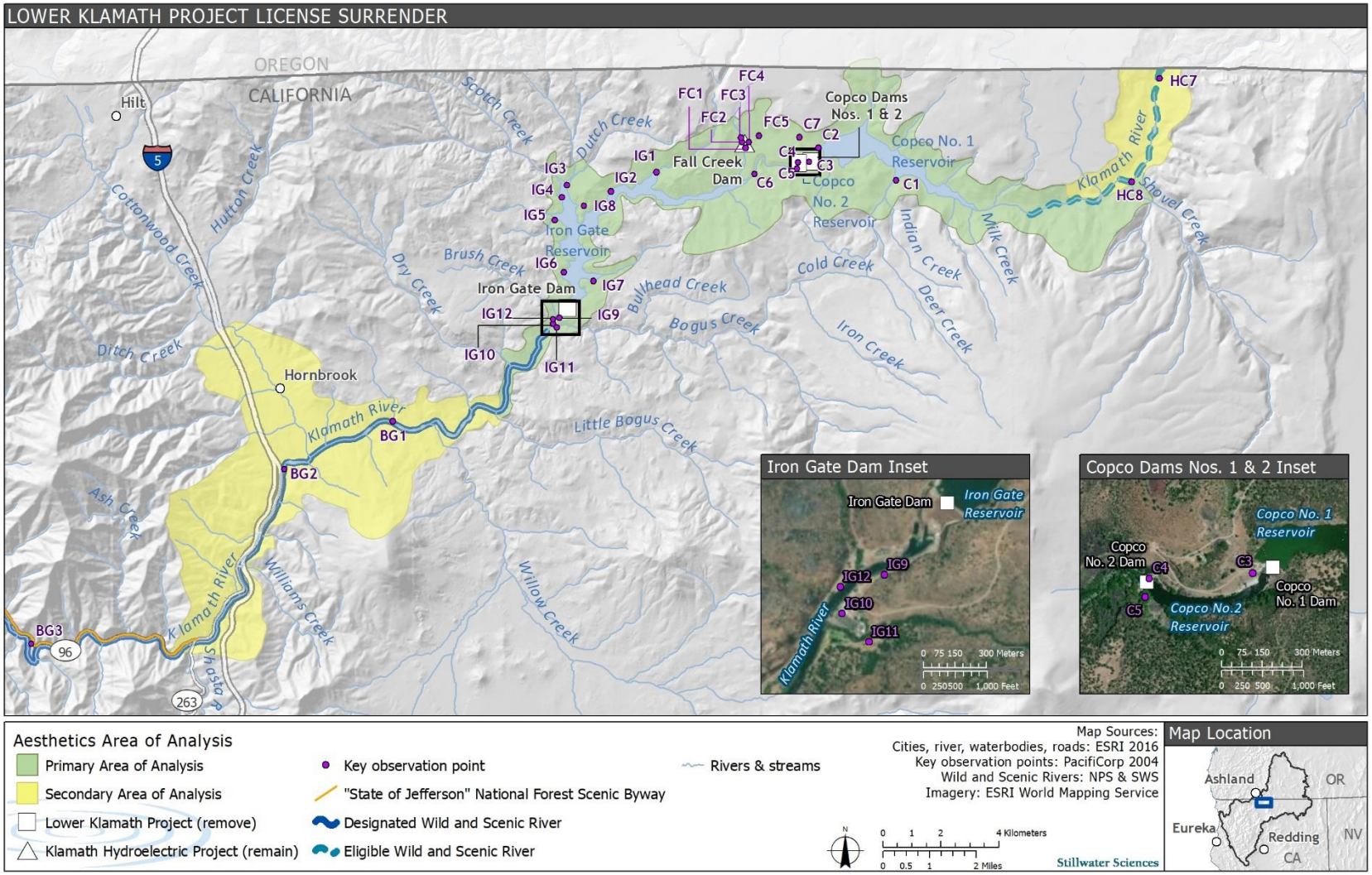

Figure 3.19-2. Locations of Key Observation Points Identified in PacifiCorp (2004a) Within the Aesthetics Primary and Secondary Area of Analysis.

Table 3.19-1. Key Observation Points in the Aesthetics Primary and Secondary Area of Analysis (locations from PacifiCorp 2004a).

Key Observation Point	Description
HC7	Klamath River from Stateline Takeout
HC8	Klamath River from Fishing Access #5 (Ager-Beswick Road)
C1	Copco Reservoir from Mallard Cove Recreation Area
C2	Copco Reservoir from Copco Cove Recreation Area
C3	Copco No. 1 Dam and Powerhouse
C4	Copco No. 2 Dam
C5	Copco No. 2 Forebay from Copco No. 2 Dam
C6	Copco No. 2 Powerhouse
C7	Copco Transmission Line
FC1	Fall Creek Recreation Area
FC2	Fall Creek Fish Hatchery
FC3	Fall Creek from Hatchery Trail
FC4	Fall Creek Powerhouse
FC5	Fall Creek Transmission Line
IG1	Jenny Creek from Jenny Creek Recreation Area
IG2	Iron Gate Reservoir from Wanaka Springs Recreation Area
IG3	Iron Gate Reservoir from Camp Creek Recreation Area
IG4	Iron Gate Reservoir from Juniper Point Recreation Area
IG5	Iron Gate Reservoir from Mirror Cove Recreation Area
IG6	Iron Gate Reservoir from Overlook Point Recreation Area
IG7	Iron Gate Reservoir from Long Gulch
IG8	Iron Gate Transmission Line
IG9	Iron Gate Dam and Powerhouse
IG10	Iron Gate Fish Hatchery and Fish Ladder
IG11	Bogus Creek from Viewpoint at Iron Gate Hatchery
IG12	Klamath River from Iron Gate Hatchery River Access
BG1	Klamath River from Access Below Klamathon Bridge
BG2	Klamath River from Collier Rest Area Overlook/Interpretive Area
BG3	Klamath River from Tree of Heaven River Access Boat Ramp

In response to the Federal Land Policy and Management Act (43 U.S.C. 35, §§ 1701 et seq.) and subsequent agency-specific regulations, federal land management agencies have developed systems specifically designed to inventory, evaluate and manage for scenic (visual) resources on public lands. As a result, the BLM developed the VRM system. The objective of BLM's VRM system is to manage public lands in a manner which will project the quality of the scenic (visual) values of those lands (BLM, 1984).

All BLM lands are assigned to one of four VRM classes, ranging from Class I, which includes the highest value scenery and associated protections, to Class IV,

which reflects the lowest value scenery and associated protections. The VRM classes provide a valuation of existing visual resources and protection standards for determining Resource Management Plan conformance during project planning.

The Lower Klamath Project dams and associated facilities fall under the BLM Redding District Resource Management Plan. All of the facilities except three [all associated with J.C. Boyle in Oregon] are located in areas that have been designated as a Class III area by a Resource Management Plan or have been classified as a Class III area because the area has not been given a specific VRM class by BLM (PacifiCorp 2004a). When evaluating project impacts, the objective for Class III visual resources is to "partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape" (BLM 1984).

For the purposes of this document, the site-specific, project level inventory is limited to the primary and secondary aesthetics Area of Analysis and based upon a combination of original data from the 2004a PacifiCorp Technical Report and additional analysis from several key observation points. In addition to the aesthetic resources in the primary and secondary aesthetics Area of Analysis being considered Class III, USBR and CDFW conducted a baseline Visual Resource Inventory within the primary and secondary aesthetics Area of Analysis as part of the 2012 KHSA EIS/EIR, according to three components: scenic quality, visual sensitivity, and distance zones, as described below.

In terms of scenic quality, BLM's VRM methodology assigns public land a rating of A, B, or C (inherent scenic attractiveness), with A being the most distinctive and C being the most common, in terms of seven key factors including: color, water, vegetation, landform, influence of adjacent scenery, scarcity, and cultural modifications (BLM 1984). Based on review of the visual analysis completed for the 2012 EIS/EIR, all of the Proposed Project area would be contained within rating A landscapes due to the following key factors:

- **Color** – Some intensity or variety in colors and contrast of the soil, rock and vegetation, but not a dominant scenic element
- **Water** – Water flowing or still, dominant in the landscape when viewed from most key observation points, but not always clear and clean appearing
- **Vegetation** – A variety of vegetative types as expressed in interesting forms, textures, and patterns
- **Landform** – Steep canyons, some interesting erosional patterns or variety in size and shape of landforms; or detail features which are interesting though not dominant or exceptional

- **Influence of adjacent scenery** – Adjacent scenery moderately enhances overall visual quality
- **Scarcity** – Distinctive, though somewhat similar to others within the region
- **Cultural modifications** – Some modifications add favorably to visual variety while other add little or no visual variety or may be discordant

In terms of visual sensitivity, BLM's VRM methodology rates landscapes as either High, Moderate, or Low by analyzing the various indicators of public concern, including: type of users, amount of use, public interest, adjacent land uses, specially designated areas, and other factors. Based on review of the visual quality analysis completed for the 2012 EIS/EIR, all of the aesthetics primary and secondary Area of Analysis would be considered High visual sensitivity because: (1) recreational sightseers are highly sensitive to changes in visual quality; (2) public interest and controversy in the area has increased in response to Proposed Project activities; (3) portions of the primary and secondary Area of Analysis are within the viewshed of residential areas; and (4) much of the Klamath River has been designated under the National Wild and Scenic Rivers Act (WSRA).

In terms of distance zones, BLM's VRM methodology classifies public lands as either foreground-middleground, background, or seldom seen. Based on review of the visual quality analysis, all of the primary and secondary Area of Analysis would be located with the foreground-middleground distance zone due to the proximity of views from recreational access sites along the river, campgrounds, key observation points along scenic highways, riverside and/or reservoir communities and residences, rivers, or other viewing locations, which are less than three to five miles away.

Table 3.19-2. Visual Resource Inventory Matrix.

Special Areas		**Visual Sensitivity**						
		High			**Medium**			**Low**
		I	**I**	**I**	**I**	**I**	**I**	**I**
Scenic Quality	**A**	II	II	II	II	II	II	II
	B	II	III	III*	III	IV	IV	IV
				IV*				
	C	III	IV	IV	IV	IV	IV	IV
		f/m	**b**	**s/s**	**f/m**	**B**	**s/s**	**s/s**
		Distance Zones						

Source: BLM 2007, BLM 1984, KHSA 2012 EIS/EIR

Notes:

Highlighted cells indicate visual resource inventory determinations for the affected environment

* If adjacent area is Class III or lower then assign Class III, if higher then assign Class IV, where objectives for each class are listed below.

Class II Objective – to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.

Class III Objective – to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

Class IV Objective – to provide for management activities which require major modifications of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.

Key:

b: background
f/m: foreground/middleground
s/s: seldom seen

3.19.2.2 Wild and Scenic Rivers and Scenic Highways/Byways

Klamath River components are part of the National (and state) Wild and Scenic Rivers System because of their free-flowing condition and "outstandingly remarkable" values. According to the (Wild and Scenic Rivers Act (WSRA) (16 U.S.C. 1271 et. seq.), these outstandingly remarkable values include scenic, recreational, geologic, fish, wildlife historic, cultural or other similar characteristics. These values along designated wild and scenic reaches are protected by both the federal and state WSRA to various degrees, but all designated river segments must maintain at least a generally natural appearance along their waterways. The natural-appearing scenic quality within the more immediate and prominent portions of these rivers is also protected along these WSR segments by the WSRA.

The Klamath River beginning 3,600 feet downstream from Iron Gate Dam (Figure 3.19-2) and continuing 189 miles downstream to the Pacific Ocean is designated as a WSR. This WSR segment is recognized for its outstandingly remarkable fisheries. It is classified under the California WSRA as recreational (river segments that are readily accessible by road or railroad, and that may have some development along their shorelines, and may have been impounded or diverted in the past (PRC § 5093.53), with portions of the tributaries classified as scenic and wild.

Scenery within the California Klamath WSR is dominated by natural settings. Its water appearance, anadromous fish and riparian vegetation within a forested river canyon are the primary scenic aspects. Since its WSR designation in 1981, flow regimes have varied moderately in response to water resource competition, government mandated flow requirements and weather within the Klamath Basin. During summer months, fluctuations in the flow regime have typically been caused by water diversions (Van de Water et al. 2006). As described in Section 3.20 *Recreation*, reduced water clarity and discoloration resulting from seasonal algae blooms has impaired the scenic character and recreational opportunities of the Middle and Lower Klamath River (see also Section 3.2 *Water Quality* and Section 3.4 *Phytoplankton and Periphyton*).

In addition, in 1990, BLM found the 5.3-mile section of the Klamath River from the Oregon-California state line to Copco No. 1 Reservoir eligible and suitable for WSR designation (Figure 3.19-2). The river segment is free-flowing and possesses outstandingly remarkable scenic, recreational, fish, and wildlife values. This river segment is not a designated WSR and is not protected under the National WSRA and its Section 7(a) requirements. However, agencies are still required within their authorities, to protect this eligible river segment's free-flowing character, water quality, and outstandingly remarkable river values. This segment of the Klamath River is also listed on the Nationwide Rivers Inventory to ensure protection of its river values (NPS 2009).

There are three Scenic Byways located along the Klamath River and within the Klamath and Six Rivers National Forests. The "State of Jefferson" National Forest Scenic Byway is located primarily on California State Highway 96 (Highway 96) between Shasta River to Happy Camp (Figure 3.19-2), and the "Bigfoot" National Forest Scenic Byway is located on Highway 96 from Happy Camp to California State Highway 299 (Highway 299). There is also an "All American Road" as classified by the U.S. Department of Transportation's Federal Highway Administration—the Volcanic Legacy Scenic Byway—which goes from Lassen National Park in California and through the Proposed Project area via Highways 97, 140, and 62 on its way to Crater Lake National Park in Oregon. These byways provide excellent views for sightseers within the Klamath and Six Rivers National Forests and access to numerous other recreational activities (America's National Scenic Byways 2017). With the exception of a small portion of the "State of Jefferson" National Forest Scenic Byway, these byways are not within the primary or secondary Area of Analysis for aesthetic resources (Figure 3.19-2).

3.19.2.3 Klamath Watershed

Along the northernmost, eastern edge, upstream of the primary and secondary aesthetics Area of Analysis, the Klamath River borders remnants of central Oregon's Modoc Plateau province. The river flows through a broad, flat valley that gradually transitions to a narrow channel as it crosses the low, rolling ridges of the Cascade Mountains.

The Upper Klamath Basin begins at the headwaters of the Klamath River in south-central Oregon and extends downstream into north-central California. This area includes agricultural lands and the Upper Klamath Basin National Wildlife Refuge Complex, which comprises six wildlife refuges and contains the USBR Klamath Irrigation Project. Regionally, a variety of public lands contain notable scenic resources. Table 3.20-1 in Section 3.20.2.1 *Regional Recreation* lists locations within the aesthetics primary and secondary Area of Analysis and surrounding region that offer opportunities for wildlife viewing, sightseeing, leisure driving, photography, and other forms of recreation that benefit from scenic quality.

In the central section of the Upper Klamath Basin, starting upstream of J.C. Boyle Dam, the topography changes dramatically, dropping rapidly into the 1,000-foot-deep upper Klamath River Canyon. The ruggedness of the terrain exemplifies the surrounding landscape, where nearby mountain peaks often reach 5,000 feet in elevation. As the Klamath River passes through the Cascade Mountains, the upper Klamath River Canyon represents a transition from the desert landscape in the east to a mountainous landscape in the west. The steep-walled canyon is the predominant visual element in the region. As it flows through the deep gorge, the river changes from slack, slow-flowing water in the broad, flat valley to a torrent of cascading whitewater. Less than five miles downstream of J.C. Boyle Dam, the canyon and neighboring ridges gradually become flatter and wider as

the river flows southwesterly across the state line and into Copco No. 1 Reservoir. Here, along the Proposed Project's western edge, the topography surrounding Copco No. 1 and Iron Gate reservoirs is open and rolling.

3.19.2.4 Klamath River Key Observation Points

PacifiCorp (2004a) identified multiple key observation points associated with the Lower Klamath Project, where the following points are located within the aesthetic primary and secondary Area of Analysis: two in the Hell's Corner Reach (HC7 and HC-8); seven in the Copco No. 1 Reservoir area (C1 to C7); twelve in the area of Iron Gate Reservoir (IG1 to IG12); five in the Fall Creek area (FC1 to FC5); and, three downstream of Iron Gate Dam (BG1 to BG3) (Figure 3.19-2, Table 3.19-1). Many of the reaches have similar characteristics with the aesthetic differences between high flows and low flows varying depending on the individual physical features of each reach (e.g., during low flows, more rocks and vegetation are visible at the river edges than at high flows; in shallower areas, lower flows affect channel depth more greatly).

Figures 3.19-3 and 3.19-4 depict views of the Klamath River from two of the key observation points downstream of Iron Gate Dam (IG12 and BG3, respectively). Under the range of flows observed, river water continues to inundate the entire channel width. Higher flows exhibit deeper water depth and higher flow velocity. Views of the Klamath River, downstream of the Lower Klamath Project dams and associated facilities, show a free-flowing river with broad channel dimensions. As a result, exposed shoreline margins and riverbed deposits are exposed under a wider range of flow conditions than the upstream sections.

Views of the Klamath River, upstream of the Lower Klamath Project dams and associated facilities (Figures 3.19-5 and 3.19-6), show a free-flowing river with similar surface area dimensions over a range of flows due to the narrower channel. Only the shoreline margins are exposed at lower flows of approximately 350 cubic feet per second (cfs). During higher flow conditions ranging up toward 2,800 cfs, water extends into adjacent upland vegetation.

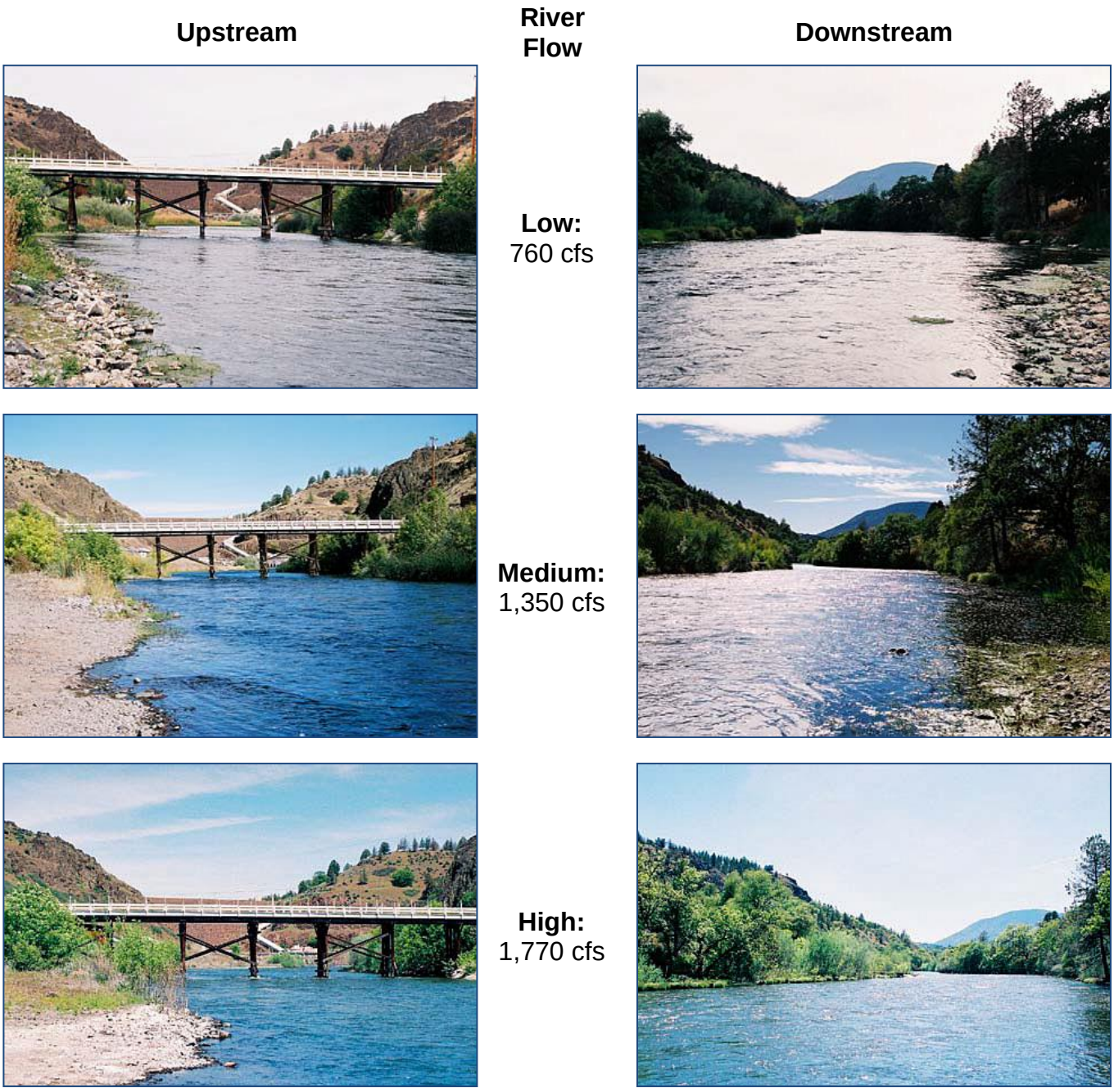

Figure 3.19-3. Views of Klamath River Downstream of Iron Gate Dam (IG12). Source: PacifiCorp 2004a.

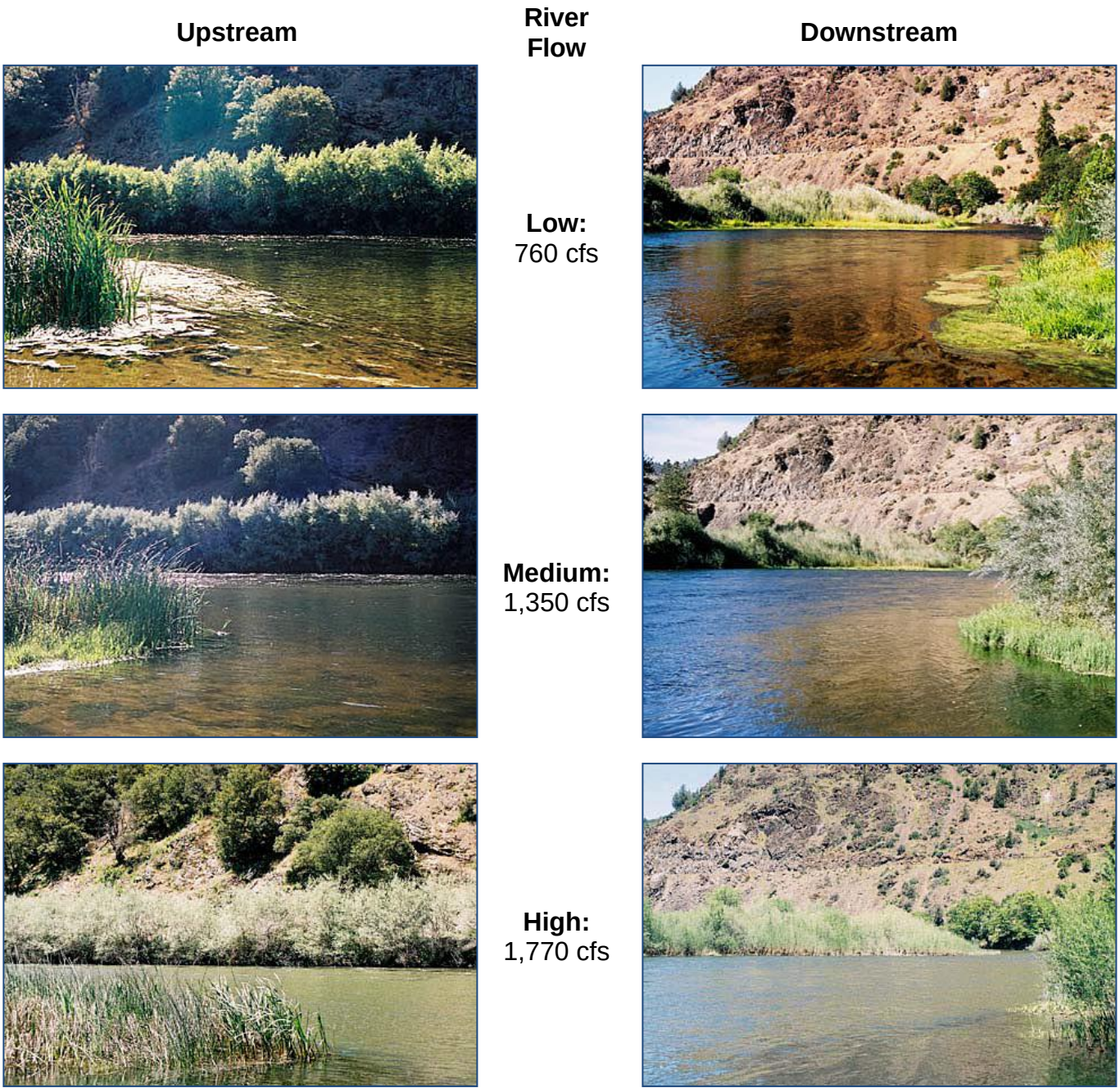

Figure 3.19-4. Views of Klamath River from Tree of Heaven River Access Boat Ramp (1.5 miles downstream of Iron Gate Dam) (BG3). Source: PacifiCorp 2004a.

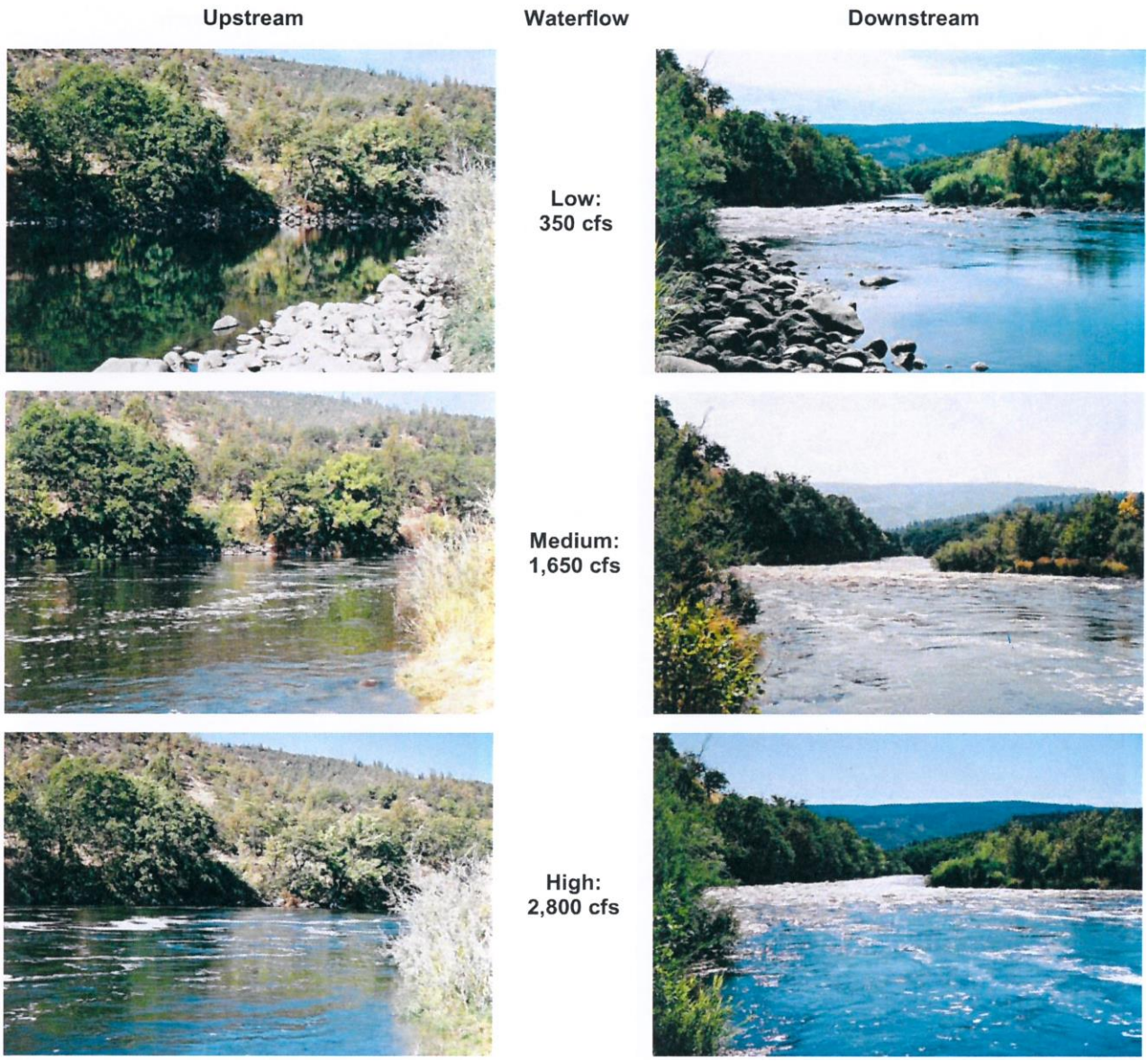

Figure 3.19-5. Views of Klamath River from Stateline Takeout (HC7). Source: PacifiCorp 2004a.

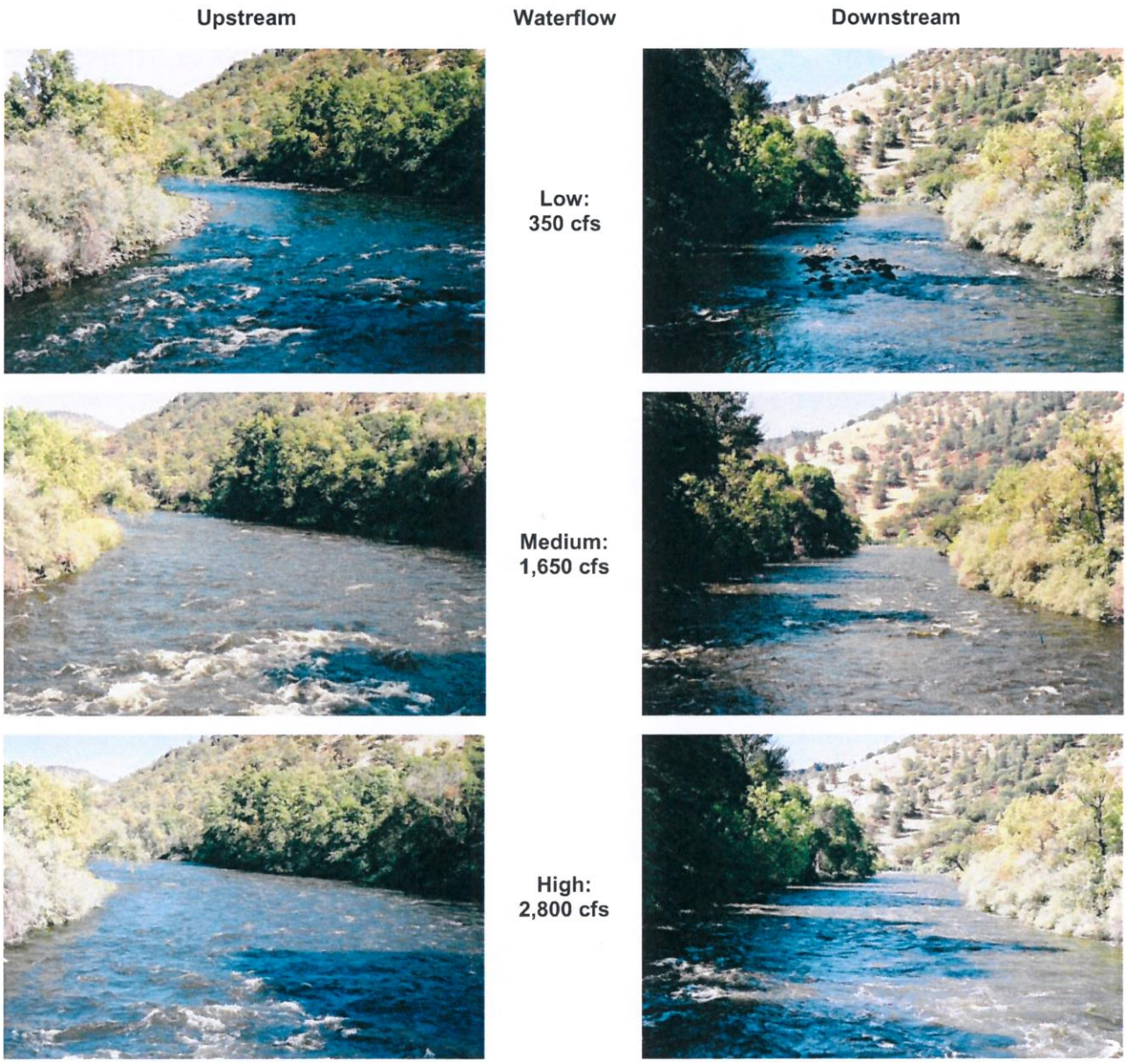

Figure 3.19-6. Views of Klamath River from Fishing Access #5 (Topsy Grade Road). Source: PacifiCorp 2004a.

3.19.2.5 PacifiCorp's Hydroelectric Project Facilities

Reservoirs

PacifiCorp (2004a) described the area landscape from nine key observation points in the vicinity of the reservoirs (C2 to C5, C7, IG9 to IG12). All reservoirs were viewed under high pool and low pool conditions. In general, the reported visual observations of the reservoirs indicated that under normal operating conditions, the three reservoirs share the visual characteristics of open expanses of relatively flat water. Also, as described in sections 3.2 *Water Quality* and 3.4

Phytoplankton and Periphyton, seasonal algae blooms occur in the reservoirs, typically peaking in late summer to early fall. During particularly intense algal blooms, floating algae mats and scums often appear and concentrate in protected areas or along the shoreline where they are not exposed to wind.

Because the water surface elevations of these reservoirs do not fluctuate substantially, the visual appearance of the landscape does not change considerably over the course of the year. When the water surface is drawn down, limited shoreline material is exposed. However, this limited exposure does not detract from the view shown.

Residences along the Copco No. 1 Reservoir shoreline, of which there are approximately 140, have unobstructed views of the reservoir water surface. The waterbody dominates their views and likely enhances the aesthetic quality of this landscape. Views on Iron Gate Reservoir are similar, however, there are no permanent residences located along this reservoir's shoreline. Viewers are limited to recreationists utilizing the local roads and recreational facilities.

Lower Klamath Project Hydroelectric Facilities in California

PacifiCorp documented the scenic characteristics of the Lower Klamath Project facilities within the aesthetics primary and secondary Area of Analysis at the following seven key observation points (alphanumeric designations refer to key observation point designations and accompanying photographs in the PacifiCorp [2004a] report):

- C3: Copco No. 1 Dam and Powerhouse
- C4: Copco No. 2 Dam
- C6: Copco No. 2 Powerhouse
- C7: Copco Transmission Line
- IG8: Iron Gate Transmission Line
- IG9: Iron Gate Dam and Powerhouse from Iron Gate Fish Hatchery
- IG10: Iron Gate Fish Hatchery and Fish Ladder

In the PacifiCorp (2004a) report, the views of the three facilities from these key observation points were characterized using the BLM VRM system. The report describes each of the three facilities in the context of the BLM VRM classification for the surrounding area (Class III). It should be noted that these assessments were done using one single photo from quite close to each facility, which magnifies its influence on the visual landscape. These observations may be summarized by facility as follows:

- **Copco No. 1 Facilities**—Copco No. 1 Dam and Powerhouse (C3) were not considered to be consistent with the VRM Class III objectives of the surrounding area. The size and prominence of these facilities were considered to dominate the view from the key observation point. However, because a view at such close proximity to the powerhouse is not generally available to the average viewer, the impact of dam and powerhouse on the

VRM Class III objectives were considered to be minimized. The Copco No. 1 transmission line was typically distant from the viewing points and would blend into the sky and not obstruct views of other parts of the landscape. Thus, the transmission line was considered to be consistent with VRM Class III objectives.

- **Copco No. 2 Facilities**—Copco No. 2 Powerhouse (C6) was not considered to be consistent with the VRM Class III objectives of the surrounding area because of its size and prominence the powerhouse dominates the view from the key observation point. Although the Copco No. 2 Dam is large, it has been designed with colors and lines that blend with the landscape, and when viewed in isolation, or from a longer distance, could therefore be considered consistent with VRM Class III objectives.
- **Iron Gate Facilities**—The Iron Gate Dam, Powerhouse, and transmission lines (IG8, IG9) were considered to be consistent with the VRM Class III objectives of the surrounding area in a detailed visual evaluation of the project vicinity as summarized in the Final EIS (2007) and documented in the *Land Use, Visual, and Aesthetic Resources Final Technical Report* (PacifiCorp 2004a). Although the dam and powerhouse are large, their colors and lines blend with the landscape. Similarly, the transmission line was typically distant from the viewing points and would blend into the sky and not obstruct views of other parts of the landscape. In instances where the support poles of the transmission lines were prominent, it was only for a short time while a viewer walks or drives by.

Figures 3.19-7 through 3.19-9 depict views of several project features located at Copco No. 1 and Iron Gate dams and associated facilities. The reservoir waterbodies are the dominant visual feature from both distant views and from shoreline locations.

Views of Copco No. 1 and Iron Gate dams are limited by topographic features that obstruct more distant views of these facilities. Views of Copco No. 1 Dam are limited to approximately 0.25 river miles downstream. Views are often blocked by local topography and the meandering course of the river. Views of Copco No. 2 Dam can also be limited because of local topography, the meandering course of the river, and vegetation. Copco No. 2 Dam can only be seen from a distance of approximately 500 feet due to these obstructions. Iron Gate Dam can be seen from a distance of approximately one mile at several residences located downstream of this facility. Views of the dam are partially obstructed by local topographic features.

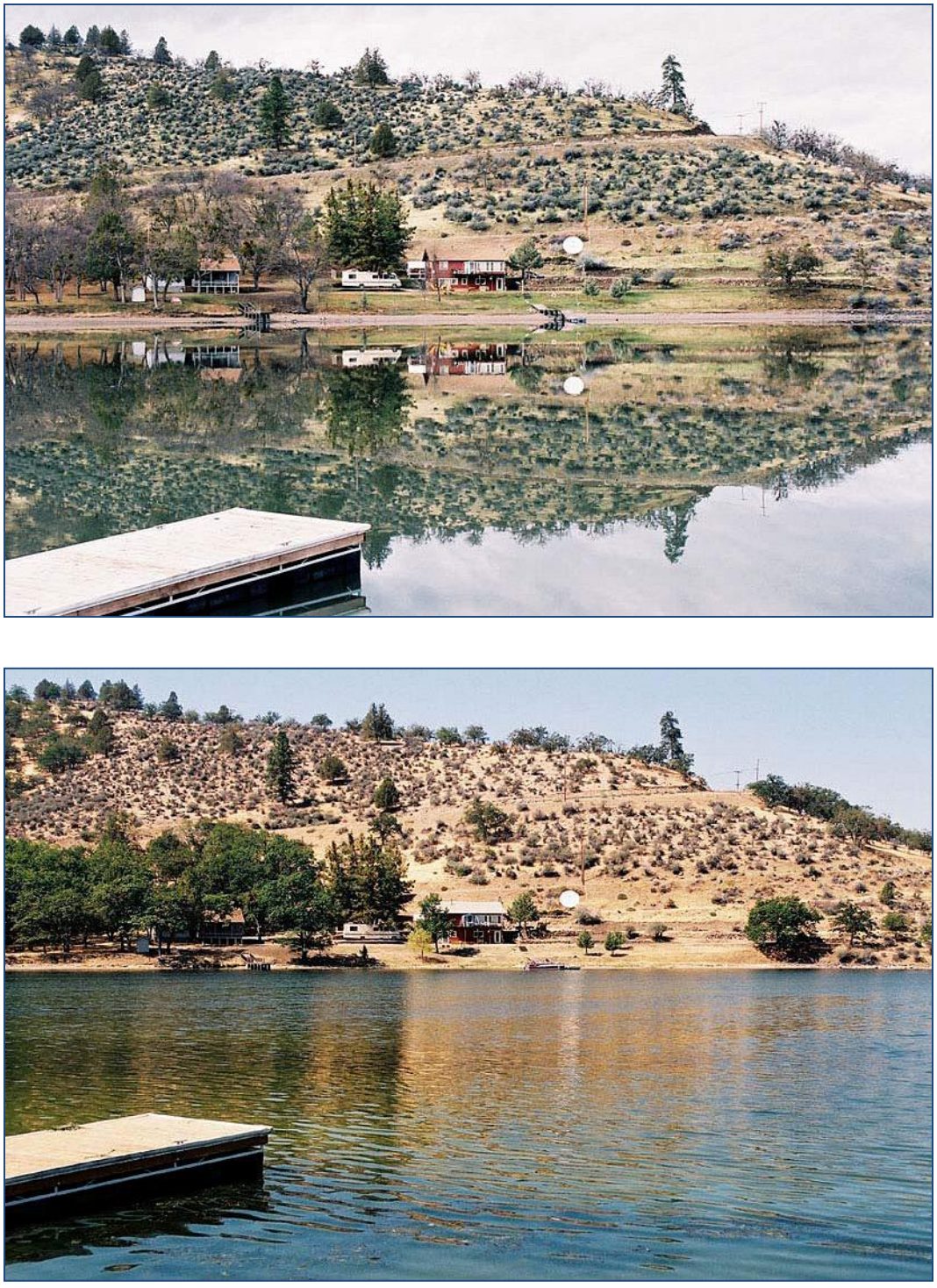

Figure 3.19-7. Copco Lake at Mallard Cove Recreation Area during Low and High Pool Conditions (C1). Source: PacifiCorp 2004a.



Figure 3.19-8. Iron Gate Reservoir at Long Gulch Recreation Area during Low and High Pool Conditions. Note the algal mats in the second photo (IG7). Source: PacifiCorp 2004a.

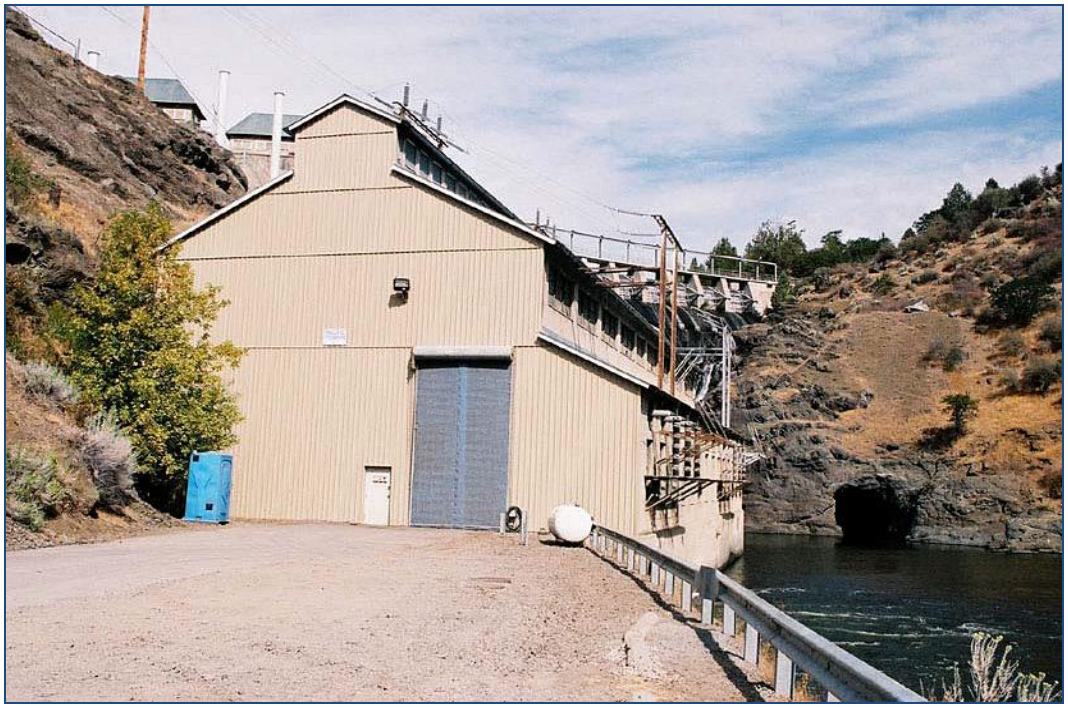



Figure 3.19-9. View of Copco No. 1 Powerhouse and Copco No. 2 Dam (C3, C4). Source: PacifiCorp 2004a.

3.19.3 Significance Criteria

Criteria for determining significant impacts on aesthetics are based upon Appendix G of the CEQA Guidelines (California Code of Regulations, title 14, section 15000 et seq.) and best professional judgement. Impacts are considered significant if the Proposed Project would:

- In areas where the VRM analysis was conducted, cause the VRM class to be degraded (i.e., changed to a higher numerical class) at a key observation point. In areas where the VRM analysis was not conducted, cause a substantial adverse effect on a scenic vista, considering in a qualitative manner the extent of the potential change to the existing landscape, how dominant the change would be in the overall public view, and the consistency of the change in the public view with the existing scenery.
- Result in a loss of or substantial adverse change to scenic elements of a landscape (including, but not limited to, landforms, trees, rock outcroppings, shape of the river channel, or visible aspects of riverbed composition such as boulders, cobble, gravel, and sand bars) as viewed from a vista point, community, recreation site area, trail, scenic highway, or designated wild and scenic river reach, or river reach that is designated as eligible and suitable to be wild and scenic.
- Substantially degrade the existing visual character or quality of the site and its surroundings.
- Create a new source of substantial light or glare that would adversely affect day or nighttime views in the area.

3.19.4 Impact Analysis Approach

The analysis of aesthetic resources in this EIR is primarily qualitative and acknowledges a degree of subjectivity, where one person's idea of what is aesthetically pleasing may not match another person's idea. However, certain guideposts or aesthetic goals can be used to guide an inquiry into what aesthetic changes many, or even most, viewers would find appealing or not. For these cases, the BLM's Visual Resource Management (VRM) methodology was used as guidance, since PacifiCorp previously had used this approach for a visual analysis of Copco No. 1, Copco No. 2, and Iron Gate dams and associated facilities (see also Section 3.19.2.1 *PacifiCorp Analysis and Bureau of Land Management Methodology*).

The primary and secondary Area of Analysis for aesthetics experiences four distinct seasons, across which Klamath River flows, reservoir water levels, and the appearance of vegetation vary. The detailed visual evaluation of the Project vicinity as summarized in the 2007 FERC EIS (FERC 2007) and documented in the *Land Use, Visual, and Aesthetic Resources Final Technical Report* (PacifiCorp 2004a) was used to characterize the primary and secondary Area of Analysis for aesthetics because the PacifiCorp (2004a) report included viewing

the key observation points during different seasons and at different water levels over an extended time period.

To evaluate the significance of potential impacts to scenic resources, the key observation points were reviewed to determine which scenic resources would be changed by the Proposed Project, with potential changes identified in terms of degree of contrast, relative size or scale, distance, visibility, and magnitude. Although the contrast rating forms provided in the BLM VRM process were not filled out for this EIR, the same basic steps were used to consider potential impacts of the Proposed Project. These steps include describing the characteristics of the existing landscape, as well as those of the Proposed Project, and assessing the contrast between the two.

Changes in scenic quality were identified and evaluated by establishing a level of contrast (i.e., no effect [visual contrast is imperceptible], weak, moderate, and strong [contrast caused by the action would be substantial]) considering effects on form, line, color, texture. Light pollution effects that could be generated during construction were also considered in relation to the associated significance criterion.

This EIR analysis categorizes potential visual impacts associated with the project into five groups: (1) loss of open water vistas; (2) changes to the river channel, flows and water quality; (3) reservoir drawdown and restoration; (4) removal of the dams and associated facilities; and (5) construction impacts. Short-term (temporary) construction-related impacts would occur during the dam removal period, including reservoir drawdown and short-term restoration activities (zero to five years), while long-term (permanent) impacts would persist beyond the construction and active restoration period.

Because the aesthetics primary and secondary Area of Analysis does not extend downstream of the confluence with the Shasta River (RM 179.5), the review of local plans and policies for aesthetics focuses on Siskiyou County. The following policies and objectives from the Siskiyou General Plan were reviewed and considered relevant to the Proposed Project: Conservation Element (Siskiyou County 1973) Objective F, and Scenic Highways Element (Siskiyou County 1975) Objectives 3 and 4. These objectives generally promote aesthetic characteristics of the land to benefit residents of the county and state, as well as tourists. The issues addressed by the aforementioned Siskiyou General Plan objectives, including revegetation of cut-and-fill slopes, are inherently addressed in the impact analyses presented in Section 3.19.5 *[Aesthetics] Potential Impacts and Mitigation*.

3.19.5 Potential Impacts and Mitigation

The Proposed Project involves removal of three dams in California (Copco No. 1, Copco No. 2, Iron Gate) and essentially all appurtenant features associated with the dams and related facilities, with the exception of buried features (Section 2.7

Proposed Project). Onsite disposal of concrete from Copco No. 1, Copco No. 2, and Iron Gate dams would occur at two disposal sites located adjacent to the reservoirs (see Figures 2.7-2 and 2.7-4). The Proposed Project includes reservoir drawdown prior to removal of the dams (Section 2.7 *Proposed Project*), which would expose the formerly inundated areas to view. The proposed reservoir restoration activities include revegetating the newly exposed reservoir areas with native species through hydroseeding and manual planting. Grading and revegetation of staging areas and onsite disposal areas are also included in the proposed restoration activities (Section 2.7.5 *Restoration of Upland Areas Outside of the Reservoir Footprint*). Monitoring and adaptive management will be used to ensure affected areas are appropriately revegetated. Management of invasive exotic vegetation could include manual weed extraction, soil solarization (covering of ground areas with black plastic sheets), tilling, and use of herbicides (Section 2.7.4 *Restoration Within the Reservoir Footprint* and Appendix B: *Definite Plan*).

Under the Proposed Project, the hard lines of the dams and large expanses of water in the reservoirs would be changed to a more natural setting with river canyon landforms and vegetation framing a continuous river. Due to the surrounding mountainous topography, views of Copco No. 1 Dam are limited to approximately 0.25 river miles downstream, Copco No. 2 Dam can only be seen from a distance of approximately 500 feet, and Iron Gate Dam can be seen from a distance of approximately one mile downstream of this facility (Section 3.19.2.5 *PacifiCorp's Hydroelectric Project Facilities*). While there are three key observation points adjacent to Copco No. 1 and Copco No. 2 dams (C3, C4, C5) at which dam deconstruction activities, concrete disposal sites, and the eventual lack of the dams would be visible (Table 3.19-3), these sites are not generally accessible by the public under existing conditions. There are four key observation points immediately downstream of Iron Gate Dam (IG9 to IG12); which are also not generally accessible by the public, although there are residences approximately one mile downstream of the dam that may be visually affected. The Iron Gate Dam disposal site also would not be visible from the four key observation points or the downstream residences, but it would potentially be visible from key observation point IG7 (Table 3.19-3). The long-term (permanent) scenic change of removing the large expanses of water in the reservoirs would be visible for a very long distance around the prior reservoir locations, at most reservoir key observation points (Table 3.19-3), and for the approximately 140 residences along the Copco No. 1 Reservoir shoreline that have unobstructed views of the reservoir water surface (Section 3.19.2.5 *PacifiCorp's Hydroelectric Project Facilities*). Figures 2.7-5 and 2.7-6 show aerial photos of the existing reservoirs with an overlay of existing reservoir bathymetry, including the historical river channels. The historical river channels represent the projected long-term extent of the Klamath River following implementation of the Proposed Project. Immediately following reservoir drawdown, and until revegetation efforts are complete, areas within the reservoir footprints would appear barren and/or sparsely vegetated (Table 3.19-3). During construction and for one to two years

following revegetation of the concrete disposal sites, the disposal site areas would also appear barren and/or sparely vegetated.

Table 3.19-3. Anticipated Visual Effects of the Proposed Project at Key Observation Points in the Aesthetics Primary and Secondary Area of Analysis (key observation point locations from PacifiCorp 2004a and shown in Figure 3.19-2 of this EIR).

Key Observation Point	Short-term (Temporary) Visual Effect[1]	Long-term (Permanent) Visual Effect[1]
HC7	• View of potential recreation site modifications	• View of modified recreation site
HC8	• View of potential recreation site modifications	• View of modified recreation site
C1	• Potential view of road improvements • View of exposed bare sediment and rock in reservoir footprints • View of restoration areas	• Loss of existing scenic reservoir view • Replacement with riverine and canyon scenic views
C2	• Potential view of road improvements • View of exposed bare sediment and rock in reservoir footprints • View of restoration areas	• Loss of existing scenic reservoir view • Replacement with riverine and canyon scenic views
C3	• View of construction areas • View of concrete disposal area for Copco No. 1 and Copco No. 2 dams • View of exposed bare sediment and rock in reservoir footprints • View of restoration areas	• Loss of view of dam and associated facilities • Creation of naturally contoured vegetated mound at concrete disposal area for Copco No. 1 and Copco No. 2 dams
C4	• View of construction areas • View of concrete disposal area for Copco No. 1 and Copco No. 2 dams • View of exposed bare sediment and rock in reservoir footprints • View of restoration areas	• Loss of view of dam and associated facilities • Creation of naturally contoured vegetated mound at concrete disposal area for Copco No. 1 and Copco No. 2 dams

Key Observation Point	Short-term (Temporary) Visual Effect[1]	Long-term (Permanent) Visual Effect[1]
C5	• View of construction areas • View of concrete disposal area for Copco No. 1 and Copco No. 2 dams • View of exposed bare sediment and rock in reservoir footprints • View of restoration areas	• Loss of view of dam and associated facilities • Creation of naturally contoured vegetated mound at concrete disposal area for Copco No. 1 and Copco No. 2 dams
C6	• View of construction areas, including City of Yreka water supply pipeline replacement • View of exposed bare sediment and rock in reservoir footprints • View of restoration areas	• Loss of view of Copco No. 2 powerhouse and associated facilities
C7	• View of construction areas associated with transmission line removal	• Loss of view of transmission lines
FC1	• View of potential recreation site modifications to support additional campsites and improved amenities	• View of modified recreation site
FC2	• View of construction activities, including Fall Creek Hatchery modifications	• Potential view of Fall Creek Hatchery modifications (ultimate fate of hatchery is speculative)
FC3	• View of construction activities, including Fall Creek Hatchery modifications	• View of Fall Creek Hatchery modifications (ultimate fate of hatchery is speculative)
FC4	• Potential view of construction activities, including Fall Creek Hatchery modifications	• View of Fall Creek Hatchery modifications (ultimate fate of hatchery is speculative)
FC5	• View of construction areas related to transmission lines	• Loss of view of transmission lines

Key Observation Point	Short-term (Temporary) Visual Effect[1]	Long-term (Permanent) Visual Effect[1]
IG1	• View of potential recreation site modifications to support additional campsites and improved amenities • View of exposed bare sediment and rock in reservoir footprints	• Loss of existing scenic reservoir view • Replacement with riverine and canyon scenic views
IG2	• View of construction activities to remove this recreation site • View of exposed bare sediment and rock in reservoir footprints	• Loss of existing scenic reservoir view • Replacement with riverine and canyon scenic views • Loss of view of recreation site facilities
IG3	• View of construction activities to remove this recreation site • View of exposed bare sediment and rock in reservoir footprints	• Loss of existing scenic reservoir view • Replacement with riverine and canyon scenic views • Loss of view of recreation site facilities
IG4	• View of construction activities to remove this recreation site • Possible view of construction to the north and across reservoir • View of exposed bare sediment and rock in reservoir footprints	• Loss of existing scenic reservoir view • Replacement with riverine and canyon scenic views • Loss of view of recreation site facilities
IG5	• View of construction activities to remove this recreation site • View of road construction activities • View of exposed bare sediment and rock in reservoir footprints	• Loss of existing scenic reservoir view • Replacement with riverine and canyon scenic views • Loss of view of recreation site facilities
IG6	• View of construction activities to remove this recreation site • View of exposed bare sediment and rock in reservoir footprints	• Loss of existing scenic reservoir view • Replacement with riverine and canyon scenic views • Loss of view of recreation site facilities

Key Observation Point	Short-term (Temporary) Visual Effect[1]	Long-term (Permanent) Visual Effect[1]
IG7	• View of construction activities • Potential view of Iron Gate Dam concrete disposal area • View of exposed bare sediment and rock in reservoir footprints	• Loss of existing scenic reservoir view • Replacement with riverine and canyon scenic views • Creation of naturally contoured vegetated mound at concrete disposal area for Iron Gate Dam
IG8	• View of construction activities to remove this recreation site • Possible view of transmission line construction across reservoir • View of exposed bare sediment and rock in reservoir footprints	• Loss of existing scenic reservoir view • Replacement with riverine and canyon scenic views • Loss of view of recreation site facilities
IG9	• View of construction activities, including Iron Gate Hatchery modifications	• Loss of view of dam and associated facilities (ultimate fate of hatchery is speculative)
IG10	• View of construction activities, including Iron Gate Hatchery modifications	• Loss of view of dam and associated facilities (ultimate fate of hatchery is speculative)
IG11	• View of construction activities, including Iron Gate Hatchery modifications	• Loss of view of dam and associated facilities (ultimate fate of hatchery is speculative)
IG12	• View of construction activities, including Iron Gate Hatchery modifications	• Loss of view of dam and associated facilities (ultimate fate of hatchery is speculative)
BG1	• None	• None
BG2	• None	• None
BG3	• None	• None

[1] Short-term visual changes are generally considered to be temporary, and long-term changes are generally considered to be permanent, unless otherwise indicated.

The Proposed Project includes modifications to the Iron Gate Hatchery and reopening of the Fall Creek Hatchery to support limited operations at these facilities for eight years following dam removal (Section 2.7.6 *Hatchery Operations*). Construction activities related to hatchery modifications would be visible in the short term (temporary) at several key observation points including, but not necessarily limited to FC2, FC3, FC4, IG9, IG10, IG11, and IG12 (Table 3.19-3).

The existing water supply pipeline for the City of Yreka passes under the upstream end of Iron Gate Reservoir (Figure 2.7-17) and would be relocated prior to reservoir drawdown to prevent damage from increased water velocities and scour once the reservoir has been drawn down. Three options for modifying the pipeline are being explored. These include: (1) micro-tunneled crossing, (2) aerial crossing on a new utility bridge, and (3) aerial crossing on a new Daggett Road bridge (see also Section 2.7.7 *City of Yreka Water Supply Pipeline Relocation*). Views of construction activities related to the City of Yreka water supply pipeline relocation would likely occur at only key observation point C6 (Table 3.19-3). Several bridges within the aesthetics primary and secondary Area of Analysis would be replaced to address structural deficiencies and/or to raise them above the new 100-year flood elevation, and roadway improvements (e.g., pavement rehabilitation, culvert replacements) would occur to facilitate construction vehicle access, all of which could be visible from several key observation points (Table 3.19-3).

The Proposed Project includes the complete removal of eight recreation sites (Table 2.7-14), including removal of structures, concrete, pavement, and most other existing recreation facilities, such as campgrounds and boat ramps that are currently located on the reservoir banks, and regrading and revegetating associated parking areas and trails (see also Section 2.7.8.3 *Recreation Facilities Management*). Views of construction activities during recreation site removal would occur at several key observation points (IG2, IG3, IG4, IG5, IG6, IG8; Table 3.19-3). The removed recreation sites would be planted with a native seed mix as described in the Reservoir Area Management Plan (Appendix B: *Definite Plan – Appendix H*). Recreational facilities at Fall Creek and Jenny Creek Day-Use Areas at Iron Gate Reservoir, and the Iron Gate Fish Hatchery Day-Use Area, would remain and may be upgraded or enhanced (Table 2.7-15). Views of construction activities related to Fall Creek and Jenny Creek Day-Use Areas would occur at two key observation points (FC1, IG1; Table 3.19-3). Future enhancements at these locations would depend on the future ownership of Parcel B lands, where these three recreational facilities are located.

Aesthetic changes resulting from the aforementioned actions under the Proposed Project would occur in the short term (up to five years) and/or the long term (more than five years). For the aesthetics analysis, short-term visual changes are generally considered to be temporary, and long-term changes are generally

considered to be permanent, unless otherwise indicated. The potential aesthetic changes analyzed under the Proposed Project include the following:

- Long-term (permanent) loss of open water vistas/views and replacement with riverine and canyon vistas/views;
- Short-term (temporary) and long-term (permanent) changes in flows and channel morphology;
- Short-term (temporary) and long-term (permanent) changes in visual water quality, including increased turbidity and reduced algal blooms;
- Short-term (temporary) bare/unvegetated area under former reservoirs after reservoir drawdown;
- Long-term (permanent) visual changes due to removal of Lower Klamath Project dams and associated facilities, and improvements to or construction of new infrastructure (e.g., bridges, recreation facilities);
- Short-term (temporary) visual impacts from stockpiles, lighting, and equipment.

Each of these potential aesthetic changes are analyzed below.

Potential Impact 3.19-1 Loss of open water vistas and replacement with riverine and canyon vistas.

The primary aesthetics Area of Analysis is rural. There are no major highways or towns within the viewshed of the reservoirs. However, there is a substantial amount of public land and public access to the area. While there is only one officially designated scenic overlook or vista point, recreational sites within the aesthetics primary Area of Analysis include the following:

- Nine developed recreation sites along the river corridor between the Oregon-California state line and Copco No. 1 Reservoir (all fishing access sites except for the “Stateline Take-out”);
- Two developed and two dispersed recreation sites at Copco No. 1 Reservoir;
- Eight developed and five dispersed recreation sites at Iron Gate Reservoir;
- Two developed recreation sites just downstream of Iron Gate Dam.

In 2001 and 2002, the California Lower Klamath Project reservoir recreation sites accounted for an average of 61,240 recreation days (defined as one visitor to a recreation area for any reason in a 24-hour period), and the river recreation sites accounted for an average of 12,500 recreation days, (PacifiCorp 2004b), not including estimated angler days. In addition to the public land and recreational sites, there are also approximately 140 residences located around Copco No. 1 Reservoir, the majority of which are vacation homes. Also, several rural and local roads, mostly unpaved, provide access within and around the primary aesthetics Area of Analysis. Most of the nearby residents and the users of the recreational facilities associated with Iron Gate and Copco No. 1 reservoirs are there to enjoy activities on those reservoirs. Part of that experience includes the

scenic, open water vistas of the area. (Potential impacts to recreational opportunities are discussed in further detail in Section 3.20 *Recreation*)

Sightseeing is a popular activity within the aesthetics primary Area of Analysis, with 39 percent of all respondents to a recreational survey of the area participating in that activity (PacifiCorp 2004b). However, sightseeing was less popular around the Lower Klamath Project dams and associated facilities, with only 30 percent and 32 percent of visitors participating in that activity at Copco No. 1 Reservoir and Iron Gate Reservoir, respectively (PacifiCorp 2004b). Conversely, 46 percent of respondents participated in sightseeing within the Hell's Corner River reach, between Copco No. 1 and J.C. Boyle reservoirs (which is in the aesthetics secondary Area of Analysis and partly in Oregon), indicating that the river itself provides a more important visual resource for visitors than the reservoirs. Boat fishing, camping and resting/relaxing were the three most popular activities at both Copco No. 1 and Iron Gate reservoirs (PacifiCorp 2004b).

Long-term (permanent) scenic vistas within the primary Area of Analysis would not necessarily be lost as a result of the Proposed Project, but they would be altered. Open water and lake vistas would be lost in favor of more natural river, canyon, and valley vistas. While not all people prefer a more natural, riverine setting, the results of prior surveys (PacifiCorp 2004b) suggest that in general the free-flowing river is preferred to the flatwater reservoir views. The recreation facilities within the aesthetics primary Area of Analysis were the primary destination of 54 percent of the recreation survey respondents (PacifiCorp 2004b), indicating that many users are just passing through and/or are visiting other destinations as well, reducing the severity of the impact of the loss of the Lower Klamath Project reservoirs.

Under the Proposed Project, the existing scenic reservoir view would be replaced with riverine and canyon scenic views, which would be a substantial change. However, since the VRM class would remain Class III (i.e., would not be degraded) at those key observation points associated with the Lower Klamath Project facilities and located within the reservoir viewshed (C1 to C7, FC5, IG1 to IG8; see Figure 3.19-2 and Table 3.19-3) the change is not considered to be adverse.

In areas where the VRM analysis was not conducted, the change in a scenic vista would also be substantial but the changed views would be similar to riverine and canyon scenic views located elsewhere in the general vicinity of the project. Note that owners of residences adjacent to the reservoirs may perceive a degradation in visual quality, while some recreational users and roadway viewers may perceive an improvement in visual quality. The latter is considered possible because under existing conditions, the Copco No. 1 and Iron Gate reservoirs often appear in a visually degraded condition due to summer algal blooms, which negatively impacted a majority of recreational survey respondents (see Potential

Impact 3.19-3). In addition, removal of human-made structures may be perceived as benefiting the visual quality of the aesthetics Area of Analysis. On balance, the long-term (permanent) change from open water reservoir scenic vistas to river, canyon, and valley scenic vistas within the primary Area of Analysis would be less than significant based upon the lack of degradation in VRM Class III relative to existing conditions and a visual change that would be consistent with riverine and canyon scenic views located elsewhere in the general vicinity of the project.

Significance
No significant impact

Potential Impact 3.19-2 Effects of changes in flows and channel morphology on scenic river vistas.
The aesthetics primary Area of Analysis (i.e., within the viewshed of the Lower Klamath Project reservoirs, which includes the proposed Limits of Work in California), is not visible from any of the nearby designated scenic byways, highways, or the WSR sections of the river (Figure 3.19-2). However, the Proposed Project could affect flows and channel morphology within the WSR sections that are associated with the aesthetics secondary Area of Analysis, which could affect scenic elements of the landscape as viewed from a vista point, community, recreation site area, trail, scenic highway, or river vantage point within the designated WSR sections.

Within the aesthetics secondary Area of Analysis, the stretch of the Klamath River from the Oregon-California state line to the upstream end of Copco No. 1 Reservoir has been determined to be eligible for listing under the WSRA. In addition, the mainstem Klamath River from 3,600 feet below Iron Gate Dam downstream to the Klamath River Estuary has been designated as "Recreational" under the WSRA. There are a number of river access sites along the Klamath River from the California-Oregon state line to the upstream end of Copco No. 1 Reservoir, including key observation points HC7 and HC8 (Figure 3.19-2), as well as downstream of Iron Gate Dam, including key observation points BG1 to BG3 (Figure 3.19-2). The river is also visible from several roadways that run parallel to the river channel or that cross the river within the secondary Area of Analysis. These include access roads to riverside and/or reservoir communities, residences, recreational access sites, and campgrounds, as well as state highways 96, 263 and US Interstate 5 (Figure 3.19-2).

In the portion of the Hydroelectric Reach between Copco No. 1 Reservoir and the Oregon-California state line (which is within the aesthetics secondary Area of Analysis), river flows within this reach would be altered by the removal of the J.C. Boyle Dam, located approximately 15 river miles upstream, which could indirectly affect views of the river. Similarly, under the Proposed Project, flows would change in the WSR segment downstream of Iron Gate Dam to the confluence with the Shasta River (RM 179.5), including key observation points BG1, BG2,

and BG3 in the aesthetics secondary Area of Analysis (Figure 3.19-2), which could also affect the river's aesthetic character.

Potential changes to flow characteristics include the timing, duration and magnitude of flows. These changes can impact the physical structure (morphology) of the river channel and the riparian vegetation. Much of the channel morphology within the aesthetics secondary Area of Analysis closest to the hydroelectric facilities is bedrock-controlled, which means flows do not have a significant influence on the channel configuration (Philip Williams & Associates, Ltd. [PWA] 2009), though there may be some minor changes to small alluvial floodplains. The hydrologic changes that would occur under the Proposed Project (i.e., smoother hydrograph due to the elimination of relatively rapid changes in flows from dam releases during the dry season, lower flows in the late summer and higher flows in the late fall, and lack of attenuation of large storm events during the wet season) would not be readily noticeable to the casual observer from key vistas along the Klamath River and the aesthetics secondary Area of Analysis downstream of Iron Gate Dam and would not result in a loss of or substantial adverse change to scenic elements of a designated WSR reach.

Further, removal of the dams would not adversely impact visual aspects of the channel aspects of channel morphology (i.e., shape of the river channel and/or presence of boulders, cobble, gravel, sand bars) in the secondary Area of Analysis. The Hydroelectric Reach between Copco No. 1 Reservoir and the Oregon-California state line would experience only small, short-term (temporary) changes in riverbed composition (i.e., proportions of cobble, gravel, sand) due to scouring and deposition of sediments from J.C. Boyle Reservoir during and immediately following drawdown; in the long term, this reach would experience a partial return to natural sediment supply (Keno Dam would remain upstream) (see also Potential Impact 3.11-5). These changes would not result in a loss of or substantial adverse change to scenic elements of a river reach that is designated as eligible and suitable to be wild and scenic. The river channel immediately downstream of Iron Gate Dam would experience the greatest amount of short-term (temporary) changes in riverbed composition, where reservoir-released sediment may temporarily deposit in pools and other slack water areas (e.g., eddies) and at tributary confluences in the reach from Iron Gate Dam to Cottonwood Creek (see also Potential Impact 3.11-5). Although potentially noticeable from scenic vistas, these short-term (temporary) localized sediment deposition areas would not result in a loss of or substantial adverse change to scenic elements of a designated WSR reach (i.e., shape of the river channel and/or presence of boulders, cobble, gravel, sand bars) as compared with existing conditions, and therefore, there would be no impact. In the long term, this reach would experience a partial return to natural sediment supply (Keno Dam would remain upstream), which also would not result in a substantial adverse change river channel aesthetics.

Significance
No significant impact

Potential Impact 3.19-3 Changes in visual water quality.
There would be visible changes in downstream water clarity (as characterized by suspended sediment concentrations and/or turbidity) resulting from the Proposed Project, including short-term (temporary) decreases in clarity due to elevated turbidity in the Hydroelectric Reach, Middle and Lower Klamath River, and Klamath River Estuary during reservoir drawdown, as well as long-term (permanent) seasonal increases in clarity due to decreases in summer algal blooms after dam removal.

Short-term (Temporary) Changes in Visual Water Quality
Due to their general lack of cohesion, the majority of the accumulated sediment deposits currently in the reservoirs would be eroded during reservoir drawdown (Section 2.7.3 *Reservoir Sediment Deposits and Erosion During Drawdown*). The erosion of reservoir sediment deposits would result in short-term (temporary) increases in turbidity and reduced clarity within and downstream of the Lower Klamath Project for several weeks to months during the reservoir drawdown period. Sediment jetting would be used at selected locations within Copco No. 1 and Iron Gate reservoirs to maximize erosion of accumulated sediments during drawdown. Revegetation efforts would occur immediately following drawdown, minimizing the potential for prolonged increases in turbidity due to erosion of sediment deposits remaining in the reservoir footprints (Section 2.7.4 *Restoration Within the Reservoir Footprint*).

Winter and spring water clarity, as characterized by suspended sediment concentrations and turbidity, is expected to return to background conditions by the end of summer during dam removal year 1, with most of the visual impacts of reduced water clarity occurring between January 1 and March 15, regardless of the water year type. The proposed sediment jetting would increase the potential that reservoir sediment deposits would be eroded to the extent possible (see also Section 2.7.3 *Reservoir Sediment Deposits and Erosion During Drawdown*) but the additional turbidity would be within the range of turbidity currently experienced on the river. Because the river reach from Iron Gate Dam (RM 193.1) to the confluence with the Shasta River (RM 179.5) is currently deprived of winter and early spring elevated inorganic suspended sediments due to the presence of the dams, this reach does not exhibit low water clarity (as characterized by relatively high suspended sediments and turbidity) during storm events that are otherwise common to much of the Klamath River downstream of the Hydroelectric Reach, as well as other rivers in the region. The potential impact of short-term (temporary) low water clarity in this reach during reservoir drawdown could result in a moderate to strong visual contrast, as characterized by the difference between high and low water clarity, in this river reach compared with existing conditions. However, because the majority of watercourses within the region experience low water clarity in the winter and early spring, particularly

during and just following storm events, this condition is not aesthetically atypical, making it inherently less noticeable by an observer in the viewshed. In addition, this stretch of river is already visually degraded due to existing development, including the Iron Gate Hatchery, recreational facilities, houses, numerous roads and Interstate 5, further limiting the intensity of the visual impact of low water clarity within the context of existing human infrastructure. Overall, there would be no loss of or substantial adverse change to scenic elements of the landscape as viewed from a vista point, community, recreation site area, trail, scenic highway, or designated WSR reach and there would be no significant impact.

The primary drawdown period for the J.C. Boyle Dam, which is upstream of the aesthetics primary and secondary Area of Analysis, would occur between January 1 and January 31 of the drawdown year. Drawdown of Copco No. 1 Reservoir would likely commence on November 1 of the year prior to drawdown, but no significant sediment release is expected until after January 1. Drawdown would be completed by March 15 of the drawdown year. Drawdown of Iron Gate Reservoir would also start January 1, with water levels controlled through the spring (Section 2.7 *Proposed Project*). Copco No. 2 Dam does not impound a significant volume of sediment, and drawdown of this reservoir would occur after Copco No. 1 Reservoir is drained to grade. Due to naturally high levels of turbidity in the river during winter flows, increased turbidity from the Proposed Project would not be noticeable for most of the drawdown period. In addition, impacts would occur for a period of less than six months. Therefore, visual impacts from increased turbidity and reduced clarity related to sediment discharges would be less than significant.

Long-term (Permanent) Changes in Visual Water Quality
Existing summer algal blooms in the Lower Klamath Project reservoirs adversely impact water quality, salmonids, recreation, and aesthetics (Section 3.2 *Water Quality*, Section 3.3 *Aquatic Resources*, Section 3.4 *Phytoplankton and Periphyton*). More than 66 percent of recreational survey respondents indicated that water quality detracted from their experience at least a little at both Copco No. 1 and Iron Gate reservoirs; 91 percent indicated the same concern about the Hell's Corner Reach. Algae was the primary water quality concern cited by respondents (PacifiCorp 2004b). The Proposed Project would reduce the occurrence and severity of algal blooms (Potential Impact 3.4-2). The removal of the dams is expected to reduce the river’s summer algae concentrations, which result in changes to both water clarity and coloration. Improvements in water quality, such as water clarity or fish viewing opportunities, could result in some improvement in scenic resources. These improvements would be more noticeable from on-river and riverside viewpoints, and much less noticeable from river canyon roadway and community viewpoints. These improvements to water quality would be beneficial.

Significance

No significant impact from short-term (temporary) changes in water quality including increased turbidity and reduced clarity

Beneficial due to long-term (permanent) changes in visual water quality from reduced algal blooms

Potential Impact 3.19-4 Visual changes resulting from reservoir drawdown and restoration including temporarily bare/unvegetated banks.

Substantial areas of bare sediment and rock would be exposed in previously inundated areas after reservoir drawdown and dam removal. Much of these areas would remain relatively bare, consisting mostly of grass and small forbs, during the summer and first wet season after dam removal, while larger vegetation becomes reestablished. Because much of the sediment would be eroded during reservoir drawdown, and because the river is bedrock-controlled, the river channel would not appear to be to significantly entrenched or flowing through mud, but rather, is expected to appear very similar to conditions before the river was impounded, though lacking in vegetation. Some slumping of the remaining sediment is anticipated, followed by drying, cracking, and hardening of the sediment prior to the establishment of vegetation. Existing wetland vegetation on the reservoir shorelines may also die off, though some of it would be relocated to repopulate the newly formed and exposed banks (Appendix B: *Definite Plan – Appendix H*).

As proposed in the Reservoir Area Management Plan (Appendix B: *Definite Plan – Appendix H*), manual revegetation would occur quickly following reservoir drawdown while the sediment deposits are still wet. In the short term, all exposed areas would be hydroseeded. Woody vegetation would also be planted in the year immediately following drawdown. Planting areas would be divided into zones (e.g., upland, riparian) that would have different species composition. Based on monitoring results, reseeding and replanting would occur again, as needed, for the following five years. Monitoring, revegetation, and invasive species control would occur annually until vegetation is reestablished and reservoir management goals are met (Appendix B: *Definite Plan – Appendix H*).

Until the restoration is complete, some areas of the reservoir footprint could appear barren and/or sparsely vegetated. Some tree-dominated wet areas that are currently near the reservoir edges may experience die-offs, although these areas account for less than 10 percent of the shoreline areas (see Potential Impact 3.5-22 and Figures 3.5-5 and 3.5-6). Revegetation of herbaceous species in barren and/or sparsely vegetated areas is anticipated to be achieved in the short term (from less than one to three years). However, it should be noted that this is not necessarily consistent with restoration of natural-appearing vegetation patterns below and above the reservoir line. Natural-appearing mature vegetation patterns with woody riparian vegetation may require 10 to over 50 years to develop. Although the condition is considered temporary, some

adverse scenery impacts would be extensive and long-term, perhaps requiring 30 years for the river corridor habitats to fully recover from dam removal (PWA 2009). However, much of the aesthetics primary Area of Analysis is grassland, which would revegetate rapidly (from less than one to three years). Woody vegetation would begin to grow and add variability to the landscape within a few years, decreasing the contrast with undisturbed areas over time.

Based upon the proposed Reservoir Area Management Plan (Appendix B: *Definite Plan – Appendix H*), the aesthetics primary Area of Analysis would be in a visible state of transition for four to five years, followed by several more years where contrast from adjacent natural woodlands, where they exist, would be evident. The exposure of previously inundated areas could result in a short-term (temporary) change in the VRM class, from VRM Class III to VRM Class IV, for those key observation points associated with the Lower Klamath Project facilities and located within the reservoir viewshed (C1 to C7, FC5, IG1 to IG8; see Figure 3.19-2 and Table 3.19-3) because exposure of the reservoir footprint may dominate the view and be the major focus of viewer attention prior to vegetation reestablishment. This would be a significant and unavoidable impact. In areas where the VRM analysis was not conducted, the exposure of previously inundated areas would cause a substantial short-term (temporary) adverse effect on scenic vistas with views of the reservoir footprint, since the extent of the change to the existing landscape would dominate the overall public view and would be inconsistent with the existing open water reservoir views and the natural vegetation patterns above the reservoir shorelines. This also would be a significant and unavoidable impact.

It is expected that within five years, revegetation within the reservoir footprints would result in scenic views that are generally consistent with the surrounding scenery (e.g., grasslands with herbaceous plants and some woodlands, riparian areas) such that the VRM class at the key observation points associated with the Lower Klamath Project facilities and located within the reservoir viewshed (C1 to C7, FC5, IG1 to IG8; see Figure 3.19-2 and Table 3.19-3) would return to baseline conditions (i.e., Class III) and, in areas where the VRM analysis was not conducted, the extent of the visual change to the existing landscape due to exposure of the reservoir footprints would no longer be inconsistent with the surrounding scenery in a way that would dominate the overall public view. Although natural-appearing mature woodlands and woody riparian vegetation may require several decades to fully develop within the reservoir footprints, the visual variability in the landscape that would occur within a few years and would continue to decrease the contrast with undisturbed areas over time, means that in the long-term (permanent), aesthetic impacts under the Proposed Project due to reservoir drawdown and restoration of bare sediments and rock would be less than significant.

Significance

Significant and unavoidable in the short-term (temporary), until vegetation is re-established, due to reservoir drawdown

No significant impact in the long term (permanent) due to reservoir drawdown

Potential Impact 3.19-5 Long-term (permanent) visual changes resulting from the removal of Lower Klamath Project dam complexes, hatchery modifications, improvements to or construction of new roads, culverts, bridges, water supply infrastructure, and removal and replacement of recreational facilities.

Removal of Dam Complexes and Hatchery Modifications

Many of the facilities associated with the Lower Klamath Project dam complexes (e.g., dams, reservoirs, powerhouses, penstocks, hatcheries) do not blend with the natural landscape and can dominate views due to their form, line, color, size, or locations, particularly those that appear taller from a distance than other natural features, and all of the facilities except three (all associated with J.C. Boyle) are located in areas that have been designated as a Class III area or have been classified as a Class III area because the area has not been given a specific VRM class by BLM (PacifiCorp 2004). Figures 3.19-11 and 3.19-12 show photo-simulations of the post-removal views of Iron Gate Dam and Copco No. 1 Dam, respectively. While the dams themselves are visible from key observation points C3, C4, C5, IG9, IG10, IG11, and IG12 (Figure 3.19-2), they are generally not visible from any scenic highway and the topography of the area makes them generally not visible from most scenic vistas in the primary aesthetics Area of Analysis. Iron Gate Hatchery and Fall Creek Hatchery also are not visible from most scenic vistas, although they are visible from key observation points FC2, FC3, FC4, IG9, IG10, IG11, and IG12 (Table 3.19-3). Accordingly, dam-removal-area landscape disturbances, as well as modifications to the hatcheries, would not have the potential to cause a substantial long-term (permanent) adverse effect on a scenic vista.

Some portions of the Lower Klamath Project dam complexes are considered to be historic structures (FERC 2007), including the Copco No. 1 Powerhouse and Dam; Copco No. 2 Powerhouse; and, the Copco No. 2 wooden stave penstock (see also Table 4.3-1, Table 4.3-3, and Table 4.3-5). However, these particular structures are not visible from any scenic highways or river sections. Potential impacts to historic resources are discussed in more detail in Section 3.12.5 *[Historical Resources and Tribal Cultural Resources] Potential Impacts and Mitigation Measures* but, for purposes of potential impacts to aesthetics, removal of these structures would have no significant impact.

Removal of Copco No. 1 and No. 2 dams involves disposal of 104,000 yd^3 of concrete at a proposed 3.5-acre disposal area immediately adjacent to these dams, at the current location of a maintenance building and the vacant south residence (Figure 2.7-2, tile 1 of 4). The Copco No. 1 and No. 2 concrete disposal

site would be visible from key observation points C3, C4, and C5 (Figure and Table). The disposal site would be graded as a hill (maximum fill height of about 55 feet) contoured to blend into the surrounding topography (see Section 2.7.1 *Dam and Powerhouse Deconstruction*). The potential short-term (temporary) impacts of concrete disposal, burial, and grading at this site are discussed in Potential Impact 3.19-6 which focuses on short-term (temporary) construction-related impacts. In the long term, there would not be a permanent visual impact of the concrete disposal site for Copco No. 1 and Copco No. 2 dams because this area is already visually degraded by the presence of the two dam complexes, and the disposal site would be naturally-contoured, covered with soil, and revegetated such that it would visually blend with the surrounding landscape. Therefore, there would not be a further degradation of the VRM classification.

Removal of Iron Gate Dam involves disposal of 1,087,000 yd^3 of earthen materials and 20,700 yd^3 of concrete at the proposed (approximately) 36-acre Iron Gate Dam disposal site, located on PacifiCorp property approximately 1 mile south of the dam (Figure 2.7-4). This disposal site is located on a plateau area above the Iron Gate Dam complex and is not generally visible from existing scenic vistas (i.e., key observation points I7, I9, I10, I11, I12), with the exception of a partially obstructed, distant (i.e., minimum of 1,800 feet away) view from key observation point IG7 (Figure 3.19-2). The disposed material would be placed to a maximum fill height of about 50 feet and graded to blend with the existing topography. Final grading of the disposal site would include relatively flat slopes (8H:1V to 5H:1V) to reduce the potential for erosion (see Section 2.7.1 *Dam and Powerhouse Deconstruction*). The potential short-term (temporary) impacts of concrete disposal, burial, and grading at this site are discussed in Potential Impact 3.19-6, which focuses on short-term (temporary) construction-related impacts. In the long term, there would not be a permanent visual impact of the Iron Gate Dam disposal site because once it is contoured, covered with soil, and revegetated, the form and color of the site would generally conform with adjacent landforms, vegetation, color, and scenery.

Improvements to Roads, Bridges, and Culverts and Water Supply Infrastructure
The Proposed Project includes replacement of the 24-inch diameter water supply pipeline for the City of Yreka, which crosses under the Klamath River near the upstream end of Iron Gate Reservoir. The three potential alignments proposed for the City of Yreka water supply pipeline would be visible from key observation point C6 (Table 3.19-3); however there already are a number of residential, commercial, and industrial developments in the vicinity of the City of Yreka water supply pipeline (see Section 2.7.7 *City of Yreka Water Supply Pipeline Relocation*). In addition, Daggett Road Bridge is located approximately 2,000 feet upstream of the current pipeline. Due to the other development nearby, a new pipeline would be visible as a new landscape feature but would not cause a substantial adverse effect on a scenic vista, or on key observation point C6, because the new pipeline alignment would represent relatively minor changes to the existing, rural, river canyon and mountainous landscape. It also would be

consistent with the existing scenery that includes occasional roads, moderately sized buildings and bridges, and unburied utilities. Therefore the aesthetic impact of these infrastructure improvements would be less than significant.

In addition, at least six bridges would need to be replaced due to structural deficiencies and/or in order to raise them above the new 100-year flood elevation. There are also culverts and roads that would need to be upgraded with new erosion and drainage control improvements (Appendix B: *Definite Plan*). However, these improvements would result in only minor visual changes to existing structures. New bridges would be built in the same general location as the ones being removed and would be sized and oriented similarly. Therefore, they would not degrade the existing visual character of the sites or their surroundings and the impact would be less than significant.

Removal and Replacement of Recreational Facilities
The Proposed Project also includes removal of eight recreational facilities on Copco No. 1 and Iron Gate reservoirs, and modification of three other recreational facilities. In addition, KRRC has developed a Draft Recreation Plan (Appendix B: *Definite Plan – Appendix Q*) that seeks to identify recreation opportunities, in coordination with stakeholders, that would offset the removal of reservoir recreation opportunities and the reduction in whitewater boating days associated with the Proposed Project. New river-based opportunities may include: (a) new routes and roads for river access; (b) two small to medium river recreation facilities that would accommodate 20 campsites, day use amenities, and access to the river for fishing and boating; and (c) a new trail between J.C. Boyle Dam and the Iron Gate Fish Hatchery (see also Section 2.7.8.3 *Recreation Facilities Management*). The areas in which recreation facilities that currently exist but are proposed to be removed (key observation points IG2, IG3, IG4, IG5, IG6, IG8; Table 3.19-3) would be restored through regrading and revegetation, which would minimize aesthetic impacts at these locations.

New roads, trails, and paths for river access could have potentially significant impacts to visual resources if not properly sited and constructed due to tree removal and construction of facilities. Similarly, river recreation facilities (i.e., campgrounds, picnic areas, river access areas with parking, and other day use areas), may distract from more natural views in the river canyon. Because these facilities have not yet been designed or sited, no site- or project-specific assessment is possible. New recreation facilities are anticipated to be modest in size and spread throughout the primary Area of Analysis. Therefore, they would have minimal potential to be inconsistent with the aesthetics significance criteria. In addition, the Final Recreation Plan would be developed by KRRC working with appropriate agencies through the FERC process, and KRRC also proposes that KRRC and the appropriate state and local agencies work together to develop recommended terms and conditions that should be adopted by FERC as conditions of approval for the Lower Klamath Project.

The KRRC's Recreation Plan and this EIR take a programmatic approach to developing recreational facilities and analyzing and mitigating any impacts attributable to these developments. New recreational facilities still are being evaluated by KRRC, including consideration of public input on the potential types and locations of these facilities. Although new recreation facilities are part of the Proposed Project, the final location, size, and design of the facilities are still under development and will be the subject of subsequent approvals. It is thus too soon to conduct a meaningful environmental analysis of the replacement facilities. However, construction and operation of new recreational facilities would undergo any environmental review necessary for the subsequent approvals, and any impacts of the construction and operation of the facilities would be mitigated, if feasible, to levels that comply with all applicable laws, regulations, and environmental standards. A Final Recreation Plan would be submitted to FERC, and this plan would include any new recreation facilities that are proposed by the KRRC. The Final Recreation Plan would be subject to environmental review under NEPA, and any necessary mitigation measures would be determined by FERC. If implementation of the Final Recreation Plan (at FERC's direction) required any further state or local approvals, then written checklists would be prepared pursuant to CEQA Guidelines sections 15162 and 15168(c) to ascertain whether further site-specific environmental review of individual reactional projects would be necessary. Such individual projects shall be subject to applicable best management practices and mitigation measures required by FERC, applicable mitigation measures in this EIR, such as Mitigation Measures WQ-1, TER-1, TER-2, TER-3, TER-5, TCR-1, TCR-2, TCR-3, and HZ-1, and any other measures required by an agency with jurisdiction over those individual recreation projects. The potential aesthetic impacts of these new recreational facilities would be reviewed at a project level in subsequent evaluations prior to their implementation.

Overall Long-Term Visual Impacts of the Proposed Project
Overall, removal of the Lower Klamath Project dam complexes, improvements to or construction of new roads, culverts, bridges, and water supply infrastructure, and removal of recreational facilities would not cause the VRM class to be degraded at a key observation point, would not adversely impact a scenic vista for those areas that were not assigned a VRM class, and there would be no significant long-term (permanent) impact of the Proposed Project.

Significance
No significant impact in the long term (permanent) due to removal of the Lower Klamath Project dam complexes and/or hatchery modifications

No significant impact in the long term (permanent) due to improvements to or construction of new roads, bridges, culverts, and water supply infrastructure



Figure 3.19-10. Iron Gate Dam Before Removal (top) and a Simulation of What the Facility Could Look Like After Dam Removal (bottom) Except for Landform/Vegetation Restoration Details Which Were Not Known at the Time of Simulation. Note that the residence shown in the foreground would also be removed under the Proposed Project Source: 2012 KHSA EIS/EIR.

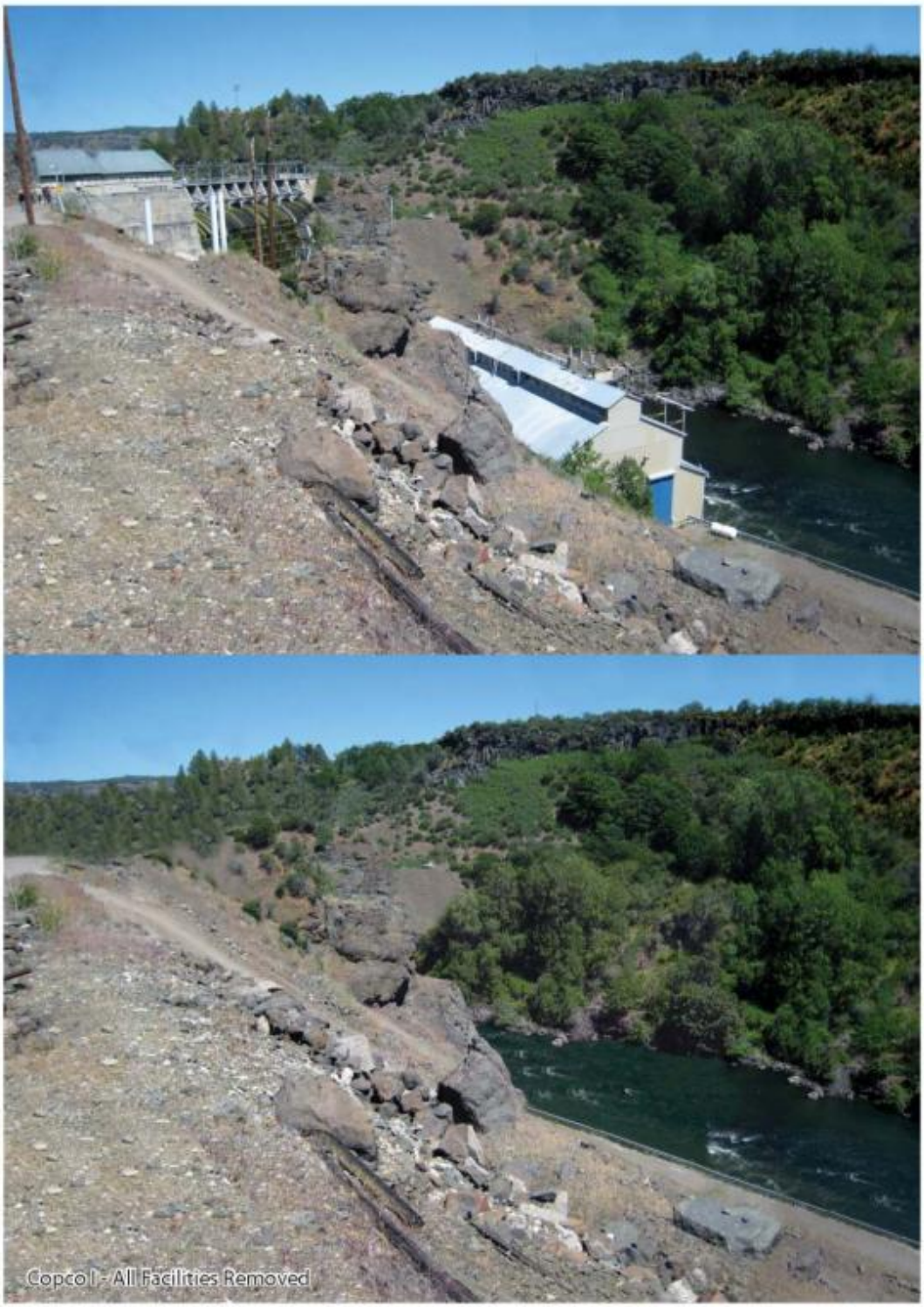

Figure 3.19-11. Copco No. 1 Dam Before Removal (top) and a Simulation of what the Facility Could Look Like After Full Removal (bottom) Except for Landform/Vegetation Restoration Details Were Not Known at the Time of Simulation. Source: 2012 KHSA EIS/EIR.

Potential Impact 3.19-6 Short-term (temporary) visual impacts of construction activities/equipment.

Removal of Dam Complexes and Hatchery Modifications

Removal of the Lower Klamath Project dam complexes (dams, reservoirs, powerhouses, penstocks) and hatchery modifications would be completed in stages over two years, with primary construction activities occurring between May and September of the second year (Table 2.7-1). During construction activities, large construction vehicles and equipment, temporary structures (e.g., trailers, portable toilets, security fencing, temporary power supply, fueling stations), temporary access roads, equipment storage areas, material stockpiles, piles of demolition materials (rock, concrete, steel), and other common construction items that would detract from the natural surroundings would be visible in the aesthetics primary Area of Analysis. Visual impacts of construction equipment and activities would vary depending on the vehicles, equipment, activities, and materials in any given area.

During construction activities, views from several key observation points in the primary Area of Analysis would be affected by dam complex deconstruction (C3, C4, C5, C6, IG9, IG10, IG11, IG12; ; Table 3.19-3) and hatchery modifications (FC2, FC3, FC4, IG9, IG10, IG11, and IG12; Table 3.19-3). Some scenic resources, such as trees, rocks, and vegetation in the immediate vicinity of the dams would need to be removed as part of the dam removal construction activities. The temporary staging of vehicles and construction equipment also would be visible from certain locations within the aesthetics primary Area of Analysis. Staging areas and most equipment would be located just downstream of Copco No. 1 Dam (Figure 2.7-2), at the upstream end of Iron Gate Reservoir (Figure 2.7-2), and just downstream of Iron Gate Dam (Figure 2.7-4), associated with key observation points C3, C4, C5, C6, potentially FC5, IG9, IG10, IG11, and IG12 (Table 3.19-3). The VRM class at these key observation points would not likely be degraded by these activities because the existing dams, powerhouses, and other non-natural facilities already are major features in the landscape. Thus, the short-term (temporary) aesthetic impacts of dam complex deconstruction, including temporary staging of vehicles and construction equipment, would be a less-than-significant impact. The same rationale applies for areas where no VRM analysis was conducted but which would have a view of the areas located just downstream of Copco No. 1 Dam, at the upstream end of Iron Gate Reservoir, and just downstream of Iron Gate Dam.

Removal of Copco No. 1 and No. 2 dams involves disposal of 104,000 yd^3 of concrete at the proposed 3.5-acre disposal area immediately adjacent to these dams, at the current location of a maintenance building and the vacant south residence (Figure 2.7-2, tile 1 of 4). The disposed materials would be placed to a maximum fill height of about 55 feet (see Section 2.7.1 *Dam and Powerhouse Deconstruction*). During construction activities, the Copco No. 1 and No. 2 concrete disposal site would be visible as a large pile of debris from key observation points C3, C4, and C5 (Figure and Table).

Removal of Iron Gate Dam involves disposal of 1,087,000 yd^3 of earthen materials and 20,700 yd^3 of concrete at the proposed (approximately) 36-acre Iron Gate Dam disposal site, located on PacifiCorp property approximately 1 mile south of the dam (Figure 2.7-4). This disposal site is located on a plateau area above the Iron Gate Dam complex and is not generally visible from existing scenic vistas (i.e., key observation points I7, I9, I10, I11, I12), with the exception of a partially obstructed, distant (i.e., minimum of 1,800 feet away) view from key observation point IG7 (Figure 3.19-2). The disposed material would be placed to a maximum fill height of about 50 feet (see Section 2.7.1 *Dam and Powerhouse Deconstruction*).

In the short-term (i.e., during construction and before revegetation occurs), the concrete disposal sites would be visible as constructed features incongruous with a natural landscape. However, at the Copco 1 No. 1 and Copco No. 2 dams' concrete disposal site, the concrete pile, while not aesthetically pleasing, would not be visually incongruent because of the existing substantially disturbed character of that area. As described above, the Iron Gate Dam disposal site would not be visible from any of the identified existing scenic vistas, therefore, even though the concrete disposal would be incongruous with the existing landscape prior to revegetation, it would not create a significant impact.

Dust emissions from deconstruction activities associated with removal of the dam complexes and onsite disposal of concrete and earth may also temporarily impact views of the river. The majority of fugitive dust generally settles out of the atmosphere within 300 feet of the source, with larger particles traveling less distance and smaller particles traveling a longer distance (USEPA 1995). Because the recreational facilities that would be impacted by construction and demolition activities would be closed during the construction period, the VRM class at the key observation points is already impacted by the presence of dams, powerhouses, and other non-natural facilities that represent change from the characteristic landscape, and most dust settles quickly, aesthetic impacts from temporary fugitive dust would not be experienced by a substantial number of people and thus would be less than significant.

Improvements to Roads, Bridges, and Culverts and Water Supply Infrastructure
At least six bridges would need to be replaced under the Proposed Project due to structural deficiencies and/or in order to raise them above the new 100-year flood elevation. Culverts and roads also would need to be upgraded with new erosion and drainage control improvements (Appendix B: *Definite Plan*). The construction activities associated with the bridge replacement, drainage, and roadway improvements (e.g., pavement rehabilitation, culvert replacements) could be visible from several key observation points in the aesthetics primary Area of Analysis (Table 3.19-3).

The Proposed Project also includes replacement of the 24-inch diameter water supply pipeline for the City of Yreka, which crosses under the Klamath River near the upstream end of Iron Gate Reservoir. Construction activities associated with the proposed City of Yreka water supply pipeline realignment would be visible from key observation point C6 (Table 3.19-3); however, views from this observation point already include a number of residential, commercial, and industrial developments in the vicinity of the City of Yreka water supply pipeline (see Section 2.7.7 *City of Yreka Water Supply Pipeline Relocation*).

Construction activities and equipment associated with these portions of the Proposed Project would be relatively small-scale and short term (temporary), consistent with normal road and infrastructure maintenance activities and small construction projects. Construction activities and equipment would be visible during construction but this would be a temporary condition and the VRM class would not be degraded relative to existing conditions since the bridges, roads, culverts, and the City of Yreka water supply pipeline realignment already represent moderate change from the characteristic landscape. Further, because these construction activities would occur over a period of less than a year and during that time most nearby recreational facilities would be closed, the activities would not be visible to a substantial number of people. The proposed construction activities associated with improvements to or construction of new bridges, roads, and culverts, and realignment of the City of Yreka water supply pipeline, would result in less-than-significant visual impacts under the Proposed Project.

Removal and Replacement of Recreational Facilities

The Proposed Project also involves removal of eight recreational facilities on Copco No. 1 and Iron Gate Reservoirs, which would affect views at several key observation points (IG2, IG3, IG4, IG5, IG6, IG8; Table 3.19-3), and potential recreation site enhancements at several key observation points (FC1, IG1; Table 3.19-3). In addition, KRRC has developed a Draft Recreation Plan (Appendix B: *Definite Plan – Appendix Q*) that may result in construction of new recreation facilities. Construction activities associated with the removal and replacement of recreational facilities would be relatively small-scale and short term (temporary). Construction activities and equipment would be visible during construction but this would be a temporary condition and the VRM class would not be degraded relative to existing conditions since the recreation site facilities already represent moderate change from the characteristic landscape. Further, because the construction activities would occur over a period of less than a year and during that time most nearby recreational facilities would be closed, the activities would not be visible to a substantial number of people. The proposed construction activities associated removal and replacement of recreation facilities would result in less-than-significant visual impacts under the Proposed Project.

Significance

No significant impact in the short term (temporary) due to removal of the Lower Klamath Project dam complexes and/or hatchery modifications

No significant impact in the short term (temporary) due to improvements to or construction of new roads, bridges, and culverts and water supply infrastructure

No significant impact in the short term (temporary) due to removal of recreational facilities

Potential Impact 3.19-7 The Project's construction or security lighting could result in new sources of substantial light or glare that would adversely affect nighttime views in the area.

Temporary lighting would be erected for nighttime construction activities during dam demolition, and security lighting might be required during deconstruction. During peak construction periods (April through November of dam removal year 2, Table 2.7-8), nighttime construction activities could occur regularly. Temporary lighting could cause glare that would adversely affect nighttime views in the area, particularly for overnight visitors and residents near the Copco No. 1 Reservoir. Because the area is rural with very little existing night lighting, and because construction lighting would be relatively intense, the impact on nighttime views would be a significant impact that would occur temporarily, until dam deconstruction was complete. No new permanent sources of light or glare would result from the Proposed Project.

The Proposed Project currently does not include measures that would reduce impacts to nighttime views cause by temporary construction lighting. KRRC proposes that KRRC and the appropriate state or local agency would work together to develop recommended terms and conditions that should be adopted by FERC as conditions of approval for the Lower Klamath Project. This is consistent with FERC's preference for licensees to be 'good citizens' of the communities in which projects are located and thus to comply, where possible, with state and local requirements. It would be appropriate for any such terms to include measures to reduce nighttime light and glare on surrounding residences during construction. However, overseeing development and implementation of measures to reduce impacts to nighttime views does not fall within the scope of the State Water Board's water quality certification authority. While the KRRC has stated its intention to reach enforceable good citizen agreements that will be finalized and implemented, at this time these agreements are not finalized and the State Water Board cannot require their implementation. Accordingly, while the State Water Board anticipates that implementation of the final FERC terms and conditions for the Proposed Project would reduce potential impacts to nighttime views to less than significant, because the State Water Board cannot ensure implementation of any associated measures, it is analyzing the impact in this EIR as significant and unavoidable.

Significance
Significant and unavoidable

3.19.6 References

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3.20 Recreation

This section describes the environmental setting for recreational resources, as well as potential environmental impacts and associated mitigation measures under the Proposed Project. Water quality, aquatic resources, and phytoplankton and periphyton[100] are discussed in this section only in terms of their relationship to recreation opportunities. For a detailed discussion of these resources, see Section 3.2 *Water Quality*, Section 3.3 *Aquatic Resources*, and Section 3.4 *Phytoplankton and Periphyton* of this EIR. Potential impacts to wild and scenic river segments are discussed in this section, as well as in Section 3.14 *Land Use and Planning*.

As part of the NOP scoping process, the State Water Board received several comments regarding potential recreation impacts due to Lower Klamath Project dam removal. Several commenters noted that reservoir recreational activities, including fishing, would be reduced due to dam removal, particularly at Copco No. 1 Reservoir. Many other comments anticipated an increase in river-related fishing and recreation following dam removal. Several commenters noted that Iron Gate Fish Hatchery is important for enhancing recreational fishing opportunities. Finally, one commenter questioned the future disposition of

[100] *Phytoplankton* are defined as aquatic microscopic organisms, including algae, bacteria, protists, and other single-celled plants, that obtain energy through photosynthesis and float in the water column of still or slowly flowing waters like lakes or reservoirs. *Periphyton* are defined as aquatic organisms including algae and bacteria that live attached to underwater surfaces such as rocks on a riverbed. See Section 3.4 *Phytoplankton and Periphyton* for additional definitions related to algae.

PacifiCorp properties within and adjacent to the former Lower Klamath Project reservoirs. Additional summary of the recreation comments received during the NOP public scoping process, as well as the individual comments themselves, are presented in Volume II Appendix A. Issues raised by the comments have been considered in the discussion below.

After circulation of the Draft EIR, numerous additional comments were received regarding recreation (see Volume III), and changes to the section in response to those comments are flagged in the comment responses and then printed in this Final EIR section. None of the changes result in significant new information in the EIR under the meaning of CEQA Guidelines, section 15088.5, subdivision (a):

> New information added to an EIR is not 'significant' unless the EIR is changed in a way that deprives the public of a meaningful opportunity to comment upon a substantial adverse environmental effect of the project or a feasible way to mitigate or avoid such an effect (including a feasible project alternative) that the project's proponents have declined to implement.

However, the changes were numerous enough that reprinting the section rather than simply including a list of revisions was warranted to improve clarity and readability of the document.

3.20.1 Area of Analysis

The Area of Analysis for recreation includes recreation areas and associated access along the Klamath River corridor from the California-Oregon border to the Klamath Estuary. Outside of the Area of Analysis for recreation, areas within and directly adjacent to the Klamath Basin, including those in Oregon, are also described to provide an overview of regional recreation opportunities and to provide a larger context for the recreational facilities that would be impacted under the Proposed Project. River reach designations are presented in Figures 2.2-2 and 2.2-3.

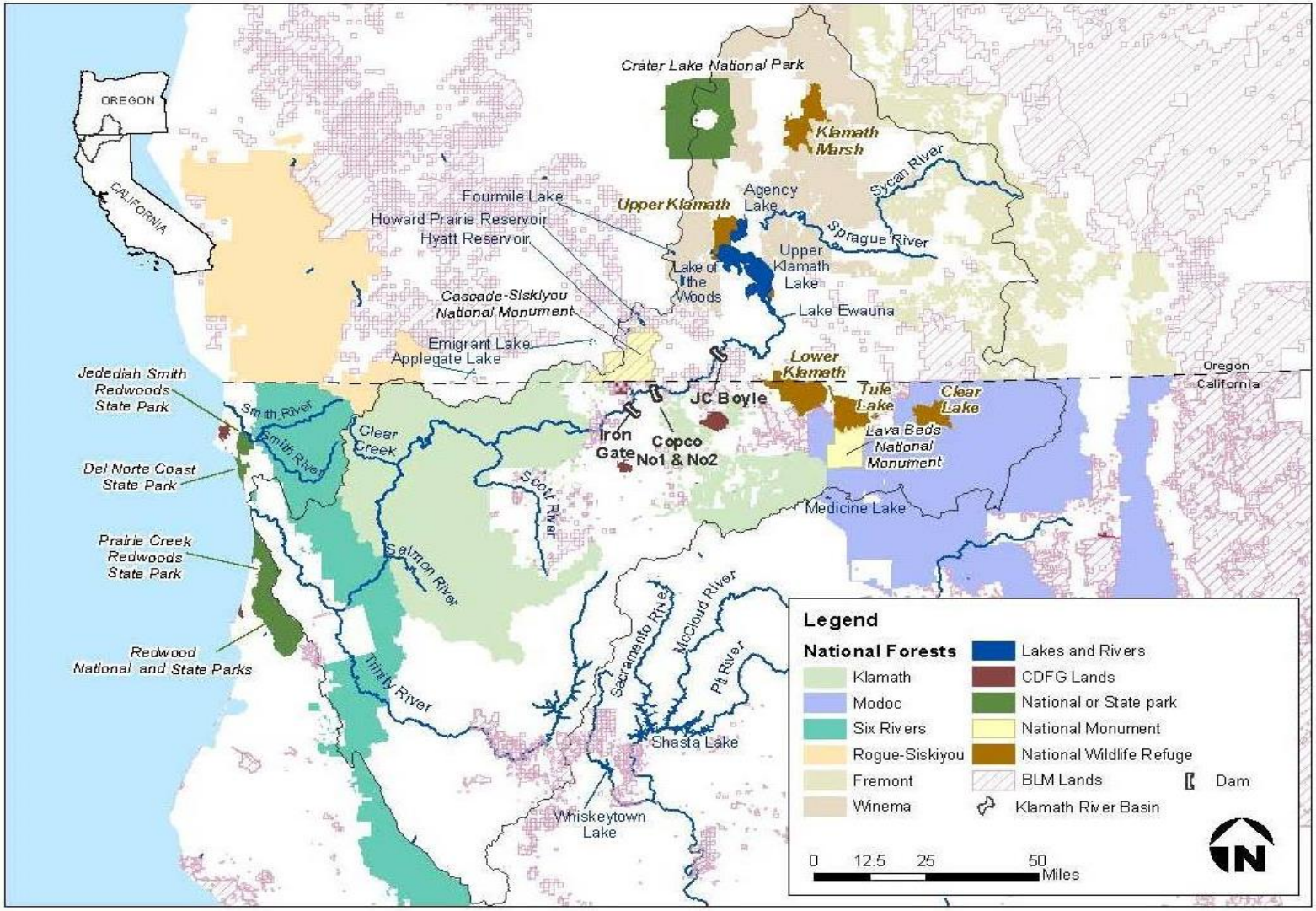

Figure 3.20-1. Area of Analysis for Klamath River Corridor and Regional Recreation Opportunities.

3.20.2 Environmental Setting

3.20.2.1 Regional Recreation

The recreational setting within the Klamath Basin is characterized by an expansive rural landscape that offers a myriad of outdoor recreational opportunities. Rivers, streams, and lakes are common throughout the mountainous landscape of the Klamath Basin, and grasslands exist in the high plateau areas of the region. Within the Klamath Basin, there are four national forests (Klamath, Fremont-Winema, Six Rivers, and Modoc), one joint national and state park (Redwood), one national park (Crater Lake), two national monuments (Lava Beds and Cascade - Siskiyou), and five National Wildlife Refuges (NWRs) (Klamath Marsh, Tule Lake, Clear Lake, Upper Klamath, and Lower Klamath), where the latter make up the Klamath Basin NWR System (Figure 3.20-1). These areas provide sightseeing, camping, hiking, fishing, boating, hunting, wildlife viewing, snow sports, off-highway vehicle uses, and other recreational opportunities. There are 297 miles of wild and scenic (under Section 2(a) (ii) of the Wild and Scenic Rivers Act [WSRA]) rivers in the Klamath Basin, which include segments of the Klamath, Scott, and Salmon rivers and Wooley Creek. There are also extensive public and private recreational opportunities along the Klamath River and within its reservoirs. Federal and state agencies, including the USDA Forest Service, BLM (including the Northern California District, and the Lakeview and Medford districts in Oregon), USFWS, the National Park Service (NPS), and CDFW, are responsible for managing associated lands located in Klamath and Jackson counties in Oregon, and Siskiyou County in California. Table 3.20-1 provides a summary of the opportunities offered on public lands within and adjacent to the Klamath Basin.

Table 3.20-1. Public Lands Offering Recreational Opportunities in the Area of Analysis for Recreation.

Name	Size	No. of Campgrounds	Recreational Activities Available											
			Sightseeing	Hiking	Picnic Areas	Fishing	Boating	OHV	Wildlife Viewing	Rock Climbing	Mountain Biking	Snow Play	Other	
Klamath National Forest	1.7 million acres	34	X	X	X	X	X	X	X	X	X	X	X	hunting, equestrian use, spelunking,
Fremont-Winema National Forest	2.3 million acres	40	X	X	X	X	X	X	X	X		X	X	hunting, equestrian use, backpacking, snowmobiling, leisure driving
Six Rivers National Forest	1 million acres	17	X	X	X	X	X	X	X			X	X	hunting, backpacking
Lava Beds National Monument	46,500 acres	1	X	X	X				X				X	spelunking
Crater Lake National Park	183,000 acres	2	X	X	X	X				X		X	X	swimming, snowshoeing, snow camping

Name	Size	No. of Campgrounds	Recreational Activities Available											
			Sightseeing	Hiking	Picnic Areas	Fishing	Boating	OHV	Wildlife Viewing	Rock Climbing	Mountain Biking	Snow Play	Other	
Klamath Marsh NWR	40,600 acres	0	X			X	X		X				X	waterfowl hunting, photography
Lower Klamath NWR	50,100 acres	0	X						X				X	waterfowl and pheasant hunting, photography, automobile touring
Upper Klamath NWR	23,100 acres	0	X		X	X	X		X				X	waterfowl hunting, photography
Redwood National and State Parks	132,000 (71,700 federal, 60,300 state) acres	4	X	X	X	X	X		X		X	X	X	Backpacking, tidepooling, bicycling, equestrian trails, scenic drives

Name	Size	No. of Campgrounds	Recreational Activities Available											
			Sightseeing	Hiking	Picnic Areas	Fishing	Boating	OHV	Wildlife Viewing	Rock Climbing	Mountain Biking	Snow Play	Other	
BLM - Cascade-Siskiyou National Monument	170,400 total, (113,000 BLM) acres	4	X	X		X	X	X	X		X	X	X	snowmobiling, equestrian use, hunting
BLM - Klamath Falls Resource Area	215,000 acres	8	X	X	X	X	X	X	X			X	X	Hang-gliding, rafting, swimming, snowmobiling

Sources: BLM 1995, 2018; NPS 2018a,b,c; USBR 2012b; USDA Forest Service 2018a,b,c; USFWS 2018a,b.
Key:
OHV: off-highway vehicle
NWR: National Wildlife Refuge
BLM: Bureau of Land Management

River-based Regional Recreation

A number of rivers cross the region, including four rivers designated as wild and scenic under the WSRA (Sprague, Sycan, Smith, and Trinity rivers). Portions of the Klamath River and its tributaries (further described below in Section 3.20.2.4 *Wild and Scenic River Conditions*), are designated as wild and scenic or have been deemed suitable and eligible for listing. Designated tributaries of the Klamath River include the Salmon River, Scott River, and Wooley Creek. These rivers provide a variety of recreational opportunities, including sightseeing, fishing, and whitewater boating. Figure 3.20-1 shows the location of these rivers relative to the Klamath River. Table 3.20-2 provides a summary of the rivers, the fish species caught, and the typical types of fishing methods (e.g., boat, bank, fly). Table 3.20-3 summarizes the whitewater boating opportunities in the region. These three tables show that there are a number of recreational opportunities outside of the Proposed Project area but within the region. The Oregon Wild and Scenic Rivers, in particular, have outstanding recreational and/or scenic values along the length of the designated segments. The California Wild and Scenic Rivers are classified as wild, scenic, and recreational along the length of the designated segments (National Wild and Scenic Rivers 2017).

Table 3.20-2. Rivers Providing Recreational Fishing Opportunities in the Region.

River	Fish Species Caught[1]	Common Types of Fishing
McCloud River	Native trout	Fly fishing, bank fishing
Pit River	Native trout; brown trout; smallmouth bass; rough fish	Fly fishing, bank fishing
Rogue River	Chinook salmon, steelhead	Drift boat, powerboat, fly fishing
Salmon River	Chinook salmon, steelhead, resident trout	Fly fishing, bank fishing
Scott River	Chinook salmon, steelhead, resident trout	Fly fishing, bank fishing
Smith River	Chinook salmon, steelhead	Drift boat, powerboat, fly fishing, bank fishing
Trinity River	Chinook salmon, steelhead, sturgeon, American shad, lamprey	Drift boat, powerboat, fly fishing, bank fishing
Upper Sacramento	Chinook salmon, native and stocked trout, American shad	Fly fishing, bank fishing
Klamath River	Redband trout, salmon	Fly fishing, bank fishing, drift boat

Sources: FERC 2007; Wild Waters Fly Fishing 2019a,b,c,d,e

[1] Wild Water Fly Fishing (2019a–e) for information on the McCloud River, Rogue River, Trinity River, Upper Sacramento River, and Klamath River.

Table 3.20-3. Rivers with Whitewater Boating Opportunities in the Region.

River	Generalized Use Levels	Boating Class Type[1]	Miles of Boatable Whitewater	Factors Affecting Use Levels
Clear Creek	Low	III–V	7	Difficult access
Klamath River (upstream of Oregon-California state line)	Moderate	III–IV+	31	Remote, not suited for beginner or intermediate boaters, unless accompanied by a commercial outfitter
Klamath River (downstream from Iron Gate Dam)	Moderate	II–V	122	Most skill levels, easy access, 186 miles support multi-day floats, shoreline camping, scenery, many outfitters, commercial use
North Umpqua River	Moderate	II–IV	32	Easy access, most skill levels, scenery, boatable year-round, shoreline suitable for camping
McCloud River	Moderate	II–IV	35	Proximity to I-5, most skill levels, low flows in summer
Pit River	Low	IV–V	34	Fragmented/short runs with long stretches of flat water between, remote location
Rogue River	High	II–V	100+	Easy access, most skill levels, scenery, boatable year-round, shoreline suitable for camping, many commercial outfitters
Salmon River	Moderate	II–V	44	Requires advanced/expert boating skills, commercial use
Scott River	Low	III–V	20	Recommended for expert boaters only
Smith River	Low	II–V	100+	Requires advanced/expert boating skills, low summer flows
Upper Sacramento River	Low	III–V	36	Proximity to I-5, average solitude
Trinity River	Moderate	II–V	100+	Most skill levels, easy access, commercial use

Sources: FERC 2007; H. Anderson, U.S. Bureau of Land Management, pers. comm., August 2019 for generalized use level in the Klamath River upstream of the Oregon-California state line.

[1] As rated by the American Whitewater International Scale of Difficulty (American Whitewater 2017).

Reservoir- and Lake-based Regional Recreation

Numerous opportunities for reservoir and lake-based recreation are available in the vicinity of the Proposed Project. Table 3.20-4 provides a summary of some of the comparable lakes and reservoirs in the region, including facilities and use levels. Within Klamath County and Jackson County in Oregon and Siskiyou County in California, there are more than 85 boatable lakes, containing approximately 40 boat ramps (Boat Escape 2017). The region also has more than 180 high-elevation and wilderness lakes in Siskiyou County (FERC 2007). In addition to boat ramps, these lakes provide nearly 2,300 developed campsites within a two-hour drive from the Lower Klamath Project reservoirs. Some reservoirs in the region are also stocked with trout or warm water fish such as perch or bass. Angling occurs at the many lakes and reservoirs in the region and many are known for having excellent fisheries.

Table 3.20-4. Comparison of Lower Klamath Project Reservoirs with Lakes and Reservoirs in the Region.

Lake or Reservoir	Distance from Nearest Subject Reservoir (road miles)	Surface Water (acres)[1]	Number of Developed Campsites	Number of Developed/ Improved Boat Launches	Number of Developed Picnic Areas	Generalized Use Levels[2, 3, 4]
Lower Klamath Project Reservoirs[5]						
J.C. Boyle	N/A	350	13	3	4	Moderate
Copco No. 1	N/A	972	0	2	2	Low
Copco No. 2	N/A	5.2	0	0	0	Low
Iron Gate	N/A	972	75	5	2	Moderate to Low
Other Lakes and Reservoirs in the Region[4, 6]						
Hyatt Reservoir	15	1,250	172	2	1	Moderate
Emigrant Lake	16	806	110	2	2	Moderate
Howard Prairie Reservoir	17	2,000	303	4	1	Moderate
Upper Klamath Lake	20	85,120	269	6	1	Moderate
Lake of the Woods	21	1,113	190	3	1	High
Fourmile Lake	26	740	25	1	0	Low
Agency Lake	28	5,500	43	3	0	Low
Applegate Reservoir	36	988	66	3	1	Low
Medicine Lake	46	408	77	1	3	Low-Heavy[7]
Gerber Reservoir	62	3,830	50	2	1	Moderate
Trinity Lake Unit	73	16,535	500	7	2	Moderate
Whiskeytown Lake	87	3,200	139	3	1	Moderate
Shasta Lake	87	29,500	320	7	7	High
Lost Creek Lake	78	3,430	202	1	2	N/A
Willow Lake	31	927	66	7	8	N/A
Willow Valley Reservoir	69	200	1	1	1	N/A

Lake or Reservoir	Distance from Nearest Subject Reservoir (road miles)	Surface Water (acres)[1]	Number of Developed Campsites	Number of Developed/ Improved Boat Launches	Number of Developed Picnic Areas	Generalized Use Levels[2, 3, 4]
Lake Siskiyou	46	160	1			N/A
Juanita Reservoir	14	55	23	2		N/A
McCloud Reservoir	58	520	6	1	1	N/A

Source: PacifiCorp 2004; Appendix B: *Definite* Plan, PacifiCorp 2015; Jackson County Parks 2017; USDA Forest Service 2017; H. Anderson, U.S. Bureau of Land Management, pers. comm., August 2019; T. Crist, Klamath County, Oregon, pers. comm., August 2019.
mi: miles
N/A: not available

1 The surface water area varies between reports. Dimensions used here are consistent with those presented in Appendix B: *Definite Plan*.

2 Generalized use is defined as the broad recreational use of an area with respect to the area's ability to support that use.

3 SHN Engineers and Geologists communications with H. Anderson are associated with Generalized Use for Other Lakes and Reservoirs (i.e., not with the Lower Klamath Project Reservoirs).

4 Jackson County Parks (2017) and USDA Forest Service (2017) provide information on developed facilities for Other Lakes and Reservoirs (i.e., not the Lower Klamath Project Reservoirs).

5 PacifiCorp (2015) provides information on developed facilities and generalized use for the Lower Klamath Project Reservoirs.

6 Stillwater Sciences communications with T. Crist, Klamath County, Oregon are associated with information on generalized use and developed facilities for Agency Lake and Medicine Lake.

7 General use levels vary widely depending on the time of year:

- Low use generally occurs between late October/early November through June. If not defined by the source then the assumption is that low use is less than 25 percent of capacity.
- Moderate use generally occurs early September through mid-October. If not defined by the source then the assumption is that moderate use is between 26 and 75 percent of capacity.
- High use generally occurs from early July through early September. If not defined by the source then the assumption is that high use is greater than 75 percent of capacity.

A small number of developed recreation facilities exist in the Upper Klamath Basin. The following paragraphs provide brief descriptions of each facility and the recreational opportunities available, to provide further context for the regional recreational setting.

Agency Lake is connected to the northern arm of Upper Klamath Lake. Although Agency Lake has no marina, there are two public boat launches and it has a fishery that features trophy redband trout. Other popular recreational activities at the lake are sightseeing, including wildlife viewing of waterfowl (and waterfowl hunting), otter, mink, deer, and bald eagles (Southern Oregon Directory and Guide 2017). The BLM's Wood River Wetland Management Area is on Agency Lake. As shown in Table 3.20-4, a number of campgrounds surround the lake.

Upper Klamath Lake is the largest freshwater body of water in Oregon. In the northern portion of the lake, Pelican Bay is known for its population of redband trout and is an extremely popular destination for fly-fishing. The bay is also a popular location for canoeing and kayaking, as well as sightseeing and wildlife viewing. Other popular activities in Upper Klamath Lake include sailing and waterfowl hunting. As shown in Table 3.20-4, there are numerous campgrounds and boat launches surrounding the lake.

The Link River segment of the Klamath River, an approximately 1-mile stretch downstream from Link River Dam (Figure 2.4-3), has only one developed recreational facility, the Link River Nature Trail. This 1.4-mile trail is for pedestrian use only and follows a gated access road on the west side of the Link River Bypass Reach. The Link River Nature Trail is popular for sightseeing, hiking, walking, jogging, trout fishing, and bird watching (FERC 2007; PacifiCorp 2019a).

The Keno Impoundment/Lake Ewauna (Figure 2.4-3) provides various recreational opportunities, including fishing, picnicking, boating, camping, sightseeing, and wildlife viewing. In the fall, waterfowl hunting is a popular activity at Keno Impoundment/Lake Ewauna. Although most of the land adjacent to the reservoir is privately owned, Lake Ewauna has several public access areas, including the City of Klamath Falls Veterans' Memorial Park/Boat Launch, Miller Island Boat Launch, the Klamath Wildlife Viewing Area, and the Keno Recreation Area and Campground (PacifiCorp 2004, 2015). Table 3.20-5 provides a summary of the facilities and estimated annual visitation and capacity as assessed by PacifiCorp as part of relicensing studies for the Klamath Hydroelectric Project (PacifiCorp 2004). Note that PacifiCorp (2004) represents the most recent survey data characterizing annual visitation and capacity for most recreational facilities in the Area of Analysis of recreation (exceptions noted, as appropriate).

Table 3.20-5. Keno Impoundment/Lake Ewauna Developed Recreation Facilities.

Site Name	Facilities	2001/2002 Est. Annual Use (User Days[1,2])	Est. Facility Use vs. Capacity
Klamath Falls Veterans' Memorial Park/Boat Launch (OR)	Boat launch, day-use area	42,500	Exceeding capacity
Miller Island Boat Launch and Klamath Wildlife Viewing Area (OR)	Boat launch, wildlife viewing trail, and a portable toilet	7,300	Approaching capacity
Keno Recreation Area and Campground (OR)	Campsites (26), day-use area, restrooms, boat launch and boarding dock	7,200	Below capacity[3]

Source: PacifiCorp 2004, FERC 2007, PacifiCorp 2015

Notes:

1 User days are defined as one visitor to a recreation area for any reason in a 24-hour period.

2 Data for PacifiCorp Klamath Hydroelectric Project Facility use was collected by PacifiCorp in 2001 and 2002. No more recently collected data exists or is available.

3 PacifiCorp (2015) reports data for the Keno Recreation Area and Campground only and generally estimates capacity utilization as follows:

- Boat launch areas at 30 percent
- Picnic areas at 17 percent
- Campsites at 17 percent

The Klamath Falls Veterans' Memorial Park provides a boathouse and boat launch ramp on the northern shoreline of Keno Impoundment/Lake Ewauna and is managed by the City of Klamath Falls, Department of Parks and Recreation. Along the northwestern end of the lake, the Klamath Wingwatchers Lake Ewauna Nature Trail provides opportunities for bird watching and hiking. This 1.8-mile trail connects Veterans' Memorial Park to the Link River trail, along the Link River to the north. Another trail is currently under construction on the northeastern side of the lake (Klamath Birding Trails 2017).

The Miller Island Boat Launch is on the east shore of Keno Impoundment/Lake Ewauna, approximately six miles south of Klamath Falls, and is managed by the Oregon Department of Fish and Wildlife. The facility is accessed by Miller Island Road, which runs three miles through the Klamath Wildlife Area and Miller Unit, and provides an entrance station area, parking area, wildlife viewing trail, and a

portable toilet. The Keno Recreation Area and Campground on the southwestern shore of the Keno Impoundment/Lake Ewauna provides a campground, day-use area, and boat launch. The campground has 26 developed campsites, restrooms, and a recreational vehicle (RV) dump station. Recreational opportunities in this area include camping, fishing, picnicking, sightseeing, and boating. The Keno Recreation Area consists of upper and lower use areas, with the upper area adjacent to the campground and the lower area adjacent to the boat launch (FERC 2007).

3.20.2.2 Klamath River-based Recreation

Upper Klamath River and the Hydroelectric Reach

Klamath river-based recreational facilities are only considered upstream to Keno Dam (i.e., inclusive of the Upper Klamath River). Upstream of Keno Dam, due to the flat topography, the influence/slackwater of Keno Reservoir extends almost to Upper Klamath Lake (FERC 2007).

Whitewater Boating Opportunities

In Oregon, the Upper Klamath River provides approximately five miles of river suitable for Class III whitewater boating, including a flatwater paddle upstream of J.C. Boyle Reservoir, however, not much boating use is reported for this reach. The reach is rated Class III difficulty and flows acceptable for whitewater boating opportunities range from 1,000 to 4,000 cfs (FERC 2007). The J.C. Boyle Bypass Reach includes about five miles of the Klamath River downstream from J.C. Boyle Dam and upstream of the J.C. Boyle Powerhouse. This reach provides Class III to IV+ rapids, and acceptable whitewater boating flows range from 1,300 cfs to 1,800 cfs; however, this reach is typically dewatered with only 100 to 300 cfs base flow due to J.C. Boyle bypass operations under existing conditions (FERC 2007). Therefore, the majority of the year there is almost no boating use on this stretch of the river.

The Spring Island boater access is adjacent to (downstream from) the J.C. Boyle Powerhouse and is managed by BLM. This site provides car-top whitewater boat launching and shoreline fishing access. The Klamath River Campground, managed by BLM, is about three miles downstream from the J.C. Boyle Powerhouse. The campground has three developed campsites and the shoreline which can be used for fishing and boater access.

Table 3.20-6 provides a summary of acceptable flow ranges for whitewater boating and other flow-dependent recreational activities in the Klamath River (from the Upper Klamath River to the ocean).

Table 3.20-6. Acceptable Flow Ranges for Various River-Based Activities for Reaches of the Klamath River.

River Reach (Length of Reach)	Activity	Low Value (cfs)[1]	High Value (cfs)[1]
Upper Klamath River (5.0 miles)	Whitewater Boating – Standard	1,000	4,000
	Play Boating	1,100	1,800
	Fishing	200	1,500
J.C. Boyle Bypass Reach (4.3 miles)	Whitewater Boating – Standard	1,300	1,800
	Fishing	200	1,000
Hell's Corner Reach (16.4 miles)	Whitewater Boating/Kayaking[2]	1,000	3,500
	Whitewater Boating/Commercial Rafting[2]	1,300	3,500
	Fishing[3]	200	1,500
Copco No. 2 Bypass Reach (1.3 miles)	Whitewater Boating	600	1,500
	Fishing	50	600
Iron Gate to Scott River (47 miles)	Whitewater Boating/Fishing	800	4,000
Scott River to Salmon River (76 miles)	Boating	800	7,000
	Fishing	800	4,000

River Reach (Length of Reach)	Activity	Low Value (cfs)[1]	High Value (cfs)[1]
Salmon River to Trinity River (23.1 miles)	Whitewater Boating/Fishing	800	10,000
Trinity River to Ocean (43.4 miles)	Whitewater Boating/Fishing	1,800	18,000

Source: Appendix R of USBR 2012b.

Notes:

1 Values were determined by the Secretarial Determination Recreation Sub-team (2010) from relicensing documents (PacifiCorp 2004, FERC 2007) and consultation with USDA Forest Service and BLM representatives.

2 Flows are within the desirable range during the daily peak hydroelectric operations period (between 10:00 AM and 2:00 PM).

3 Flows are within the desirable range for at least 4 hours during the daily non-peak hydroelectric operations period (either between 5:00 AM and 11:00 AM or between 3:00 PM and 9:00 PM).

Key:

cfs: cubic feet per second

Within California, whitewater boating opportunities are provided on the Hell's Corner Reach of the Klamath River Hydroelectric Reach, and the Copco No. 2 Bypass Reach. The Hell's Corner Reach from J.C. Boyle Reservoir to Copco No. 1 Reservoir extends about 16.4 river miles. Several public fishing and boat access areas exist along this reach, as summarized in Table 3.20-7. A 2002 recreation survey indicated that whitewater boating is the most common activity among respondents between J.C. Boyle Dam and Copco No. 1 Reservoir (PacifiCorp 2004).

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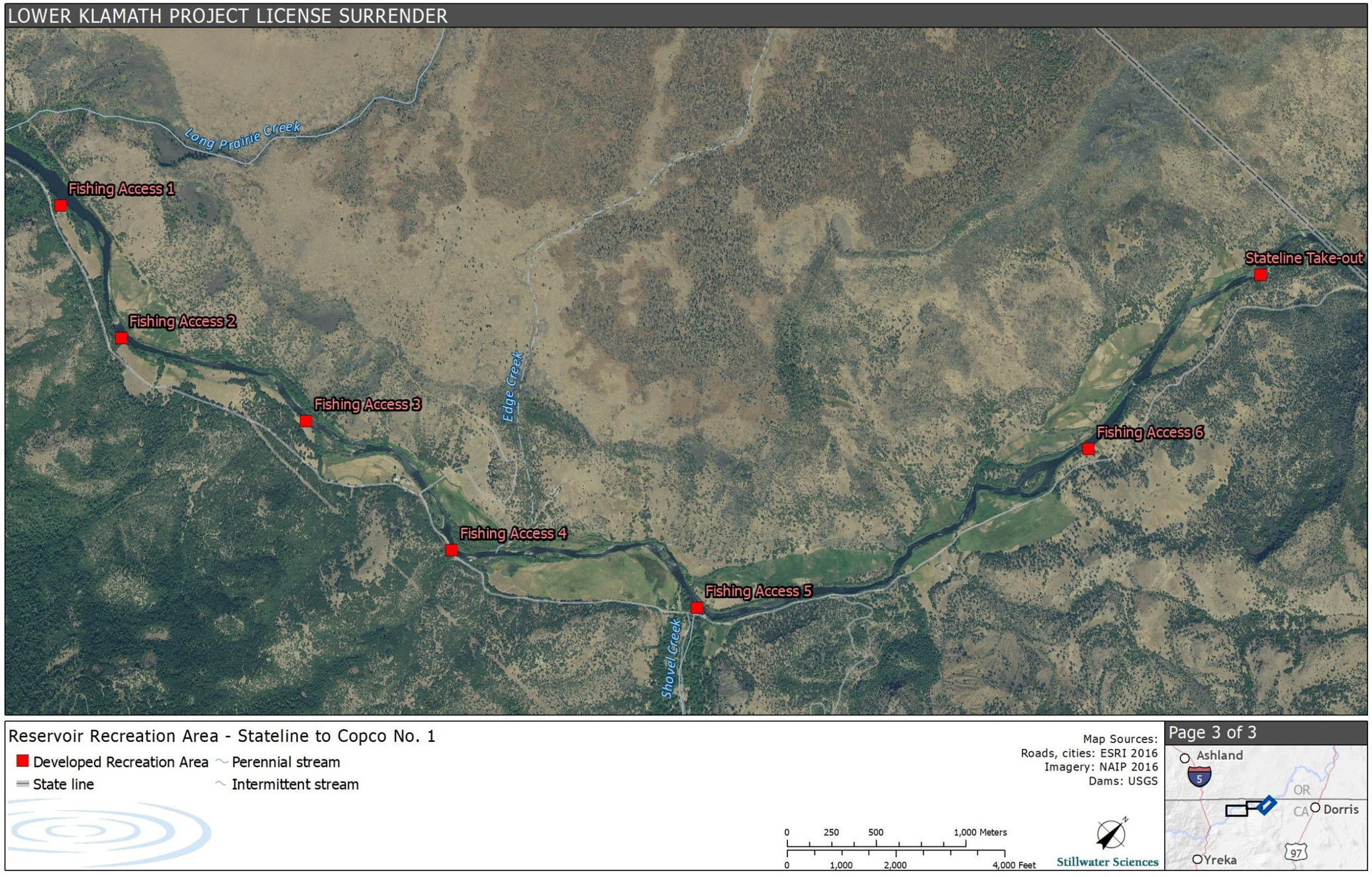

Figure 3.20-2a. California Stateline to Copco No. 1 Reservoir Recreation Area. Data source: PacifiCorp 2004.

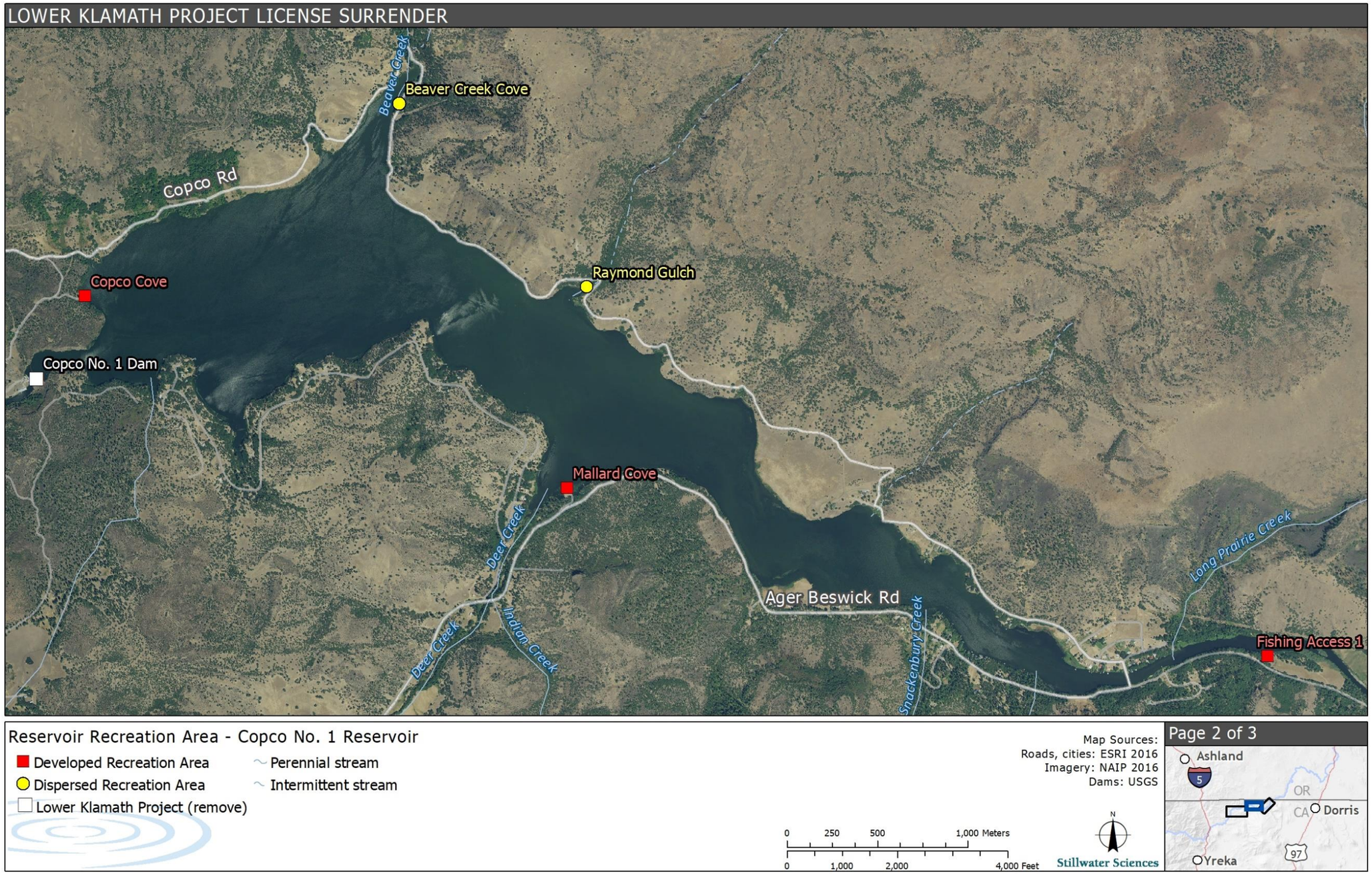

Figure 3.20-2b. Copco No. 1 Reservoir Recreation Area. Data source: PacifiCorp 2004.

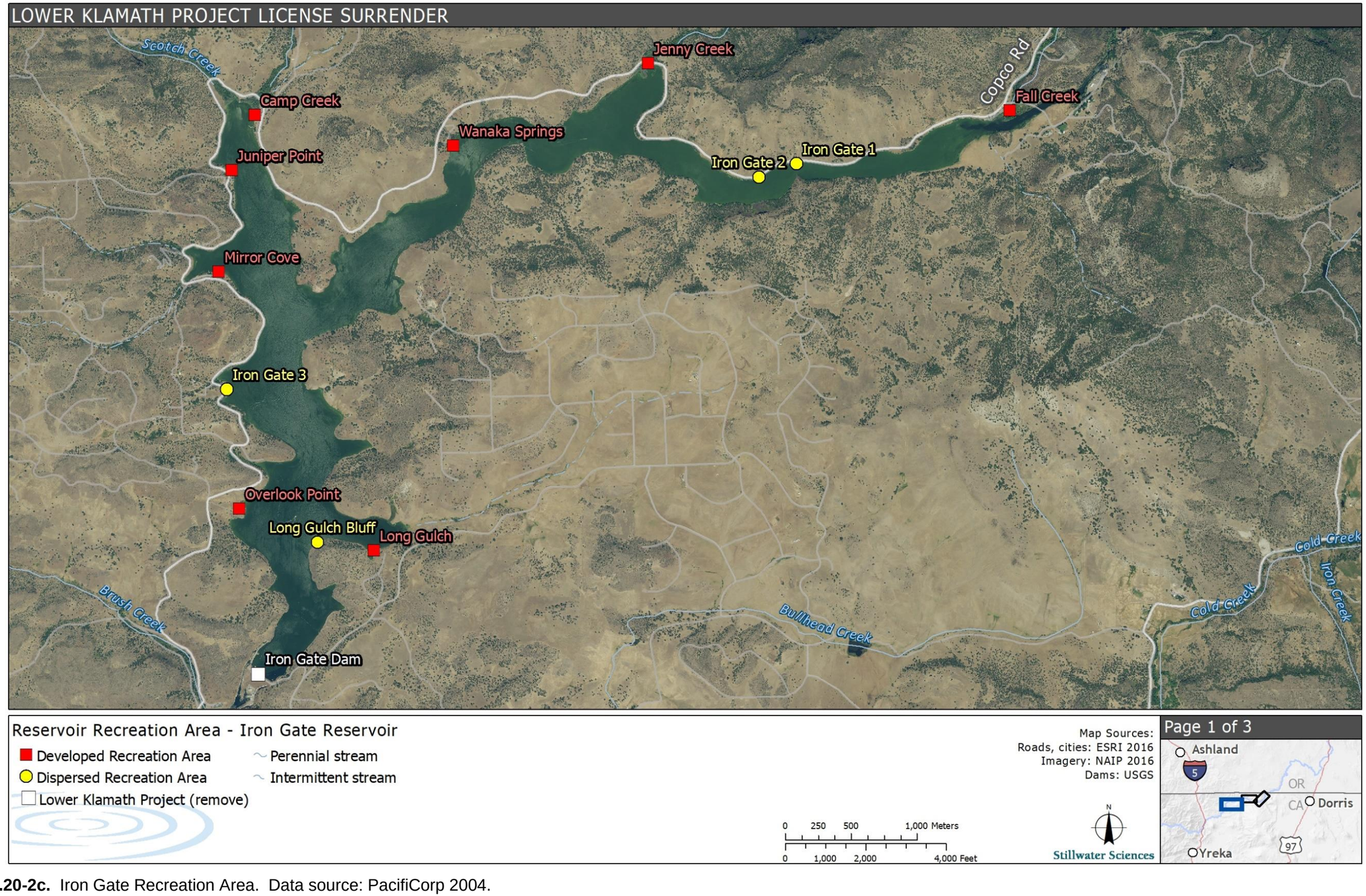

Figure 3.20-2c. Iron Gate Recreation Area. Data source: PacifiCorp 2004.

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Table 3.20-7. Hell's Corner Reach Developed Recreation Facilities.

Site Name[1]	Facilities	2001/2002 Est. Annual Use (Recreation days)	Est. Facility Use vs. Capacity
Spring Island Boater Access	Launch area, shoreline fishing access, restrooms	5,200	Moderate to nearly exceeding capacity[2]
Klamath River Campground	Campsites (3), picnic area, shoreline fishing and boating access, restrooms	1,000	Moderate to High[3]
Oregon-California State Line Take-out	Boat put- in/take-out, shoreline fishing access, restrooms	2,700	Approaching capacity
Fishing Access Sites 1–6	Shoreline fishing access, parking	3,600	Below capacity

Source: PacifiCorp 2004, FERC 2007, H. Anderson, U.S. Bureau of Land Management, pers. comm., August 2019.

[1] Stillwater Sciences communications with H. Anderson associated with information on facilities and use estimates for all sites except Fishing Access Sites 1–6.

[2] Moderate on weekdays and nearly exceeding capacity during weekends and holidays.

[3] Moderate on weekdays and high during weekends and holidays.

The State line take-out access area of the Hell's Corner Reach, at the Oregon/California State line, includes upper and lower areas and is co-managed by BLM and PacifiCorp. The facility provides shoreline fishing and boat launching access. The fishing access sites provide access to the Klamath River in six locations between the State line take-out access area and Copco No. 1 Reservoir.

BLM manages whitewater boating use in the Hell's Corner Reach, a 16.4-mile reach from below J.C. Boyle Reservoir to the Fishing Access Site 1 take-out (see Figure 3.20-2a). This reach provides Class III to IV+ rapids during daily peaking flows from the PacifiCorp hydropower operations (between 10:00 AM and 2:00 PM), and acceptable whitewater boating flows range from 1,300 cfs to 3,500 cfs for commercial rafting and heavier loaded boats. Acceptable minimum flows for kayaking and private boaters are 1,000 cfs. Due to J.C. Boyle bypass operations, flow rates within this reach do not meet the acceptable range to create or enhance whitewater boating opportunities outside of the daily peaking flows (i.e., typical base flow ranges from 100 to 300 cfs).

Whitewater boating use occurs typically during April through October, with peak season during June to August. Commercial boating use is allowed by permit only. Currently, there is a set of nine commercial boating permits. There are no limits to the number of clients or trips allowed by commercial permits or restrictions to private boating capacity. In 2018, eight commercial boating permits were issued, which resulted in 2,001 user days. Although there was one additional permit issued for 2019, user days are anticipated to remain within 10 percent of the 2018 total (H. Anderson, U.S. Bureau of Land Management, pers. comm., August 2019). Factors that constrain the carrying capacity of the reach are vehicle congestion at the take-out locations near Copco No. 1 Reservoir and the limited size and number of areas that are available to scout rapids (FERC 2007).

The Copco No. 2 Bypass Reach is approximately 1.3 miles long, extending from Copco No. 2 Dam to the Copco No. 2 Powerhouse and whitewater boating opportunities are limited due to lack of flow. However, the reach could provide Class IV whitewater opportunities at acceptable flows ranging from 600 to 1,400 cfs (Appendix S).

Fishing Opportunities

In Oregon, fishing is allowed from September 30 until June 16 on the Klamath River downstream from Link River Dam. The highest use in this area occurs from late winter through spring; this area is mainly used by Klamath Falls residents. At lower flow times, anglers use the river at a few sites where there is access for bank fishing through thick riparian vegetation. Catch records indicate that although angler success is consistently low, there is a greater percentage of larger fish caught in the upstream reach than between J.C. Boyle Dam and the state line. Table 3.20-6 summarizes flows acceptable for fishing opportunities in the various reaches of the Klamath River.

PacifiCorp conducted a visitor use survey in 2002 to obtain information on existing visitor demand, needs, and recreational activities within the area between J.C. Boyle Reservoir and Iron Gate Dam. The results of the survey indicated that 33 percent of visitors to the area participate in bank fishing, both along the river and reservoirs. Survey respondents also indicated that fishing for trout on river reaches in this area is considered very good, and one of the two most popular reaches for fishing opportunities includes the J.C. Boyle Bypass Reach downstream from J.C. Boyle Dam. Opportunities for trout fishing also exist downstream of J.C. Boyle Powerhouse (Hell's Corner Reach). This reach (between J.C. Boyle Powerhouse and the state line) is popular with anglers, and catch records indicate good angler success, although fish size is typically smaller than fish caught below Keno Dam and rarely exceeds 16 inches (FERC 2007). Note that the prior Klamath Hydroelectric Project relicensing studies represent the most recent survey data characterizing annual visitation and capacity for most recreational facilities in the Area of Analysis of recreation (exceptions noted, as appropriate). River flow and fish habitat conditions have not changed

significantly since 2002, such that the level of recreational activities in, and general public use of, this reach are also likely to be generally the same.

Recreational opportunities downstream from Hell's Corner Reach, between the California/Oregon state border and Iron Gate Dam, are quite popular for angling. In 1974, a 6-mile reach of the Klamath River, from the California/Oregon state line to Copco No. 1 Reservoir (not including tributaries), was designated as Wild Trout Waters by the State of California and is managed under the Wild Trout Program (CDFW 2017) (see also Section 3.3 *Aquatic Resources*). Demand for recreational angling is high in this area. However, the Klamath River between the Copco No. 1 and Iron Gate developments has limited public access and no documented fishing activity.

In California, the Lower Klamath Project dams impound three waterbodies on the Klamath River: Copco No. 1, Copco No. 2, and Iron Gate reservoirs. Since Copco No. 2 is small with a surface area of only about 40 acres and contains no recreational facilities, the discussion focuses on Iron Gate and Copco No. 1 reservoirs. In addition to these reservoirs, there is a stretch of un-impounded river between the California-Oregon state line, and Copco No. 1 Reservoir. There is also a small (approximately 1.5-mile) stretch of river in between Copco No. 2 Dam and Iron Gate Reservoir. Figures 3.20-2(a), (b), and (c) show the locations of these waterbodies, and Section 3.20.2.3 *Lower Klamath Project Reservoir-based Recreation* describes recreational opportunities at each of these areas.

Middle and Lower Klamath River

The USDA Forest Service (Klamath and Six Rivers National Forests) manages the majority of the Klamath River corridor from downstream from Iron Gate Dam to the confluence with the Trinity River. Other areas downstream from Iron Gate Dam are also managed by the NPS, BLM, tribes, and private landowners. Table 3.20-8 summarizes the river-based recreational opportunities available on the Klamath River downstream of Iron Gate Dam.

Table 3.20-8. River-Based Recreation Opportunities in the Middle Klamath River, Between Iron Gate Dam and the Confluence with the Trinity River.

Reach	Length (miles)	Current Recreation Opportunities
Iron Gate Dam to Shasta River	13	Sightseeing, fishing (especially from boats), tubing and swimming, whitewater boating (rare), waterplay
Shasta River to Scott River	34	Sightseeing, fishing, canoeing, whitewater boating, locational playboating, waterplay
Scott River to Indian Creek	36	Sightseeing, fishing, canoeing, whitewater boating, waterplay
Indian Creek to Salmon River	40	Sightseeing, fishing, whitewater boating, canoeing, hiking, waterplay
Salmon River to Trinity River	40	Sightseeing, fishing, waterplay

Source: PacifiCorp 2004; PacifiCorp 2019b

There are two privately developed recreation facilities located along the Middle Klamath River a few miles downstream of Iron Gate Dam. The R Ranch Klamath River Campground is located a few miles east of Cottonwood and I-5 and 2.5 miles downstream from Iron Gate Dam along 1.7 miles of the Middle Klamath River. This campground contains 156 campsites with a large lodge/recreation center and provides opportunities to fish, hunt, and view natural scenery and wildlife. And the Klamath Ranch Resort Blue Heron RV Park is located along the Klamath River 1.5 miles downstream of Iron Gate Dam. This campground features 26 campsites, several accessory structures, a fly-fishing school casting pond, historic restaurant, and boat launch.

In addition, there are two National Forest Scenic byways located along the Middle Klamath River and within the Klamath and Six Rivers National Forests. The “State of Jefferson” National Forest Scenic Byway is located primarily on California State Highway 96 (State Highway 96) between Shasta River to Happy Camp, and the “Bigfoot” National Forest Scenic Byway is located on Highway 96 from Happy Camp to California State Highway 299 (State Highway 299). There is also an “All America Road,” the Volcanic Legacy Scenic Byway, which goes from Lassen National Park in California and through the project area via Highways 97, 140, and 62 on its way to Crater Lake National Park in Oregon. These byways provide excellent views for sightseers within the Klamath and Six Rivers National Forests and access to numerous other recreational activities (America’s Scenic Byways 2017).

Downstream of the Trinity River confluence, the Lower Klamath River flows through the Yurok, Hoopa, and Resighini Indian Reservations and Redwood National Park, as well as through public lands managed by the BLM and privately-owned lands. A number of private RV and tent campgrounds are along

the river in Redwood National Park, and just outside of the park in the City of Klamath. These campgrounds provide opportunities for bank fishing, camping, and picnicking. Other recreation opportunities in the area are associated with Redwood National and State Parks, which includes Jedediah Smith, Del Norte Coast, and Prairie Creek Redwood state parks and Redwood National Park, which offer hiking, hunting, wildlife viewing, and other recreational opportunities. (See Table 3.20-1 for a summary of the facilities associated with these parks.)

Public Health Issues

As discussed in Section 3.2.2.7 *Chlorophyll-a and Algal Toxins*, concentrations of chlorophyll-*a* and *Microcystis aeruginosa* have exceeded World Health Organization guidelines for protection from adverse effects in recent years, in both Copco No. 1 and Iron Gate reservoirs, as well as reaches of the Klamath River downstream from Iron Gate Dam. In 2005, 2008, 2009, 2010, 2012, 2013, 2014, 2016, and 2017, the North Coast Regional Board, Karuk Tribe, Yurok Tribe, USEPA, and other local, state, and federal agencies issued warnings to residents and recreational users of the reservoirs and river to use caution near these algal blooms due to possible health effects of exposure to *Microcystis aeruginosa* and its microcystin toxin (see also Section 3.4.2.3 *Hydroelectric Reach*) (Kann and Corum 2006, 2009; North Coast Regional Board 2009, 2010, 2012a, 2013, 2014, 2016, 2017a). Effects range from mild, non-life-threatening skin conditions to permanent organ impairment and death, depending upon exposure time and intensity (FERC 2007). As identified in comments received during the scoping period for the 2012 KHSA EIS/EIR, as well as in PacifiCorp's recreation survey in 2002, these water quality issues and public health warnings have resulted in reduced recreational activity in affected river segments in recent years.

Recently, PacifiCorp has been testing the use of an intake barrier/thermal curtain installed in 2015 at Iron Gate Dam to limit the downstream release of high concentrations of blue-green algae [cyanobacteria] and associated algal toxins (e.g., microcystin) from in-reservoir summer and fall algal blooms. The intake barrier/thermal curtain acts as an obstacle that generally restricts the intake zone for Iron Gate Dam, so the intake preferentially withdraws water from the deeper portions of the reservoir with lower blue-green algae [cyanobacteria] concentrations and cooler water. However, the intake barrier/thermal curtain effectiveness is dependent on stratification in the reservoir, so higher water flow or other mixing conditions that reduce reservoir stratification also notably decrease the performance of the intake barrier/thermal curtain. Additionally, the intake barrier/thermal curtain effectiveness is limited when there are low dissolved oxygen concentrations in the deeper reservoir waters that require raising the curtain to meet dissolved oxygen water quality standards downstream of Iron Gate Dam. Blue-green algae [cyanobacteria] and microcystin releases downstream into the Klamath River were reduced when the intake barrier/thermal curtain was in use during 2015 and 2016, but there were still exceedances of posting limits for algal toxins downstream of Iron Gate Dam during 2017 and

2018 (see Section 3.2.2.2 *Water Temperature* and Section 3.2.2.7 *Chlorophyll-a and Algal Toxins* for further discussion) (PacifiCorp 2016, 2017; Watercourse Engineering, Inc. 2016, 2017, 2018, 2019).

Whitewater Boating Opportunities
Extensive whitewater boating opportunities exist downstream from Iron Gate Dam. Depending on the river segment and level of flow, there are opportunities for play, standard, and big water boating on Class II and III waters (American Whitewater 1998). These runs are boatable in rafts, kayaks, inflatable kayaks, and open canoes. Table 3.20-6 summarizes the acceptable flow ranges for all reaches within the area of effect, including downstream from Iron Gate Dam.

Although not as challenging as the Hell's Corner Reach upstream, there are a few rapids that are sometimes rated Class IV, including Hamburg and Upper Savage on the Otter's Playpen run, Rattlesnake on the day-use run below Happy Camp, and Dragon's Tooth between Ferry Point and Coon Creek Access. There is also a well-known kayak playboating wave known as the "School House Wave" between Skehan Bar and Gottville. This wave is typically available during low to moderate summer flows and is popular with local kayakers from the Mount Shasta, Klamath Falls, and Ashland areas (PacifiCorp 2004). There is also a Class V-VI rapid at Ishi Pishi Falls (Somes Bar) that boaters are strongly advised to portage around due to its cultural significance to local tribes (American Whitewater 2017).

The primary whitewater boating season is in summer (June through August), when water temperatures are warm; however, the Klamath River can be boated in most months of the year. There is less whitewater rafting downstream from the Trinity River confluence after the river turns northwest into strong prevailing winds. There are fewer developed river access points along this reach than in the reaches upstream. This reach is located within the boundaries of the Yurok Tribe Indian Reservation. Data collected by the USDA Forest Service and BLM indicate that substantially more whitewater boating occurs on the Klamath River downstream of Iron Gate Dam than in the Klamath River upstream to J.C. Boyle Dam. From 1994 through 2009, the average annual number of user days was 14,392 per year. However, whitewater boating in this portion of the Klamath River has decreased somewhat in recent years. Total user days from 2000 through 2003 ranged from 13,976 to 15,349 per year, whereas from 2005 through 2009, total user days ranged from 11,751 to 15,279 per year (DOI 2011).

Fishing Opportunities
The Klamath River downstream from Iron Gate Dam has high quality angling opportunities extending nearly 200 miles to the Pacific Ocean and is open to fishing year-round. This reach, designated a wild and scenic river (see Section 3.20.2.4 *Wild and Scenic River Conditions* below), attracts and supports several fishing outfitter services that focus on salmon, steelhead, and trout fisheries. A review of outfitters conducted as part of the Secretarial Determination process

identified over 50 outfitters providing sport fishing, boat fishing, and/or fly-fishing trips on the Klamath River. Twenty-seven river access sites within the Klamath National Forest provide access for fishing in this section of the river. Use at the sites varies; however, most are rated as light usage (Klamath National Forest 2017). Tables 3.20-9 and 3.20-10 provide available use data for Chinook salmon and steelhead fishing on the Klamath River. As shown in Table 3.20-9, angler success for Chinook salmon has varied annually.

Table 3.20-9. Estimated Number of Recreational Salmon Angler Hours and Chinook Salmon Harvest on the Klamath River (excluding the Trinity River), 2001–2018.

Year[1]	# Angler Hours	Average Hours Per Trip	Chinook Salmon Harvest (# Fish)	Chinook Salmon Harvest (# Fish)	Chinook Salmon Harvest (# Fish)
			Adults	Grilse (Jacks)	Total
2001	88,053	4.4	9,621	1,365	10,986
2002	85,925	4.7	9,769	651	10,420
2003	79,228	4.8	7,322	589	7,911
2004	71,397	4.7	3,463	2,293	5,756
2005	61,000	4.8	1,029	912	1,941
2006	41,792	4.7	57	5,202	5,259
2007	64,101	4.6	4,975	257	5,232
2008	56,005	5.2	1,560	4,039	5,599
2009	67,160	4.6	4,820	2,033	6,853
2010	58,842	5.1	2,610	1,570	4,180
2011	56,759	4.8	3,019	8,738	11,757
2012	87,748	5.0	11,837	3,802	15,639
2013	102,381	4.6	18,628	2,212	20,840
2014	60,376	4.8	4,464	3,190	7,654
2015	77,228	4.6	7,798	1,580	9,315
2016	36,651	4.6	162	1,310	1,472
2017	16,678	4.1	42	71	113
2018	44,204	4.3	2,206	4,075	6,281
01–05Avg	77,121	4.7	6,241	1,162	7,403
06–10Avg	57,580	4.8	2,804	2,620	5,425
11–15Avg	76,898	4.8	9,149	3,904	13,053
16–18Avg	32,511	4.3	803	1,819	2,622

Sources: CDFW 2016, NMFS 2011, CDFW 2018, Troxel and Lindke 2019.
Notes:
[1] CDFW (2018) provides Chinook Salmon Harvest Data for 2016 through 2018.

Table 3.20-10. Estimated Number of Recreational Steelhead Angler Days on the Klamath River (excluding the Trinity River), 2003–2008.

Year	# Angler Days
2003	19,183
2004	14,345
2005	13,216
2006	19,371
2007	15,622
2008	21,192
03-08Avg	17,155

Source: NMFS 2011

Downstream from the Trinity River confluence, angling in the Klamath River is dependent on the annual status of the fall-run Chinook salmon run, so the number of businesses that offer angling guide services varies from year to year with the Chinook salmon population size. The main run of Klamath River Chinook salmon peaks in late fall and is normally over by mid-January each year; the steelhead season generally starts in November and runs through March (see also Section 3.3 *Aquatic Resources*).

Anglers fish from boats and the bank. Most of the boat fishing occurs from drift boats or rafts. Fishing regulations allow anglers to keep up to five trout per day and most of the fishing activity occurs in summer and fall. Quotas and limits on salmon and steelhead have varied over the years, and regulations may depend on whether the fish are wild or from a hatchery.

3.20.2.3 Lower Klamath Project Reservoir-based Recreation

As there are no reservoirs located on the Klamath River downstream of Iron Gate Dam, the following discussion of reservoir-based recreation focuses on the Lower Klamath Project reservoirs located in the Hydroelectric Reach from J.C. Boyle Reservoir to Iron Gate Dam.

Hydroelectric Reach

J.C. Boyle Reservoir

J.C. Boyle Reservoir has a surface area of approximately 420 acres and is about 3.6 miles long. Developed public recreational facilities at the reservoir include Pioneer Park, Sportsman's Park, and Topsy Campground (Table 3.20-11). See Appendix B: *Definite Plan - Appendix C,* Figure 5.1-1, Sheets 2-3, for locations of these recreational facilities.

Table 3.20-11. J.C. Boyle Reservoir Developed Recreation Facilities.

Site Name	Ownership	Facilities[1]	2001/2002 Est. Annual Use	Est. Facility Use vs. Capacity
Pioneer Park	PacifiCorp	Picnic areas, boat launches, interpretive signs, restrooms	16,700	Below capacity
Topsy Campground	BLM	Campsites (13), an RV dump, one day-use areas, a boat launch with boarding dock, an accessible fishing pier, restrooms	5,600	Moderate to nearly exceeding capacity[2]
Sportsman's Park	Klamath County	Shooting ranges, dirt racetracks, archery courses, a model aircraft flying field, off-highway vehicle area, restrooms	12,600	Below capacity

Source: PacifiCorp 2004, FERC 2007, PacifiCorp 2019b, BLM 2019, H. Anderson, U.S. Bureau of Land Management, pers. comm., August 2019.

[1] PacifiCorp (2019a) and BLM (2019a) cover facilities information only.

[2] Stillwater Sciences communication with H. Anderson provides estimates on facility use versus capacity for Topsy Campground only. This use was estimated as moderate on weekdays and nearly exceeding capacity during weekends and holidays.

Pioneer Park is owned and operated by PacifiCorp and it lies off Oregon State Highway 66 (State Highway 66) east and west of Spencer Bridge. Pioneer Park is a day-use area that provides picnic areas, boat launches, interpretive signs, and two restroom facilities. It has an improved boat ramp on the east shore just off State Highway 66, and a picnic area and unimproved boat launch on the west shore. Popular activities at this location include sightseeing, boating, fishing, swimming, and picnicking (PacifiCorp 2004, 2019b).

Topsy Campground is managed by BLM. The campground is south of State Highway 66 off Topsy Grade Road, a gravel road maintained on an as-needed basis by BLM, private owners, timber companies, and PacifiCorp. This site features a campground with 13 campsites, an RV dump, one day-use area, a boat launch with boarding dock, an accessible fishing pier, and two restroom facilities. The campground is available to the public and BLM charges fees for day-use and camping at this facility (PacifiCorp 2004; BLM 2019).

Sportsman's Park, approximately 0.25-mile east of the reservoir, is a multi-use recreation area owned by Klamath County and leased long term to Klamath Sportsman's Park Association. The park does not provide developed reservoir access, but it does provide river access for fishing. The park contains shooting ranges, dirt racetracks, archery courses, and a model aircraft flying field. The park also has facilities for self-contained RVs and some tent camping. Annual membership passes and single-day passes for use of the park are available to the general public for a fee (PacifiCorp 2004, Sportsman's Park 2017).

In California, the Lower Klamath Project dams impound three waterbodies on the Klamath River: Copco No. 1, Copco No. 2, and Iron Gate reservoirs. In addition to these reservoirs, there is a stretch of un-impounded river between J.C. Boyle Reservoir and Copco No. 1 Reservoir. Figures 3.20-2(a), (b), and (c) show the locations of these reservoirs, and the following sections describe recreational opportunities at each of these areas.

Copco No. 1 Reservoir

Copco No. 1 Reservoir, with a surface area of approximately 1,000 acres and about 4.5 miles long, has two publicly available day-use facilities—Mallard Cove and Copco Cove—that are owned and operated by PacifiCorp. These facilities provide day-use access to the reservoir, and although they are not official campgrounds, camping occasionally occurs at both locations. Copco No. 1 Reservoir currently provides a recreational fishery for non-native fishes including largemouth bass, trout, catfish, crappie, sunfish, and especially yellow perch (Hamilton et al. 2011). Table 3.20-12 summarizes the existing facilities and estimated use during 2001/2002 at both of these areas.

Table 3.20-12. Copco No. 1 Reservoir Developed Recreation Facilities.

Site Name	Facilities[1]	2001/2002 User Days[2,3]	Est. Facility Use vs. Capacity
Mallard Cove	Picnic area, restrooms, boat launch with boarding dock	7,600	Below capacity
Copco Cove	Picnic area, restrooms, boat launch with boarding dock	1,250	Below capacity

Source: PacifiCorp 2004, FERC 2007, PacifiCorp 2019b
Notes:

1 PacifiCorp (2019b) provides details on the facilities available at each site.

2 User days are defined as one visitor to a recreation area for any reason in a 24-hour period. Estimated use was during the 2001/2002 study period (PacifiCorp 2004). Note that the prior Klamath Hydroelectric Project relicensing studies represent the most recent survey data characterizing annual visitation and capacity for most recreational facilities in the Area of Analysis of recreation (exceptions noted, as appropriate).

3 Although annual user data from 2001/2002 represent the most comprehensive information available, these data were collected prior to data characterizing seasonal blue-green algae [cyanobacteria] blooms in Iron Gate Reservoir became available (see also Section 3.4.2.3 *Hydroelectric Reach*) and prior to the freshwater CyanoHABs Program that began posting of public health advisories for California reservoirs that exceed algal toxin thresholds.

Mallard Cove, on the south shore of Copco Reservoir, is accessed off Ager-Beswick Road and includes day-use facilities, two restrooms, and a boat launch with boarding dock. Copco Cove, on the western shoreline of Copco Reservoir, off of Copco Road, has a small picnic area, two restrooms, and a boat launch with boarding dock (PacifiCorp 2004, 2019b).

Additionally, homes on Copco Lake provide private recreational access, including docks for fishing, boating, swimming and birdwatching.

Copco No. 2 Reservoir

Copco No. 2 Reservoir is relatively small (with a surface area of approximately 5.2 acres [PacifiCorp 2015] and about 0.3-mile long) and has a narrow configuration with steep and difficult shoreline access. Copco No. 2 Reservoir has no recreational facilities and no public access (FERC 2007, PacifiCorp 2015).

Iron Gate Reservoir
Iron Gate Reservoir has a surface area of approximately 944 acres and is 6.8 miles long. The reservoir has the highest concentration of recreation sites of all the developments associated with the PacifiCorp facilities. The developed facilities at Iron Gate Reservoir are owned and managed by PacifiCorp and include a trail (Fall Creek Trail), five combination day-use and campground areas (Jenny Creek, Camp Creek, Juniper Point, Mirror Cove, and Long Gulch), three day-use areas (Fall Creek, Overlook Point, and Wanaka Springs), and a fish hatchery and associated day-use area (Iron Gate). Recreational opportunities include sightseeing, swimming, fishing, boating, and day and overnight use. Iron Gate Reservoir currently provides a recreational fishery for non-native fishes including largemouth bass, trout, catfish, crappie, sunfish, and especially yellow perch (Hamilton et al. 2011). Summer and weekend use is high at the reservoir due to the popularity of bass tournaments, waterskiing, and camping.
Table 3.20-13 summarizes the developed recreation facilities at the reservoir.

The Fall Creek Day-Use Area is at the upper end of the reservoir and includes a four-site picnic area, unimproved boat launch access, and restroom facilities (PacifiCorp 2019b). This small day-use area is adjacent to the CDFW Fall Creek Fish Hatchery and provides access to Fall Creek Trail. Fall Creek Trail is a short (0.1-mile) trail located adjacent to the Fall Creek Fish Hatchery where visitors can hike up to Fall Creek Falls.

Wanaka Springs Day-Use Area provides six picnic sites, a fishing dock, restroom facilities, hiking trail, and some informal camping occurs in the area (PacifiCorp 2019b).

Table 3.20-13. Iron Gate Reservoir Developed Recreation Facilities.

Site Name	Facilities[1]	2001/2002 Est. Annual Use (User days)[2]	Est. Facility Use vs. Capacity
Fall Creek Day-Use Area and Fall Creek Trail	Picnic sites (4), boat launch access, restrooms, hiking trail	4,150	Below capacity
Overlook Park	Picnic sites (2), restrooms	1,900	Below capacity
Wanaka Springs Day-Use Area	Picnic sites (6), boat dock/fishing pier, restrooms, hiking trail	4,150	Exceeding capacity
Jenny Creek Day-Use Area and Campground	Picnic sites (5), fishing access, restrooms	3,700	Approaching capacity

Site Name	Facilities[1]	2001/2002 Est. Annual Use (User days)[2]	Est. Facility Use vs. Capacity
Camp Creek Day-Use Area and Campground	Campsites (22), large overflow camp area, , boarding and fishing docks, swimming area, a RV dump station, sports field, interpretive display restrooms	15,250	Exceeding capacity
Juniper Point Day-Use Area and Campground	Campsites (9), swimming beach, restrooms	4,700	Exceeding capacity
Mirror Cove Day-Use Area and Campground	Campsites (10), a boat launch, restroom	11,140	Exceeding capacity
Long Gulch Day-Use Area and Campground	Picnic sites (2), boat launch, restrooms	5,200	Below capacity
Iron Gate Fish Hatchery[3]	Picnic area, picnic shelter, visitor center/interpretive kiosk, restrooms, trail to river	450	Below capacity

Sources: PacifiCorp 2004, FERC 2007; PacifiCorp 2019b, H. Anderson, U.S. Bureau of Land Management, pers. comm., August 2019; P. Brock, California Department of Fish and Wildlife, pers. comm., August 2019.

1 PacifiCorp (2019b) provides information on facilities available at each site, excluding Iron Gate Fish Hatchery.

2 Although annual user data from 2001/2002 represent the most comprehensive information available, these data were collected prior to data characterizing seasonal blue-green algae [cyanobacteria] blooms in Iron Gate Reservoir became available (see also Section 3.4.2.3 *Hydroelectric Reach*) and prior to the freshwater CyanoHABs Program that began posting of public health advisories for California reservoirs that exceed algal toxin thresholds.

3 Stillwater Sciences communications with P. Brock , California Department of Fish and Wildlife, covers information for Iron Gate Fish Hatchery.

Overlook Point is on the west side of the reservoir, approximately 0.75-mile upstream of Iron Gate Dam. The facility has picnic sites and restrooms on moderately steep topography, providing a good view of the reservoir and surrounding landscape (PacifiCorp 2019b).

Jenny Creek Day-Use Area includes five picnic sites, fishing access, and a restroom facility. Jenny Creek is on the north side of the reservoir and provides a creekside setting for picnicking and bank fishing (PacifiCorp 2019b).

Camp Creek Day-Use Area and Campground is along a narrow reach on the north side of Iron Gate Reservoir. The surrounding hilly, semi-arid landscape and the reservoir provide pleasant views. Camp Creek Campground has 22 campsites designed primarily for RV campers, with a large overflow RV/tent camping area. The facility also has three boat docks/fishing piers, a double lane boat ramp, and restrooms (PacifiCorp 2019b).

Juniper Point Day-Use Area and Campground has nine campsites, a swimming beach, and restroom facilities (PacifiCorp 2019b).

Mirror Cove is a day-use area and campground centrally located on the west side of the reservoir. The area offers 10 campsites, a boat dock, a double-lane boat ramp, and restroom facilities (PacifiCorp 2019b). This particular location is popular for group camping and is used extensively by local water-ski clubs. This boat launch is the nearest access to a competitive water-ski course placed in the western area of the reservoir.

Long Gulch Day-Use Area and Campground is on the east side of the reservoir directly across from Overlook Point. Facilities at this location include two picnic sites, restroom facilities, and a boat launch. Land along an adjacent ridge is occasionally used for dispersed camping and day-use (PacifiCorp 2004, 2019b).

Immediately downstream of Iron Gate Dam, the Iron Gate Fish Hatchery is operated by CDFW and includes a public day-use area adjacent to the hatchery and an undeveloped boat launch across the river from the hatchery. The day-use area includes a picnic area, a picnic shelter, visitor center/interpretive kiosk, restroom facilities, a trail to the river, and seasonal interpretive tours. Fishing is prohibited in this area as well as within 3,500 feet downstream from the dam.

Visitor Use and Perception

PacifiCorp conducted a visitor survey in 2004 to assess recreational use and visitor perceptions of recreational facilities, including the Lower Klamath Project reservoirs. The majority of visitors surveyed (approximately 60 percent of total) were from Klamath County and Jackson County, Oregon. The remaining visitors were from California (approximately 40 percent of total), approximately half of which came from Siskiyou County (approximately 20 percent of total). When asked to indicate all activities participated in while visiting the Lower Klamath Project reservoirs, more than half of the visitors' surveys included resting/relaxing as one of the activities. When surveyed on their perception of crowding at the reservoirs, the mean score of respondents was 3.2 (on a 9-point scale from 1—not crowded to 9—extremely crowded), indicating that visitors did not feel overly crowded while participating in recreation activities. Further, approximately 39 percent of respondents had changed their visits to the Lower Klamath Project reservoirs from other lakes in the area to avoid crowding. When surveyed regarding management options of the reservoirs, survey respondents indicated

opposition to the collection of user fees at either day-use sites or facility campgrounds (PacifiCorp 2004).

In response to the survey question “Has water quality ever affected your visit to the Klamath River area?” approximately two-thirds of recreational users of the Lower Klamath Project reservoirs had negative perceptions of water quality, commenting on its color, turbidity, and odor. The source of visitor concerns was primarily the brown, foamy water in free-flowing reaches and regular, extensive phytoplankton [algae] blooms that occur throughout the reservoirs. Visitors reported that the phytoplankton [algae] produces bad odors, fouls fishing lines, and reduces the area available for fishing, swimming, and wading (FERC 2007). Note that the prior Klamath Hydroelectric Project relicensing studies represent the most recent survey data characterizing annual visitation and capacity for most recreational facilities in the Area of Analysis of recreation (exceptions noted, as appropriate). Seasonal reservoir algal blooms have not diminished significantly since 2002, such that the level of recreational activities in, and general public use of, the reservoirs are also likely to be generally the same.

3.20.2.4 Wild and Scenic River Conditions

Two segments of the mainstem Klamath River are designated wild and scenic rivers, one in Oregon and one in California (Figure 3.20-3). The reach in Oregon, between the J.C. Boyle Powerhouse and the Oregon-California state line was designated a wild and scenic river in 1994. As this section is not in California, it is not analyzed in this EIR.

In California, the entire river beginning 3,600 feet downstream of Iron Gate Dam to the Klamath Estuary (i.e., Middle and Lower Klamath River) is designated a wild and scenic river segment by both the State of California and the federal government. Wild and scenic river segment boundaries include variable-width linear corridors which typically include not more than 320 acres per linear mile (averaging up to approximately 0.5 mile in width along the river corridor). However, some protections for designated outstanding remarkable values can extend beyond the boundaries. In addition, the 5.3-mile section of the Upper Klamath River from the California-Oregon state line to the slack water of Copco No.1 Reservoir is considered to be eligible and suitable for wild and scenic river designation under Section 5(d)(1) of the WSRA.

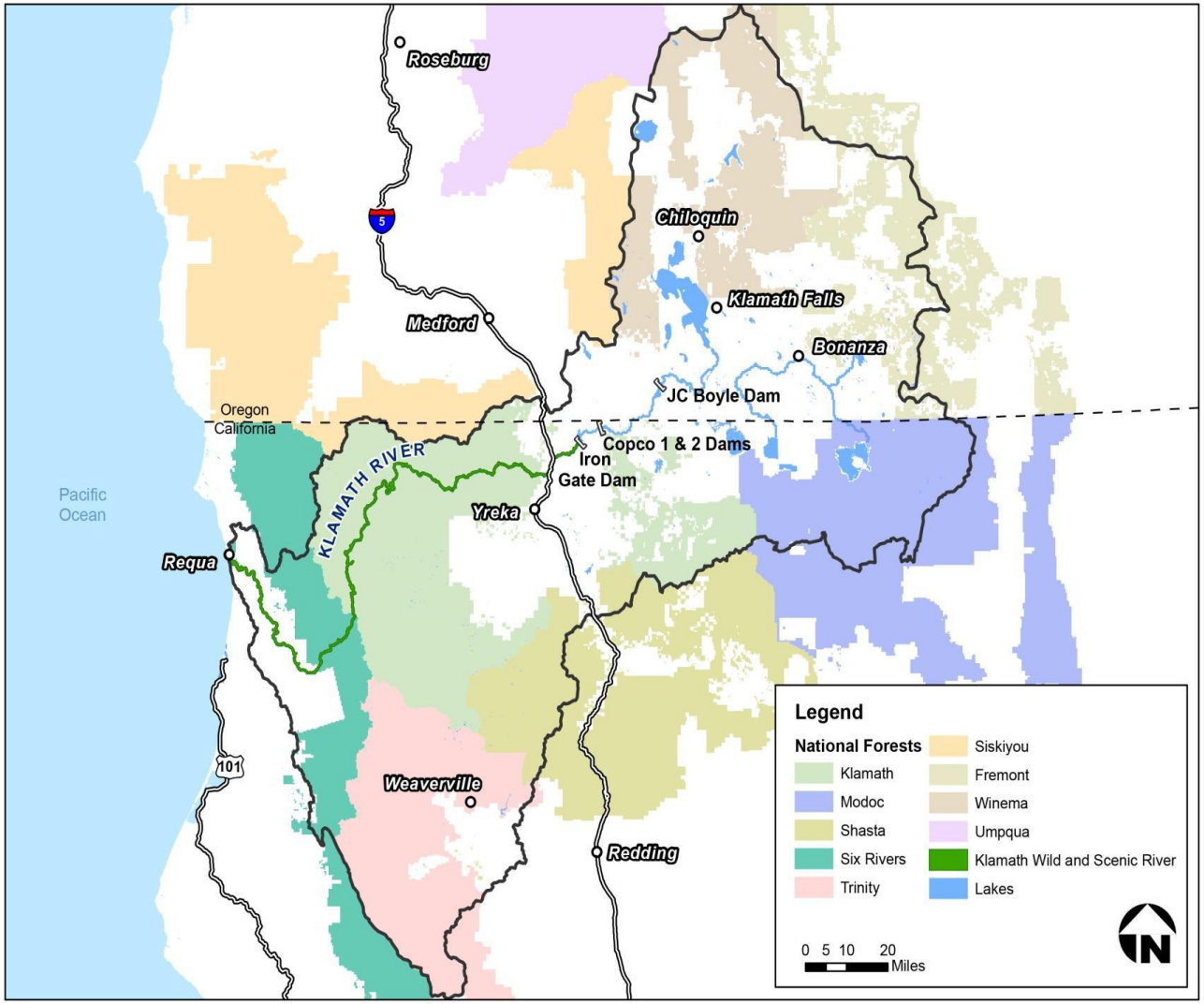

Figure 3.20-3. Klamath Wild and Scenic River Corridor.

California Klamath River Wild and Scenic River Segment

The Klamath River downstream of Iron Gate Dam, as well as portions of three tributaries (Salmon and Scott rivers and Wooley Creek), were added to the National Wild and Scenic River System in 1981 through Section 2(a)(ii) of the WSRA. The wild and scenic river portion of the mainstem Klamath River in California is classified as recreational with portions of the tributaries classified as scenic and wild. At the time of listing, the anadromous fishery, including salmon and steelhead, was considered to have the outstandingly remarkable value for the entire 286 miles of the designated segment, which includes the tributaries. Criteria for designation of this reach as a wild and scenic river include scenery, recreation, fisheries, and wildlife. The environmental setting for each of these topics is described in the corresponding sections of the EIR, as follows:

- Scenery – Section 3.19.1 [*Aesthetics*] Environmental Setting
- Recreation – Section 3.20.1 [*Recreation*] Environmental Setting
- Fishery – Section 3.3.1 [*Aquatic Resources*] Environmental Setting
- Wildlife – Section 3.5.1 [*Terrestrial Resources*] Environmental Setting
- Water Quality – Section 3.2.1 [*Terrestrial Resources*] Environmental Setting
- Algae – Section 3.4.1 [*Phytoplankton and Periphyton*] Environmental Setting

Eligible and Suitable Wild and Scenic River Section on the Klamath River

In 1990, BLM found the 5.3-mile section of the Upper Klamath River from the California-Oregon state line to the slack water of Copco No.1 Reservoir to be eligible and suitable for wild and scenic river designation under Section 5(d)(1) of the WSRA. The river segment is free-flowing and possesses outstandingly remarkable scenic, recreational, fish, and wildlife values. This river segment is not a designated wild and scenic river and is not protected under the WSRA and its Section 7(a) requirements. The BLM is required, within its authorities, to protect this suitable river segment's free-flowing character, water quality, and outstandingly remarkable river values. This segment of the Klamath River is also listed on the Nationwide Rivers Inventory (NPS 2009). If a river is listed in the Nationwide Rivers Inventory, the federal agency involved with the action must consult with the land managing agency in an attempt to avoid or mitigate adverse effects of any proposed water resources projects. This consultation is required pursuant to a directive from the Council on Environmental Quality.

For the purposes of evaluating the potential impacts of the Proposed Project on the eligible and suitable river segment, the environmental setting for each of designation criteria topics are covered in the corresponding sections of the EIR listed above.

3.20.3 Significance Criteria

Criteria for determining significance on recreational opportunities are based on Appendix G of the CEQA Guidelines (California Code of Regulations title 14,

section 15000 et seq.) and professional judgement. As the Appendix G checklist questions for recreational impacts are limited, two additional criteria were added for this EIR as there is potential for impacts on a variety of users and uses under the Proposed Project. Impacts from the Proposed Project would be considered significant if any of the following criteria are met:

- Adverse changes to or loss of recreational facilities affecting a large area or substantial number of people.
- Significant increase in the use of existing parks or other recreational facilities such that substantial physical deterioration of the facilities would occur or be accelerated.
- Construction of new or expansion of existing recreational facilities which might have an adverse physical effect on the environment.
- Affect identified resource values in a wild and scenic river segment (i.e., scenic, recreational, fish, and wildlife) such that the long-term wild and scenic river designation or eligibility for listing would be compromised.

3.20.4 Impact Analysis Approach

The impact analysis for recreational resources considers the potential implications of the Proposed Project on changes to river- and reservoir-based recreation opportunities, activities, and settings within the Area of Analysis. Short-term and long-term effects on access, flow-dependent recreational activities, recreational fishing, and other recreational activities associated with the existing Klamath River corridor and reservoir recreational facilities within the Area of Analysis are described. The relocation of the City of Yreka's water supply pipeline is not expected to result in any impacts to recreational resources; therefore, it is not addressed in this section of the EIR.

3.20.4.1 Recreational Setting, Facilities, and Access

Likely changes to recreational use and access were assessed qualitatively, including changes from reservoir-based recreational opportunities to more river-based opportunities in the areas where the Lower Klamath Project dams, recreational facilities, and/or PacifiCorp facilities would be removed. The short-term effects analysis includes a discussion of potential areas where recreational access would be restricted during construction activities. The assessment of long-term effects considers potential changes in the recreational setting and experience, changes in water quality and reservoir area revegetation for Klamath River-based recreational opportunities, as well as potential impacts on regional recreational facilities due to increased use.

The KRRC's Recreation Plan takes a programmatic approach to developing recreational facilities and mitigating any impacts attributable to these developments. Proposed new recreational facilities are being evaluated by KRRC, including consideration of public input on the potential types and locations of these facilities. A Final Recreation Plan would be submitted to FERC, and this

plan would include any new recreation facilities that are proposed by the KRRC. The Final Recreation Plan would be subject to environmental review under NEPA, and mitigation measures would be determined by FERC. If implementation of the Final Recreation Plan (at FERC's direction) requires any further state or local approvals, then written checklists would be prepared pursuant to CEQA Guidelines sections 15162 and 15168(c) to ascertain whether further site-specific environmental review of individual reactional projects would be necessary. Such individual projects shall be subject to applicable best management practices and mitigation measures required by FERC, applicable mitigation measures in this EIR, such as Mitigation Measures WQ-1, TER-1, TER-2, TER-3, TER-5, TCR-1, TCR-2, TCR-3, and HZ-1, and any other measures required by an agency with jurisdiction over those individual recreation projects. The potential environmental impacts of these new recreational facilities would be reviewed at a project level in subsequent evaluations prior to their implementation.

Given that this EIR analyzes the potential environmental impacts of adding new recreational sites or expanding existing recreational sites for water quality (Potential Impact 3.2-4), aquatic resources (Potential Impact 3.3-21), terrestrial resources (Potential Impact 3.5-1, Potential Impact 3.5-7, Potential Impact 3.5-10), historical resources and tribal cultural resources (Potential Impact 3.12-1), utilities (Potential Impact 3.18-1), and aesthetics (Potential Impact 3.19-5, Potential Impact 3.19-6), Potential Impact 3.20-4, which was included in the Draft EIR, is unnecessary and has been removed from this Final EIR.

3.20.4.2 Whitewater Boating Opportunities

Optimal and acceptable flows for whitewater boating opportunities along reaches of the Klamath River were assessed as a part of the technical review completed for the Proposed Project. The range of acceptable flows resulted from the Final Technical Report, Klamath Hydroelectric Project (PacifiCorp 2004). Flow values that fall within these ranges are considered acceptable flow levels for the various activities (see Table 3.20-6).

Hydrologic modeling was used to assess changes in the availability of acceptable flows under the various alternatives. The modeling results for each water year type were subjected to a statistical analysis (paired T-tests) to determine whether the difference in number of days meeting the acceptable range of flows following dam removal (both on an annual and monthly basis) would be statistically significant. A qualitative approach was used to assess the effects of the identified alternatives on whitewater boating access and existing whitewater boating opportunities.

3.20.4.3 Recreational Fishing Opportunities

The results of the hydrologic modeling were used to: determine whether changes in flow would affect recreational fishing opportunities (i.e., the number of days

with optimal flows for recreational fishing); qualitatively assess potential changes in fisheries populations and abundance; and determine effects of changes from reservoir-based fishing opportunities to river-based opportunities.

3.20.4.4 Other Recreational Opportunities

The analysis also includes an assessment of other recreational activities, such as sightseeing, swimming/wading/tubing, fish and wildlife viewing, and camping that occur within the river corridor and a qualitative discussion of the effects of the various alternatives on these activities. The discussion here covers both anticipated short-term effects, such as construction-related effects, and long-term effects, such as changes in reservoir-based swimming opportunities.

3.20.4.5 Wild and Scenic Rivers

Evaluation criteria for each of the four protected resources specified in the WSRA Section 7 (a) (i.e., scenic, recreational, fish, and wildlife) have been developed to assess the effects of the Proposed Project as compared with conditions at the date of the Klamath River's designation into the National Wild and Scenic Rivers System (see Section 3.20.2.4 *Wild and Scenic River Conditions*). The type (positive or negative) and duration (short term or long term) of the effects are described, and the magnitude of these effects is analyzed. The effects are characterized as unchanged, beneficial, or adverse (or similar conclusion), by value (i.e., scenic, recreational, fisheries, and/or wildlife), for that resource.

Scenery was evaluated using the following criteria:

- Water flow character (river flows and accompanying river width, depth, and channel inundation or exposure)
- Water appearance (clarity, turbidity, depth of view, color, prominence of phytoplankton and periphyton)
- Fish and wildlife viewing
- Riparian vegetation
- Natural appearing landscape character (the visual effects of facilities and structures as viewed from within the designated wild and scenic river corridor)

Recreation was evaluated using the following criteria:

- Whitewater boating
- Recreational fishing
- Other recreational activities (water play, swimming, camping)
- Recreational setting (water quality related aesthetic odors, tastes, contacts, and public health and safety aspects)

Fishery was evaluated using the following criteria:

- Stream flow regime

- Water temperature
- Water quality (physical, biological, and chemical)
- Aquatic habitat (geomorphic condition, sediment transport regime, and substrate quality)
- Fish species population conditions, specifically:
  - Anadromous salmonid fish species
  - Resident fish species
  - Species traditionally used and culturally important to Native Americans

Wildlife was evaluated using the following criterion:

- Changes in habitat for affected species

3.20.5 Potential Impacts and Mitigation

Potential Impact 3.20-1 Effects on existing recreational facilities and opportunities due to access restrictions, noise, dust, and/or sediment release resulting from construction activities.

Construction activities associated with dam removal would result in temporary loss of access to recreational facilities at the Lower Klamath Project reservoirs and associated reservoir-based recreational opportunities. Access could remain restricted for an additional period following completion of dam removal as restoration activities are conducted on the former reservoir area and existing recreational areas are modified to accommodate the new river channel. However, as described above in Section 3.20.2.1 *Regional Recreation*, a number of reservoirs, lakes, and rivers are present within and adjacent to the Klamath Basin and provide similar opportunities for recreational activity. Therefore, temporary impacts on recreational access in the vicinity of Iron Gate and Copco No. 1 reservoirs would be less than significant.

As described in Potential Impact 3.9-1 and Potential Impact 3.23-1, the use of heavy vehicles and equipment during dam removal activities, and to a much lesser degree during restoration, would result in increases in dust and ambient noise in the vicinity of the Proposed Project. These activities will primarily occur over a period of approximately one and a half years; however, in any one location, there will generally be less than six months of nuisance generating activities (see Table 2.7-1). These increases could indirectly result in a decrease in the quality of recreational experiences at nearby facilities that would not have restricted access during construction (e.g., river access, trails, and private parks not directly affected by construction and reservoir drawdown). Specific effects related to dust and noise during construction are discussed in detail in Potential Impact 3.9-1 and Potential Impact 3.23-1, respectively.

With regard to recreational activities, increases in ambient noise and air pollutants could impede visitors' ability to rest and relax, and disrupt bird and wildlife viewing opportunities. These effects would last for the duration of

demolition activity and during initial restoration activities. However, as shown in Figures 3.20-2(a-c), the majority of recreation facilities and access points at the Lower Klamath Project reservoirs and along the Hydroelectric Reach are located a fair distance away from the Lower Klamath Project dams and would continue to provide opportunities for recreation until drawdown is completed. Because noise and dust impacts decrease with increasing distance from the source, impacts at these recreational facilities will be minimal. Further, as described in Section 3.20.2.1 *Regional Recreation*, numerous other recreational facilities are available outside the area of affect, but within the vicinity of the Iron Gate and Copco No. 1 reservoirs that provide similar recreational opportunities (Table 3.20-4). Therefore, these temporary noise and dust impacts would be less than significant.

As discussed in Potential Impact 3.2-3, drawdown of the reservoirs would result in short-term increases in turbidity (also expressed as suspended sediment concentration) downstream from the Lower Klamath Project reservoirs. Elevated turbidity would be most pronounced immediately downstream from Iron Gate Dam to Bogus Creek and it would become less noticeable farther downstream due to dilution from tributary flows entering the Klamath River. Modeling of suspended sediment concentrations during drawdown indicates suspended sediment concentrations would decrease to 60 to 70 percent of the initial value by Seiad Valley (RM 132.7) and to 40 percent of the initial value downstream of Orleans (approximately RM 59). Turbidity in the Klamath River is anticipated to flush through the system relatively quickly, but elevated turbidity is conservatively anticipated to occur for six to ten months following drawdown based on modeling of suspended sediment concentrations (USBR 2012a). Sediment jetting would occur during drawdown maximize erosion of accumulated sediments during this period and potentially reduce turbidity after drawdown concludes, and immediate revegetation will occur to further minimize the potential for prolonged increases in turbidity. Turbidity in the Klamath River is expected to resume natural background levels by the end of post-dam removal year 1 regardless of the water year type based on modeling of suspended sediment concentrations (USBR 2012a) (see Potential Impact 3.2-3 for more details).

The increase in turbidity would reduce visibility for boaters, swimmers, and fishermen during the sediment flushing period and could result in reduced public participation for these activities (e.g., swimmers might be less likely to enter the river, and fishermen might be less successful due to the reduced water clarity). Increased turbidity would also affect swimmer safety considerations if swimmers are unable to see the river bottom or navigate around obstacles, such as large boulders or logs beneath the water surface. However, impacts would be temporary; following completion of reservoir drawdown activities, water quality and clarity would be expected to improve as sediments are flushed downstream and into the Pacific Ocean. Due to naturally high levels of turbidity in the river during winter flows, increased turbidity from the Proposed Project would not be noticeable for most of the drawdown period. In addition, turbidity impacts

primarily would occur for a period of approximately six to ten months, with turbidity decreasing with distance downstream of Iron Gate Dam due to dilution from tributary flows entering the Klamath River. Turbidity would likely be only slightly above or similar to natural background turbidity in the Klamath River downstream of Seiad Valley (RM 132.7) by mid-May following drawdown based on a comparison of model SSCs during drawdown and natural background SSCs, except during dry water year types when turbidity may remain above natural background turbidity until after September (USBR 2012a). While opportunities for fishing and swimming in the vicinity of the Klamath River, including the area where Copco No. 1 and Iron Gate reservoirs are located, would be reduced during the drawdown period when these recreational activities would typically be low, opportunities for fishing and swimming in the Klamath River downstream of Seiad Valley (RM 132.7) during the deconstruction period would be similar or slightly reduced compared to existing conditions since turbidity would only be slightly above or to similar to natural background turbidity levels during most water year types. Additionally, opportunities for fishing and swimming would remain available in tributaries of the Klamath River during both drawdown and deconstruction. As such, the Proposed Project would not result in adverse changes to or loss of recreational facilities affecting a large area or substantial number of people; therefore, the impacts are less than significant.

Sediment release could also decrease the quality of water-contact-based recreational opportunities if sediment released downstream resulted in longer-term deposition in pools, eddies, slack water, and beaches and decreased the availability of these areas for recreational activity. As discussed in Potential Impact 3.11-5, modeling was conducted to determine the potential for such deposition following dam removal activities. The results of the modeling indicate that following dam removal activities, short-term deposition of fine and coarse sediment would occur primarily between Iron Gate Dam and Cottonwood Creek and average river bed elevation would change (i.e., increase or decrease) by up to 1 foot (see Figure 3.11-15). The Proposed Project was developed to allow reservoir drawdown to occur during winter months when precipitation, river flows, and turbidity are naturally highest. Suspended sediment concentrations would be highest during the period of greatest reservoir drawdown (January through mid-March of dam removal year two), as erodible material behind the dams is mobilized downstream (see also Potential Impacts 3.2-3 and 3.11-6). During normal to dry water years, suspended sediment concentrations would begin to decline in late March and would continue declining through early summer. If it is a wet year, it may take longer to drain the reservoirs and the high concentrations may extend until June. Suspended sediment concentrations would return to near background conditions for all water year types within the first year following removal (see also Potential Impact 3.2-3). Therefore, it is unlikely that sediment release would decrease the availability of pools, eddies, or beaches for recreational activity, even temporarily, and impacts on the quality of water contact-based recreational opportunities would not be- significant.

Overall, the impacts of construction and restoration activities are limited in temporal and geographic scope and so would not result in adverse changes to or loss of recreational facilities affecting a large area or substantial number of people. Nor would they result in a significant temporary increase in the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facilities would occur or be accelerated. Tables 3.20-2, 3.20-3, and 3.20-4 show that there are numerous alternative recreational facilities and access outside the area of affect, but within the vicinity. Most of these facilities experience low to moderate use levels and they can accommodate additional users. Recreational users who are temporarily displaced would be able to use these other areas, but they are unlikely to overload the other areas because those areas have sufficient capacity to accept them. Therefore, impacts will be less than significant.

Significance
No significant impact

Potential Impact 3.20-2 Long-term adverse changes to or loss of reservoir-based recreation activities and facilities due to removal of Iron Gate and Copco No. 1 reservoirs.
The removal of Iron Gate and Copco No. 1 reservoirs under the Proposed Project would eliminate existing opportunities for reservoir-based recreation activities, such as power boating, waterskiing, lake swimming, and flat-water boat angling. Copco No. 2 Reservoir is very small and has no recreational facilities or access. As discussed in Section 3.20.2.3 *Lower Klamath Project Reservoir-based Recreation*, Iron Gate and Copco No. 1 reservoirs are popular recreational areas for sightseeing, fishing, camping, swimming, boating, and wildlife viewing, and they attract visitors primarily from the surrounding communities in Klamath and Jackson counties, Oregon and Siskiyou County, California. The reservoirs are popular recreation areas in part because they are uncrowded relative to other lakes in the area and do not require user fees. Some activities associated with reservoir recreation could still be possible in the restored river channel (e.g., swimming and wading). However, due to increased flows, certain reservoir-based recreation such as swimming opportunities and flat-water boating may be limited in the restored river channel during certain times of year and in wet water years.

Thus, under the Proposed Project there would be a long-term loss of local reservoir-based recreational activities at Iron Gate and Copco No. 1 reservoirs, but there would be no change from existing conditions in reservoir-based recreational activities at Copco No. 2 since it has no recreational facilities or access.

However, a number of other lakes and reservoirs are in the vicinity of the Lower Klamath Project reservoirs and provide similar opportunities for recreation in an uncrowded setting (Table 3.20-4). Specifically, Fourmile Lake, Agency Lake,

Applegate Reservoir, and Medicine Lake, located from 26 to 46 miles away from the Lower Klamath Project reservoirs, each have generally low-use levels as well as similar or greater surface area, a greater number of developed campsites, and a similar number of improved boat launches compared with Iron Gate and Copco No.1 reservoirs (see Table 3.20-4). As described in Section 3.20.2.1 *Regional Recreation* (in particular, see Table 3.20-4), there are more than 85 boatable lakes in Klamath and Jackson Counties in Oregon and Siskiyou County in California that are within 100 miles of the Lower Klamath Project reservoirs and provide similar facilities and activities. The Lower Klamath Project reservoirs only account for less than 1.5 percent of the surface area of the regional lakes, 2.2 percent of the developed campsites and 1.1 percent of the boat launches. The percent of picnic areas was not calculated, because Table 3.20-4 only includes day-use only picnic areas and does not include day-use areas that are also associated with overnight facilities. In addition, there are a multitude of other recreational facilities in the region; Table 3.20-1 lists public lands, but there are private facilities as well. Also, as stated by PacifiCorp (2004), approximately two-thirds of recreational visitors to the Lower Klamath Project reservoirs had negative perceptions of water quality, stating concerns of bad odors and phytoplankton (e.g., blue-green algae [cyanobacteria]) blooms, which restrict areas available for fishing, swimming, and wading. Moreover, blue-green algae [cyanobacteria] blooms in the Lower Klamath Project have continued in recent years (see also Section 3.4.2.3 *Hydroelectric Reach*) (E&S Environmental Chemistry, Inc. 2013, 2014, 2015, 2016, 2018a, 2018b; North Coast Regional Board 2008, 2009, 2010, 2012a, 2013, 2014, 2016, 2017; USEPA 2007). Therefore, the loss of Iron Gate and Copco No.1 reservoirs under the Proposed Project would not result in a long-term loss in regional lake-based recreational activities that would affect a large area or a substantial number of people.

With respect to local recreational facilities and access points, the Proposed Project would completely remove most of the existing recreational sites at Iron Gate, Copco No. 1, and J.C. Boyle reservoirs, which primarily provide fishing, boating, and day-use access to the three reservoirs. Several existing recreational sites also provide camping facilities for overnight use. Decommissioning of these facilities would include removal of structures, concrete and pavement, regrading and revegetation of associated parking areas, access roads, and other improvements (Appendix B: *Definite Plan – Appendix Q*). Facilities at Fall Creek and Jenny Creek Day-Use Areas at Iron Gate Reservoir, Topsy Campground at J.C. Boyle Reservoir, and the Iron Gate Fish Hatchery Day-Use Area downstream of Iron Gate Reservoir, would remain, where possible, and be upgraded or enhanced (Appendix B: *Definite Plan – Appendix Q*). In addition, most existing river access facilities would be retained and upgraded.

The Proposed Project includes a Recreation Plan (see Appendix B: *Definite Plan – Appendix Q* for the Draft Recreation Plan) that would be used to identify new recreation opportunities that offset the proposed removal of reservoir recreation

sites as well as the reduction in whitewater boating days resulting from the Proposed Project (see Potential Impact 3.20-5 for a discussion of whitewater boating). KRRC has started an ongoing stakeholder outreach process seeking input from potentially impacted recreation users, operators, managers and administrators, including tribes, state and federal agencies, county agencies and chambers of commerce, local residents, recreation businesses, and public interest groups. The stakeholder outreach process would continue through the development of the Final Recreation Plan, which is scheduled for completion by KRRC in June 2019. The Draft Recreation Plan includes potential recreation opportunities identified in the USBR (2012b) Detailed Plan as well as those identified through recent stakeholder outreach efforts. The Draft Recreation Plan also outlines preliminary criteria for screening opportunities, including whether each recreation opportunity would: *"directly address the recreation impacts generated by the KHSA;"* and *"directly address or offset changes in the localized reservoir recreation or Hells Corner boating near where the impacts are occurring."* In addition, the Proposed Project includes the transfer of approximately 8,000 acres of real property (Parcel B lands; see also Section 2.7.10 *Land Disposition and Transfer*) located in Klamath County, Oregon, and Siskiyou County, California, to the respective states (or a designated third party) for public interest purposes, including river-based recreation, open space, active wetland and riverine restoration, and public education.

The Proposed Project would result in the loss of the locally popular fishery for non-native fishes including largemouth bass, trout, catfish, crappie, sunfish, and yellow perch (Hamilton et al. 2011). Fishing is popular in Copco No. 1 and Iron Gate reservoirs, especially for yellow perch, with one fishing guide (Shaffer 2005) considering the reservoirs the best yellow perch fishery in California. Without the Lower Klamath Project dams, fishing for non-native warm water species would be lost at the Lower Klamath Project reservoirs. While the yellow perch fishery in the reservoirs is considered by Shaffer (2005) to be the best in California, it does not constitute a recreational resource that would affect a large area or substantial number of people since there are other yellow perch fishing opportunities near the Copco No. 1 and Iron Gate reservoirs in northern California and southern Oregon, including Emigrant Lake (Ashland Daily Tidings 2009). Additionally, fishing tournaments like the largemouth bass tournaments (e.g., Rogue Valley Bassmasters) in Iron Gate Reservoir would no longer occur under the Proposed Project (Hamilton et al. 2011). However, yellow perch fishing and bass tournaments occur in dozens of lakes in northern California and southern Oregon, including some of those listed in Table 3.20-4, because these non-native fish occur over large areas of the Western United States. Thus, with respect to perch, largemouth bass, and other warm water fishing, Copco No. 1 and Iron Gate reservoirs do not constitute a recreational resource that, if lost or adversely changed under the Proposed Project, would affect a large area or substantial number people. Steelhead, trout, and salmon fisheries would be enhanced by the Proposed Project, since Lower Klamath Project reservoir habitat would be replaced by riverine habitat that supports these cold water species. Lastly, the

loss of warm-water fishing in Iron Gate and Copco No. 1 reservoirs does not represent the loss of a recreational resource that would affect a large number of people. Therefore, fishing-related impacts from the Proposed Project would be less than significant.

Given that a number of other lakes and reservoirs in the vicinity of the Lower Klamath Project provide similar opportunities for reservoir-based recreation in an uncrowded setting, KRRC's proposal to retain and enhance most existing river access facilities within the Area of Analysis for recreation, and Parcel B land transfer under the Proposed Project that would potentially allow for additional future river-based recreation opportunities, the Proposed Project would be highly unlikely to result in a loss of recreational facilities affecting a large area or substantial number of people. In addition, the KRRC has prepared a Draft Recreation Plan (Appendix B: *Definite Plan – Appendix Q*) that includes stakeholder outreach, identification of potentially new or modified recreational facilities as well as evaluation and screening criteria, which will further reduce the likelihood of any potential impacts.

Significance
No significant impact

Potential Impact 3.20-3 Significant increase in the use of regional recreational facilities due to loss of Iron Gate and Copco No. 1 reservoirs, such that substantial physical deterioration or acceleration of deterioration of the regional facilities would occur.
The Proposed Project would result in the loss of reservoir-based recreational facilities at Iron Gate and Copco No. 1 reservoirs, but this impact is not significant for the reasons discussed in Potential Impact 3.20-2. While the Proposed Project also includes the creation of additional recreational facilities and opportunities, the types of river-based recreational opportunities available following dam removal activities, including camping in a river setting as opposed to camping in a lake/reservoir setting, may not appeal to the same recreational users who currently visit and recreate at Iron Gate and Copco No. 1 reservoirs. In other words, while new recreation opportunities would exist along the restored river corridor, there could be a change in user type.

A number of other lakes and reservoirs are in the vicinity of the Lower Klamath Project reservoirs and provide similar opportunities for recreation in an uncrowded setting for people specifically seeking lake or reservoir-based recreation (Table 3.20-4). Specifically, Fourmile Lake, Agency Lake, Applegate Reservoir, and Medicine Lake, are located from 26 to 46 miles away from Iron Gate and Copco No.1 reservoirs, and each exhibits generally low use-levels as well as similar or greater surface area, number of developed campsites, and number of improved boat launches. Within Klamath County and Jackson County, Oregon, and Siskiyou County, California, there are more than 85 boatable lakes, containing nearly 40 boat ramps (Boat Escape 2017). There

are also more than 180 high-elevation and wilderness lakes in Siskiyou County (FERC 2007). In addition to boat ramps, these lakes provide nearly 2,300 developed campsites within less than a two-hour drive from Iron Gate and Copco No. 1 reservoirs (Table 3.20-4). The Lower Klamath Project reservoirs only account for less than 1.5 percent of the surface area of the regional lakes, 2.2 percent of the developed campsites and 1.1 percent of the boat launches. In addition, there are a multitude of other recreational facilities in the region; Table 3.20-1 lists public lands, but there are private facilities as well. Given the number and proximity of these regional lakes, as well as other lakes and reservoirs summarized in Table 3.20-1, the loss of Iron Gate and Copco No. 1 reservoirs under the Proposed Project would not be a significant impact because it would not result in a substantial increase in the use of regional lake and reservoir recreational facilities such that deterioration of those facilities would occur or be accelerated.

Significance

No significant impact

Potential Impact 3.20-5 Changes to or loss of river conditions that support whitewater boating.

Dam removal activities would not affect whitewater boating access locations, as access areas are at established places along the Klamath River channel, outside of the Lower Klamath Project reservoirs and would not be affected by dam removal activities. As discussed in the impact analysis above and in Potential Impact 3.11-6, drawdown of the reservoirs would not result in substantial changes to the floodplain or river channel. Thus, no impacts to land-based recreational facilities would be expected. Therefore, there would be no adverse impacts on whitewater boating access downstream of Iron Gate Dam. However, in the reaches between the existing dams, particularly in the Hell's Corner Reach, whitewater boating access would likely be temporarily affected due to dam removal activities and sedimentation, as discussed previously. Potential impacts on whitewater boating access locations would be short-term and less than significant.

To assess potential long-term impacts on whitewater boating under the Proposed Project, existing modeling results from the recreation analysis conducted for the 2012 KHSA EIS/EIR were applied to characterize the average number of days that acceptable river flows would occur in specific reaches each month. The existing model uses the KBRA Flows for a "dams out" scenario (i.e., removal of J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate dams and associated facilities) and the 2010 BiOp Flows for a "dams in" scenario (see Appendix S for details). Flow requirements in the Klamath River have changed since the modeling for the 2012 KHSA EIS/EIR was performed, including issuance of new operational flow requirements for USBR's Klamath Irrigation Project (i.e., 2013 BiOp Flows and 2019 BiOp Flows). Accordingly, as detailed in Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project* and

Appendix S *Recreation Supporting Technical Information*, the Lower Klamath Project EIR analyses consider both the 2013 BiOp Flows and the 2019 BiOp Flows as separate existing conditions CEQA baselines to account for the change in the operational flow requirements for the Klamath Irrigation Project between the issuance of the Notice of Preparation (December 22, 2016) and the issuance of the Draft EIR (December 27, 2018).

In contrast to conditions analyzed for the 2012 KHSA EIS/EIR, Keno Dam flow releases for maintaining the 2013 BiOp Flows or the 2019 BiOp Flows generally would be similar irrespective of dam removal, which would minimize any flow differences between modeled "dams in" and "dams out" scenarios that result from Keno Dam releases, and would minimize any variation in the modeled number of days with acceptable recreational flows between "dams in" and "dams out" scenarios that result from Keno Dam releases (see Appendix S, Section S.3 for additional detail). However, within the Hydroelectric Reach, the primary difference between the "dams in" and "dams out" flow scenarios, namely the lack of hydropower peaking operations under a "dams out" scenario, would still affect recreational flows under the Proposed Project in the same way as was modeled in the 2012 KHSA EIS/EIR. Thus, while the 2013 BiOp Flows and the 2019 BiOp Flows are different from the 2012 KHSA EIS/EIR modeled flows (i.e., KBRA Flows and 2010 BiOp Flows), the previously-modeled number of days with acceptable recreation flows under a "dams out" scenario still generally characterize the number of days of acceptable recreation flows under the Proposed Project for the J.C. Boyle Bypass Reach, the J.C. Boyle Peaking Reach (including Hell's Corner Reach), and the Copco No. 2 Bypass Reach (see Appendix S, Section S.3 for additional detail).

At Iron Gate Dam, the applicable biological opinion flow requirements also would remain the same regardless of dam removal (i.e., existing conditions flows would not change), which would minimize any flow differences between modeled "dams in" and "dams out" scenarios downstream of Iron Gate Dam, and would minimize any variation in the modeled number of days with acceptable recreational flows between "dams in" and "dams out" scenarios downstream of Iron Gate Dam (see Appendix S, Section S.3 for additional detail). Overall, under the Proposed Project there would be no change in the availability of flows within the acceptable flow ranges for whitewater boating for the reaches downstream from Iron Gate Dam compared to existing conditions and thus there would be no long-term significant impact to whitewater boating in Klamath River reaches downstream from Iron Gate Dam.

The reaches of the Upper Klamath River that are currently inundated by the existing Copco No. 1 and Iron Gate reservoirs would be converted to free-flowing riverine reaches over the long term, and depending on the river channel and access, could provide additional opportunities for whitewater boating in these reaches. However, river flows following dam removal activities were not modeled for areas currently inundated by reservoirs. While it could be expected there

would be additional opportunities for whitewater boating in these reaches, no records exist of the condition or suitability of the presently inundated areas for whitewater boating activities. With details of the condition of these areas lacking, it is too speculative to determine the quality and quantity of whitewater boating opportunities that could be realized due to dam removal activities in areas currently inundated by reservoirs. Accordingly, this analysis does not rely on the creation of whitewater boating opportunities in these reaches.

In contrast, for the Copco No. 2 Bypass Reach, previous model results indicate there would be a substantial increase in whitewater boating opportunities during the July through September time period (i.e., 22 to 30 additional days per month on average; Appendix S, Table S-3 and Table S-6). Comparison of the monthly range of KBRA Flows utilized in the modeling with the 2013 BiOp Flows or the 2019 BiOp Flows indicates that the whitewater boating opportunities during the July through September time period would still increase under both the 2013 BiOp Flows and the 2019 BiOp Flows, and the magnitude of the increase may be more than modeled under the KBRA Flows for the 2012 KHSA EIS/EIR (Appendix S, Figure S-5). This is because flows would be more likely to fall within the range of acceptable flows for whitewater boating in the Copco No. 2 Bypass Reach (i.e., 600 cfs to 1,500 cfs) under 2013 BiOp Flows or the 2019 BiOp Flows than the modeled KBRA Flows, especially during July (Appendix S, Figure S-5). Overall, the increase in the number of days with acceptable flows for whitewater boating under the Proposed Project would be a long-term beneficial effect on whitewater boating in the Copco No. 2 Bypass Reach.

In the J.C. Boyle Bypass Reach, modeling done in 2012 under the KBRA Flows show an increase in the average annual number of days with acceptable flows for whitewater boating during the July through September time period after implementation of the Proposed Project (i.e., 2 to 7 additional days per month on average; Appendix S, Table S-3 and Table S-6). However, under either the 2013 BiOp Flows or 2019 BiOp Flows, even though the bypass operations would cease and flows in the J.C. Boyle Bypass Reach would increase under the Proposed Project, the Keno Dam flow exceedance curves indicate that Upper Klamath River flows between July and September would remain below the minimum flow necessary for whitewater boating in this reach (i.e., 1,300 cfs) (Appendix S, Figure S-2). Accretions from groundwater springs in the J.C. Boyle Bypass Reach and tributaries would potentially result in flows greater than 1,300 cfs in July through September during very wet years under the Proposed Project (i.e., exceedance probability less than 5 percent; Appendix S, Figure S-2), but there would be no flow within the acceptable range for whitewater boating in this reach between July and September under most years (i.e., 95 percent of water years; Appendix S, Figure S-2) and the average annual number of days with acceptable flows for whitewater boating under the Proposed Project during July through September would be similar to the original model results for the No Project scenario (i.e., 0 days; Appendix S, Table S-6). However, the difference in the modeled number of days with acceptable flows under the KBRA Flows

versus under 2013 BiOp Flows or the 2019 BiOp Flows does not represent an adverse impact for the Proposed Project because the 2013 BiOp Flows and the 2019 BiOp Flows after dam removal do not represent a change from existing conditions (the KBRA Flows represented a change from the existing conditions for the 2012 KHSA EIS/EIR analysis). Thus, there would be no impact on whitewater boating in the J.C. Boyle Bypass Reach during the high demand months of July through September under the Proposed Project.

In other months of the year, modeling done in 2012 under the KBRA Flows shows an increase or decrease in the average annual number of days with acceptable flows for whitewater boating after implementation of the Proposed Project (Appendix S, Table S-3 and Table S-6). Under the Proposed Project with the 2013 BiOp Flows or the 2019 BiOp Flows, there would be flow within the acceptable range for whitewater boating in the J.C. Boyle Bypass Reach in above average to wet water years. For example, in June, 2013 BiOp Flows would be within the acceptable range for whitewater boating between above average to wet water years (i.e., approximately 20 to 35 exceedance probability; Appendix S, Figure S-2) and 2019 BiOp Flows also would be within the acceptable range for whitewater boating between above average to wet water years (i.e., approximately 15 to 25 exceedance probability; Appendix S, Figure S-2). In October, 2013 BiOp Flows would exceed 1,300 cfs during wet water year types (i.e., exceedance probability less than approximately 8 percent; Appendix S, Figure S-2), and 2019 BiOp Flows also would exceed 1,300 cfs during wet water year types (i.e., exceedance probability less than approximately 5 percent; Appendix S, Figure S-2). Thus, there would be a potential increase in the number of days with acceptable flows for whitewater boating in the J.C. Boyle Bypass Reach outside of the current high demand months of July through September during wetter water year types under the Proposed Project compared to existing conditions, which would be potentially beneficial.

The Hell's Corner Reach is located partially in California and partially in Oregon. This stretch of river would be impacted by removal of the J.C. Boyle Dam, which is part of the Proposed Project and is located in Oregon. Since potential impacts to flows in the Hell's Corner Reach were brought up as an issue during the Lower Klamath Project scoping process, and because the impacts would also occur in California, a discussion and analysis is included in this EIR. Currently, the Hell's Corner Reach is the only Class IV+ rapids in the region with late summer flows. Whitewater rafters can boat on the Hell's Corner Reach from April through October due to hydroelectric peaking power and flows historically generated by J.C. Boyle Powerhouse to meet high power demand periods. This typically occurs for four hours, between 10 a.m. and 2 p.m. each day. It also happens approximately 15 to 20 days per month in July, August and September. Additionally, flow peaking occurs on a predictable schedule, which is highly favorable for commercial boating operations. The vast majority of rafting is performed by permitted commercial outfitters, due to the technical difficulty of the run and lack of access to scouting points. There are 10 outfitters, which take up

to 200 clients down the river per day, primarily between July and September, and BLM has set an overall carrying capacity of 250 people per day on this stretch of river (DOI 2011).

In the Hell's Corner Reach, there would be loss of acceptable flows for whitewater boating opportunities with the Proposed Project under 2013 BiOp Flows or under the 2019 BiOp Flows as compared to existing conditions due to the loss of hydropower operations. The minimum flow necessary for whitewater boating in this reach is estimated to be between 1,000 cfs and 1,300 cfs. Klamath River flow in the high demand months of July to September are expected to remain below 1,000 cfs under the 2013 BiOp Flows except during very wet water years (i.e., exceedance probability less than 5 percent), and under the 2019 BiOp Flows except during wet and very wet water years (i.e., exceedance probability less than 10 percent), based on an evaluation of flow exceedance curves at Keno Dam (Appendix S, Figure S-4). Accretions from groundwater springs in the J.C. Boyle Bypass Reach and tributaries may cause some increase in the flow between Keno Dam and the Hell's Corner Reach, but the flow exceedance curve at Keno Dam is still expected to be representative of flow conditions within the Hell's Corner Reach under the Proposed Project with 2013 BiOp Flows or with 2019 BiOp Flows. Flow in the Hell's Corner Reach would be below the minimum flow necessary for whitewater boating between July and September during most water year types (i.e., 95 percent of water year types), eliminating most opportunities for whitewater boating during this time under the Proposed Project. During April through June and October, whitewater boating opportunities still would exist during some water year types under the Proposed Project, but there would be a significant reduction compared to existing conditions, especially during October when flows in the Hell's Corner Reach would only be greater than 1,000 cfs (i.e., the minimum for whitewater kayaking) during wetter water years (i.e., exceedance probability less than 30 percent) (Appendix S, Figure S-4).

There are a number of alternative rafting opportunities in the region that are available all summer, including the Klamath River downstream of Iron Gate Dam, Trinity River and Rogue River. However, due to the lower late summer flows, the higher-class rapids are not available, typically from July until the fall rains start. From spring through early summer, there are ample whitewater rafting opportunities for all skill levels in the region (see Table 3.20-3). However, whitewater boating opportunities within the Hell's Corner Reach would be significantly reduced or eliminated during July through October depending on the water year type.

The Proposed Project would result in the loss of a unique opportunity in the region to raft Class IV+ rapids for three months during the late summer and early fall. This would affect recreational rafters during that time, as well as 9 commercial outfitters (see also Section 3.20.2.2 *Klamath River-based Recreation*). However, the resource is not lost completely due to the following:

(1) alternative Class IV+ whitewater boating opportunities during other times of the year; and (2) ample alternative nearby rafting opportunities in the late summer, albeit with lower class ratings. However, the impact to whitewater boating opportunities in the Hell's Corner Reach (within the upper portion of the Hydroelectric Reach) would be significant and unavoidable.

Significance

No significant impact in the Middle and Lower Klamath River

Beneficial impact in the Copco No. 2 Bypass Reach (within the Hydroelectric Reach)

Significant and unavoidable impact in the Hell's Corner Reach (within the upper portion of the Hydroelectric Reach)

Potential Impact 3.20-6 Changes to or loss of other river-based recreation including fishing.

No significant impacts to river-based recreational facilities upstream of the Hydroelectric Reach would occur as a result of the Proposed Project, because any changes to flow and water quality would occur within and downstream of this reach. However, as discussed in Potential Impact 3.3-7 through 3.3-11 in Section 3.3.5.9 *Aquatic Resource Impacts*, removal of the dams would help eliminate barriers to volitional fish passage in the Klamath River upstream of the Lower Klamath Project, which would beneficially affect recreational fishing at these upstream locations.

In general, river-based recreational facilities downstream of the Hydroelectric Reach would not be physically affected by dam removal activities, since there would be little change to the 100-year floodplain extent under the Proposed Project (see also Potential Impacts 3.6-3 and 3.20-1). However, along the Middle Klamath River from Iron Gate Dam (RM 193.1) to the confluence with Humbug Creek (RM 174.0), the 100-year floodplain extent would change slightly due to dam removal and this would potentially impact existing recreational facilities. At the Blue Heron RV Park, the Fish Hook Restaurant (see Site "FS-2" in Appendix B: *Definite Plan – Appendix C, Figure 7.7-1 Sheet 1*) is within the 100-year floodplain extent under current conditions and would remain within the (altered) 100-year floodplain extent following dam removals. The R Ranch office at the Klamath Campground (see Site "FS-3" in Appendix B: *Definite Plan – Appendix C, Figure 7.7-1 Sheet 2*) is also within the 100-year floodplain extent under current conditions and would remain within the (altered) 100-year floodplain extent following dam removals. Thus, there would be no change or loss to these facilities under the Proposed Project. The Blue Heron RV Park office structure (see Site "FS-1" in Appendix B: *Definite Plan – Appendix C, Figure 7.7-1 Sheet 1*) is not within the 100-year floodplain extent under current conditions and would be within the (altered) 100-year floodplain extent following dam removals. While there would be an increased potential for flooding at this

office structure, this would not represent an adverse change or loss of a recreational facility affecting a large area or substantial number of people and therefore impacts to recreation would be less than significant. In addition, the Proposed Project includes implementation of the Downstream Flood Control Project Component, as described in Section 2.7.8.4 *Downstream Flood Control* and in Appendix B: *Definite Plan.* Thus, under the Proposed Project, KRRC would move or elevate legally-established structures, where feasible, to reduce the risks of exposing people and/or structures to damage, loss, injury, or death involving flooding, which would further reduce the potential for flooding impacts to this structure.

Downstream of Humbug Creek (RM 174.0), there would be no significant effect on flood elevations (Potential Impact 3.6-3) and therefore there would be no impacts to river-based recreational facilities, including to the Klamath National Forest Tree of Heave Campground near the confluence of Humbug Creek (Figure 7.7-1 in Appendix B: *Definite Plan – Appendix C*).

Over the long term, removal of the Lower Klamath Project dams is also expected to result in water quality improvements within the Hydroelectric Reach and in the Middle and Lower Klamath River downstream of Iron Gate Dam (see Potential Impacts 3.2-1, 3.2-11, 3.2-12, and 3.2-13), which could improve visitor perceptions and attract a greater number of visitors to existing recreational facilities.

Dam removal activities are expected to result in long-term improvements in water quality, notably by decreased prevalence of microcystin toxin during summer phytoplankton blooms in the Lower Klamath Project reservoirs and in the Middle and Lower Klamath River. As discussed in Section 3.2.2.7 *Chlorophyll-a and Algal Toxins* and Section 3.20.2.4 *Wild and Scenic River Conditions*, microcystin toxin has been associated with public health risks for recreational bathing waters. Health warnings issued in 2005, 2007, 2008, 2009, 2010, 2012, 2013, 2014, 2016, and 2017 by the USEPA, the North Coast Regional Board, and other agencies warned recreation visitors to use caution due to the potential health effects of contact with waters containing elevated microcystin concentrations. In addition, 91 percent of recreational survey respondents indicated that water quality detracted from their experience at least a little within the Hell's Corner Reach (PacifiCorp 2004). These adverse effects related to water quality negatively influenced the quality of the recreational experience for visitors and also resulted in safety risks to the recreational visitors. As existing conditions for water-contact-based recreational activities are considered adverse due to water quality, improved water quality conditions would result in long-term beneficial effects.

As discussed in Section 3.3.5.9 *Aquatic Resource Impacts*, dam removal activities are anticipated to result in increased abundance of recreational fish species from increased access to suitable habitat, and improved habitat

conditions. The increased fisheries populations and abundance would beneficially affect recreational fishing opportunities. More specifically, the increased abundance and extent would allow for enhanced fishing opportunities and could decrease the number of closures of entire fishing seasons over the long term. These effects on recreation-based fisheries would be long-term and beneficial.

The Proposed Project would improve river access and create new fishing opportunities in the Hydroelectric Reach through implementation of the Recreation Facilities Plan (see Potential Impact 3.20-2), which would benefit fishing opportunities in this area. Given negligible changes in flows and improvements in access, impacts in reaches downstream from Iron Gate Dam would be less than significant. There would be a reduction in length of time available for fishing in the Copco No. 2 Bypass Reach based on analysis of flows in the Klamath River under existing conditions and under the Proposed Project (see Appendix S for additional details), with the decrease in days with suitable flows for fishing primarily occurring during May (Table 3.20-6). In the Hell's Corner Reach there also would be a reduction in the availability of acceptable flows during April (see Appendix S for additional details); however, the potential impacts would be minor overall and outweighed by other beneficial effects (Figure 3.20-4).

Significance

No significant impact for the Middle Klamath River between Iron Gate Dam (RM 193.1) and Humbug Creek (RM 174.3)

Beneficial impact for the Hydroelectric Reach, the Middle Klamath River downstream of Humbug Creek (RM 174.3), and the Lower Klamath River

Potential Impact 3.20-7 Effects on Wild and Scenic River resources, designations, or eligibility for listing.

The following section provides an assessment of the effects of the Proposed Project on each of the four resources specified in the Wild and Scenic River Act Section 7(a) (i.e., scenery, recreation, fish, and wildlife river values). The evaluation criteria presented in Section 3.20.4.5 *Impact Analysis Approach* were used to assess the effects of the Proposed Project as compared with conditions present at the time of wild and scenic river designation or eligibility listing, as well as changes to the condition of the river since the time of the designation or eligibility listing that have affected its wild and scenic character.

California Klamath River Wild and Scenic River Segment

Scenery

The Proposed Project would eliminate the major sources of seasonal phytoplankton blooms to the Klamath River downstream of Iron Gate Dam (see also Section 3.4.2.3 *[Phytoplankton and Periphyton] Hydroelectric Reach,* Section 3.4.2.4 *[Phytoplankton and Periphyton] Middle and Lower Klamath River,*

and Potential Impact 3.4-2), enhancing water appearance in the wild and scenic river segment of the Klamath River in California by eliminating or substantially reducing seasonal algal surface scums in the Middle and Lower Klamath River and increasing water clarity during summer low-flow periods.

As discussed in Potential Impact 3.2-3, drawdown of the reservoirs would result in short-term increases in turbidity (also expressed as suspended sediment concentration [SSCs]) downstream from the Lower Klamath Project reservoirs. Elevated turbidity would be most pronounced immediately downstream from Iron Gate Dam to Bogus Creek and it would become less noticeable farther downstream due to dilution from tributary flows entering the Klamath River. Modeling of SSCs during drawdown indicates SSCs would decrease to 60 to 70 percent of the initial value by Seiad Valley (RM 132.7) and to 40 percent of the initial value downstream of Orleans (approximately RM 59). Sediment jetting would occur during drawdown maximize erosion of accumulated sediments during this period and potentially reduce turbidity after drawdown concludes, and immediate revegetation would occur to further minimize the potential for prolonged increases in turbidity. Turbidity in the Klamath River is anticipated to flush through the system relatively quickly, but based on modeling of SSCs elevated turbidity is conservatively anticipated to occur for six to ten months following drawdown, with turbidity completely resuming natural background levels by the end of post-dam removal year 1 regardless of the water year type (USBR 2012a) (see Potential Impact 3.2-3 for more details). Although removal of the dams would result in increases in SSCs (Potential Impact 3.2-3) and decreased water clarity, the SSC increases would be short term and as such would not affect scenic value such that the long-term wild and scenic river designation or eligibility for listing would be compromised. In the long term, improved water appearance from on-river, in-river, and/or riverside viewpoints would improve the wild and scenic character of the Klamath River below the Lower Klamath Project.

With respect to periphyton colonization in the California Klamath wild and scenic river segment, although increased nutrient transport and recycling following dam removal could favor enhanced periphyton growth downstream from Iron Gate Dam, dam removal would also restore more frequent river sediment movement (Potential Impact 3.11-6) and increased flow variability during storm flow downstream of Iron Gate Dam, which could result in increased scouring of periphyton during late spring storm events (Potential Impact 3.4-5). The magnitude of the effect of bed turnover and scouring on periphyton would decrease with distance downstream, with increased scour occurring from Iron Gate Dam to approximately the Shasta River (RM 179.5), or the upper portion of the California Klamath River wild and scenic river segment. Although there would be negative water clarity impacts on scenic quality due to elevated SSCs during reservoir drawdown, the increases would be temporary and as such would not affect scenic value in a manner that would compromise the long-term wild and scenic river designation or eligibility for listing. Instead, the long-term effect

of the Proposed Project would improve the scenic value of the California Klamath River wild and scenic river segment.

As discussed in Section 3.3.5.9 *Aquatic Resource Impacts*, removal of the Lower Klamath Project dams is expected to increase the long-term abundance, productivity, population spatial structure, and genetic diversity of fall-run Chinook salmon (Potential Impact 3.3-7), spring-run Chinook salmon (Potential Impact 3.3-8), coho salmon (Potential Impact 3.3-9), steelhead (Potential Impact 3.3-10) and Pacific Lamprey (Potential Impact 3.3-11) in the Klamath River. The expected restoration of the anadromous fish populations would largely be the result of the increased access to anadromous fish habitat within the Upper Klamath Basin, along with water quality improvements downstream from the Lower Klamath Project. The increased population of fish species and increased water clarity would improve scenic fish viewing value. Increased fish viewing would be most prominent during fish migration, spawning, or holding periods, when the fish concentrate at particular reaches, pools, riffles, and falls. Fish and wildlife viewing impacts to scenic quality would be long-term and beneficial for the California Klamath River wild and scenic river segment.

Specific effects on river-dependent wildlife populations and scenic viewing opportunities are unknown. As discussed in Section 3.5.5.5 [*Terrestrial Resources] Potential Impacts and Mitigation – Wildlife Corridors and Habitat Connectivity*, riparian habitat in the Iron Gate Dam to Shasta River reach of the California Klamath River wild and scenic river segment would potentially be improved by dam removal activities because proportional increases in wildlife presence related to the increase in abundance of anadromous fish in the river and scenic wildlife viewing are expected. Therefore, effects on river-dependent wildlife populations and scenic viewing opportunities would be long-term and beneficial.

Removal of the Lower Klamath Project may result in an increase in riparian vegetation immediately downstream from Iron Gate Dam due to more regular transport of riverbed sediments (Potential Impact 3.11-5) and sediment deposition that has the potential to create new surfaces for riparian plants to colonize (Potential Impact 3.5-5). Improved riparian vegetation would increase the presence and scenic variety of the vegetation within the Klamath River wild and scenic river segment in California and may result in long-term beneficial effects.

The California Klamath River wild and scenic river segment is downstream from the Lower Klamath Project; therefore, removal of the dams and associated facilities would not result in any changes to the overall landscape character in the designated segment of the river. However, as discussed above, water appearance in the wild and scenic river segment is expected to improve due to elimination or reduction of large seasonal phytoplankton blooms transported into the Middle and Lower Klamath River (Potential Impact 3.4-2), as is the quality of

the riparian vegetation (Potential Impact 3.5-4). These improvements would result in a more natural landscape character for the California Klamath River wild and scenic river segment and result in a long-term positive scenic quality effect from both near river and distant viewpoints.

Recreation

During dam removal years 1 and 2, release of sediment deposits stored within the reservoir footprints could decrease the quality of and opportunity for water contact activities. However, initial reservoir drawdown would occur in the coldest high flow months of winter and early spring when recreation use of the Lower Klamath Project reservoirs is at its lowest. Further, the increases in SSCs (Potential Impact 3.2-3) and decreased water clarity during dam removal would be short term so these would not affect the scenic value in a manner that would compromise the long-term wild and scenic river designation or eligibility for listing. In the long term, dam removal activities would improve water quality and also improve water contact-based recreation activities. For the California Klamath River wild and scenic river segment, dam removal activities would not affect recreational activities access downstream from the dams, and dam removal activities would result in improved water quality downstream from the dams in the long term.

As discussed in Potential Impact 3.20-5, following removal of the dams, changes in the availability of flows within the acceptable flow ranges for whitewater boating and fishing opportunities would be negligible for the reaches downstream from Iron Gate Dam following dam removal. Whitewater boating opportunities under the Proposed Project with 2013 BiOp Flows or 2019 BiOp Flows would be similar to results previously modeled under the KBRA Flows downstream of Iron Gate Dam (see also Potential Impact 3.20-5 and Appendix S). Therefore, no adverse impacts to flow-related whitewater boating opportunities would occur for the California Klamath River wild and scenic river segment. Dam removal activities would also result in long-term improvements to water quality conditions over existing conditions. With improved water quality, the whitewater boating recreation experience would also improve. Therefore, long-term water quality-related whitewater boating impacts would be beneficial for the California Klamath River wild and scenic river segment.

As discussed in Potential Impact 3.20-6, removal of the Lower Klamath Project would not result in substantial increases or decreases in the number of days with acceptable flows for recreational fishing. However, as described in Potential Impacts 3.3-7 through 3.3-11, the geographic extent of the Klamath River fish habitat would be substantially expanded compared to existing conditions. Moreover, the long-term improvements to water quality conditions are expected to reduce fish disease and increase the likelihood of fish survival. Increased fish populations could result in expansion of fishing seasons or increases to quotas and bag limits. Thus, recreational fishing effects from implementing the

Proposed Project would be long-term and beneficial for the California Klamath River wild and scenic river segment.

There could be short-term impacts to recreational fishing during Lower Klamath Project reservoir drawdown. While it is not possible to accurately predict short-term deposition patterns in the mainstem Klamath River channel at a fine spatial scale (e.g., individual pools or other slack-water areas that may serve as fishing holes), general sediment transport and depositional patterns observed in the Klamath River and other analogous river channels indicate that dam-released sediment that may temporarily deposit in pools and other slack water areas (e.g., eddies) and at tributary confluences in the reach from Iron Gate Dam to Cottonwood Creek would be highly erodible during subsequent flow events, leading to a short residence time (i.e., likely one year or less except during dry years) (Potential Impact 3.11-5). Thus, the potential for clogged fishing holes or less accessible shorelines that are temporarily blocked by sediment deposits of limited extent would be short-term and as such would not affect recreational value in a manner that would compromise the long-term wild and scenic river designation or eligibility for listing.

Further, in the short term, new beaches and riparian areas may become established, increasing the variety of shoreline settings. Most of these effects would be temporary and many aspects of the wild and scenic river segment's recreation setting would be considerably improved in the long term once the Klamath River stabilizes. The improved water quality conditions following completion of drawdown activities would improve the recreational setting overall. With regard to public health, improved water quality, and in particular a reduction in the potential for seasonal exposure to high levels of algal toxins (greater than 8 µg/L microcystin) generated by nuisance blooms in the Lower Klamath Project reservoirs and transported into the Middle and Lower Klamath River (Potential Impact 3.2-12) would also reduce potential human health risks associated with water-contact-based activities. Therefore, effects on the recreational setting would be long term and beneficial for the California Klamath River wild and scenic river segment.

Fisheries

Following removal of the Lower Klamath Project, the Klamath River would return to a natural flow regime in the Middle Klamath River immediately downstream of Iron Gate Dam. Restoration of the natural flow regime and upstream sediment supply would improve water quality conditions, likely reducing the occurrence of myxozoan parasites (*Ceratomyxa shasta* and *Parvicapsula minibicornis*) that are known to negatively affect salmonids (see Potential Impact 3.3-10). Increased spawning gravel from upstream sources could enhance spawning habitat following dam removal. Restoring natural sediment mobility processes could also help scour periphyton (e.g., *Cladophora* spp.) (Potential Impact 3.4-5), and deposited sand and gravel would be a less favorable substrate for the periphyton because of greater particle mobility during high-flow events than the existing

armored substrate. A reduction in periphyton would reduce the habitat for the fish pathogen's alternate host (Section 3.3.5.5 *Fish Disease and Parasites*). Further, as discussed above, removal of the reservoirs would eliminate habitat for populations of blue-green algae that produce toxins that can result in acute and chronic effects on fish, including increased mortality, reduced fecundity, reduced feeding, and habitat avoidance (see Potential Impact 3.3-12). Thus, stream flow regime effects would be long term and beneficial for the California Klamath River wild and scenic river segment.

Removal of the Lower Klamath Project would improve water quality conditions over existing conditions. Following dam removal, the seasonal temperature regime downstream from Iron Gate Dam would be more suitable for salmon (see Potential Impact 3.2-2, Potential Impact 3.3-1, Potential Impact 3.3-6, Potential Impact 3.3-7, Potential Impact 3.3-8, Potential Impact 3.3-9, Potential Impact 3.3-10, and Potential Impact 3.3-11). Water temperature effects of dam removal would therefore be long-term and beneficial for the California Klamath River wild and scenic river segment.

As described in Potential Impact 3.11-5, the Proposed Project would restore natural sediment transport processes. Following the initial drawdown period and flushing of reservoir sediment downstream, aquatic habitat conditions would be expected to improve compared to existing conditions, in the long term. Therefore, effects on aquatic habitat conditions would be long-term and beneficial for the California Klamath River wild and scenic river segment.

As discussed in as described in Potential Impacts 3.3-7 through 3.3-11, dam removal would result in beneficial long-term effects on anadromous salmonids. Dam removal would restore connectivity to hundreds of miles of potentially usable habitat in the Upper Klamath Basin and would create additional spawning and rearing habitat within the Hydroelectric Reach. While sediment released during dam removal could be sufficient to cause substantial smothering of spawning gravels, pool infilling, gill abrasion, and changes to holding and migration patterns in the Klamath River reaches immediately downstream of Iron Gate Dam, these impacts would be temporary, as sediment is expected to be flushed through the river system relatively quickly, and would not affect survivability of fish species in a manner that would compromise the long-term wild and scenic river designation or eligibility for listing. Removal of the Lower Klamath Project would also eliminate fish barriers and expand fish access to upstream spawning areas.

Removal of the Lower Klamath Project would improve conditions for native resident fish species, including culturally important fish species (e.g., Chinook salmon, coho salmon, steelhead, and lamprey), by restoring connectivity between the Lower and Upper Klamath River, and by returning a natural flow regime to the reaches where the reservoirs currently exist, thereby improving water quality (see Potential Impact 3.3-1, Potential Impact 3.3-4, Potential Impact

3.3-7, Potential Impact 3.3-8, Potential Impact 3.3-9, Potential Impact 3.3-10, Potential Impact 3.3-11, Potential Impact 3.3-12, and Potential Impact 3.3-21). Dam removal would also likely result in diminished non-native fish habitat and populations, reducing competition for space and resources with native resident fish (see Potential Impact 3.3-17). Therefore, effects on the conditions for native resident fish species, including species traditionally used and culturally important to Indian Tribes, would be beneficial and long term in the California Klamath River wild and scenic river segment.

Wildlife

Riparian vegetation in the California Klamath River wild and scenic river segment downstream from the Iron Gate Dam would benefit from dam removal activities In the long term, especially in the reach between the Iron Gate Dam and the Shasta River confluence (Potential Impact 3.5-4). Special status species that utilize riparian habitat, such as the willow flycatcher (Potential Impact 3.5-12) and Western pond turtle (Potential Impact 3.5-16) would benefit in the long term from successful riparian habitat recovery from Iron Gate Dam downstream to the Klamath River's confluence with the Shasta River.

In addition to improving riparian habitat, the Proposed Project would result in improvements in fish resources in the long term following dam removal, thus providing increased forage for wildlife species that depend upon fish as a food source. The area currently blocked by dams would provide additional available habitat for anadromous fish (see above discussion). Increased fish abundance would also create greater foraging opportunities for riparian and riverine species such as bald eagle, river otter, osprey and black bear (see also Potential Impact 3.5-24). Therefore, there would be a long-term, beneficial effect on habitat for special status species in the California Klamath River wild and scenic river segment. Because wildlife viewing is an important component of recreational opportunities within the Area of Analysis, impacts to recreation would also be long-term and beneficial.

Summary

Overall, dam removal activities under the Proposed Project that return the Middle and Lower Klamath River (i.e., downstream of Iron Gate Dam) to a more natural condition would result in long-term beneficial effects to this candidate wild and scenic river reach's free-flowing condition, water quality, scenic, wildlife, fishery, and recreation river values and the long-term wild and scenic river designation or eligibility for listing would be not be compromised.

Eligible and Suitable Wild and Scenic River Section on the Klamath River

In addition to the designated wild and scenic river segment, the Klamath River reach from the California-Oregon state line to the upstream end of Copco No. 1 Reservoir was found to be "eligible and suitable" for wild and scenic river designation, though it has not yet been designated into either the National or the State Wild and Scenic River System. The potential outstandingly remarkable

values include scenery, fisheries, wildlife, and recreation (whitewater boating and fishing). This candidate wild and scenic river reach is included in the Area of Analysis for recreation.

Short-term negative impacts on water quality, scenic, recreation, fishery, and wildlife river values would be likely to occur due to high SSCs anticipated during drawdown of the upstream J.C. Boyle Reservoir (see Potential Impact 3.2-3). Short-term impacts would also occur as a result of restricted access and use of river-based recreation facilities and opportunities within the Limits of Work during dam removal years 1 and 2. However, these temporary impacts would not affect river values in a manner that would compromise the long-term wild and scenic river eligibility for listing. In the long term, dam removal under the Proposed Project would eliminate hydropower peaking and return this section of the Hydroelectric Reach to a more natural condition than under existing conditions.

Overall, dam removal activities under the Proposed Project that return this section of the Hydroelectric Reach to a more natural condition would result in long-term beneficial effects to this candidate wild and scenic river reach's free-flowing condition, water quality, scenic, wildlife, fishery, and recreation river values and the long-term wild and scenic river designation or eligibility for listing would be not be compromised.

Significance

No significant impact in the short term for the designated California Klamath River wild and scenic river segment

No significant impact in the short term for the eligible and suitable California Klamath River wild and scenic river section

Beneficial in the long term for the designated California Klamath River wild and scenic river segment

Beneficial in the long term for the eligible and suitable California Klamath River wild and scenic river section

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3.21 Hazards and Hazardous Materials

Volume I Section 3.21 Hazards and Hazardous Materials, paragraph 1 on page 3-1029:

This section describes the environmental setting for hazards and hazardous materials, as well as potential environmental impacts and associated mitigation measures for the Proposed Project. The discussions in the following subsections focus primarily on the transport, use, and disposal of hazardous materials, school proximity to hazardous materials, contaminants and contaminated sites, nearby airports, emergency response plans, and wildfires. For information on chemicals and aquaculture drugs used in hatchery operations, please see Section 3.2.5 Water Quality – Potential Impacts and Mitigation Potential Impact 3.2-17.

Volume 1 Section 3.21.2.3 Hazards and Hazardous Materials – Environmental Setting – Contaminants/Contaminated Sites, paragraph 4 on page 3-1034:

The dams and hydroelectric facilities within the Proposed Project area may also include items such as transformers, batteries, bushings, oil storage tanks, bearing and hydraulic control system oils, lead bearings, soils or other material contaminated with lead from the use of lead-based paints or plumbing and 700 tons of creosote-treated wood in the wooden stave penstock at Copco No. 2 Dam, as well as wood utility poles (see also Appendix B: Definite Plan – Appendix O3).

Volume I Section 3.21.2.3 Hazards and Hazardous Materials – Environmental Setting – Contaminants/Contaminated Sites, paragraph 4 on page 3-1034:

Certain closed systems, such as transformer bushings, cannot be tested until time of disposal. Thus, small quantities of polychlorinated biphenyls (PCBs) may be present in hydraulic fluids, soils, and in transformers and other electrical equipment, including older fluorescent light fixtures. Old light switches may contain mercury. The dams and hydroelectric facilities within the Proposed Project area may also include items such as transformers, batteries, bushings, oil storage tanks, bearing and hydraulic control system oils, lead bearings, soils or other material contaminated with lead from the use of lead-based paints or plumbing and 700 tons of creosote-treated wood in the wooden stave penstock at Copco No. 2 Dam (see also Appendix B: *Definite Plan – Appendix O3*). ~~Phase 1 and Phase 2 Environmental Site Assessments are currently underway (Appendix B: *Definite Plan*).~~

Volume I Section 3.21.5 Hazards and Hazardous Materials – Potential Impacts and Mitigation – Potential Impact 3.21-1 Proposed construction-related activities

could result in substantial exposure to hazardous materials through the routine transport, use, or disposal of hazardous materials, paragraph 1 on page 3-1042 to paragraph 5 on 3-1045:

Potential Impact 3.21-1 Proposed construction-related activities could result in substantial exposure to hazardous materials through the routine transport, use, or disposal of hazardous materials.
The Proposed Project would not result in the long term routine transport, use, or disposal of hazardous materials since the Proposed Project is the removal of existing dams and their associated hydroelectric facilities, and, once completed, the Proposed Project would not involve the continued use, transport or disposal of hazardous materials. However, in the short term, construction-related dam removal would involve routine transport, use, and disposal of general construction waste materials (e.g., concrete, rebar, building waste, power lines; see also Appendix B: *Definite Plan – Sections 5.3–5.5*) and some hazardous materials (e.g., treated lumber, asbestos, lead, PCBs, fuels, gases, etc.) would be encountered, used, transported and disposed of during those construction activities.

~~The Proposed Project Phase 1 Environmental Site Assessment for hazardous materials is underway but has not yet been completed. A Phase 2 Environmental Site Assessment for hazardous materials would be undertaken, as needed.~~ Existing information regarding hazardous waste associated with the Lower Klamath Project dams and its facilities indicates that creosote or other treated wood is present, including 700 tons of treated wood waste from the wooden-stave penstock at Copco No. 2 Dam, wood utility poles, as well as batteries, possible PCBs from transformers and other electrical equipment, asbestos-containing materials in building materials, fuels and oils, flammable and combustible liquids, flammable and nonflammable gases, corrosives, concrete dust (if it generates high pH waste), and soils or other material contaminated with lead from the use of lead-based paints or plumbing (see additional detail in Appendix B: *Definite Plan – Appendix O3*). On December 30, 2019, the State Water Board received a submittal from PacifiCorp (PacifiCorp 2019a), which included redacted versions of Phase I and Phase II reports (KRRC 2019f, g, h, i, j, k, l, m, n, and o). As noted in the submittal, these reports included the following.

Phase I Environmental Site Assessments (ESA) documents

- Phase I ESA for the Lower Klamath Hydroelectric Project, Dated August 23, 2019
- Phase I ESA for the City of Yreka Diversion Dam, Dated July 10,2019
- Phase I ESA for the Fall Creek Hatchery, Dated July 10,2019

Phase II documents consisting of a series of Hazardous Building Materials Survey (HMBS) reports and a single Phase 2 ESA

- J.C. Boyle Development, HBMS Revision I , Dated August 27, 2019

- Copco No. I Development, HBMS Revision I , Dated August 22, 2019
- Copco No. 2 Development, HBMS Revision 1, Dated August 22, 2019 Iron Gate Development, HBMS Revision 1, Dated August 22, 2019
- Iron Gate Hatchery and Fall Creek Hatchery, HBMS Revision I , Dated August 22, 2019
- City of Yreka Diversion Dam, HBMS Revision I, Dated August 27, 2019
- Iron Gate Hatchery Burn Pit, Phase II ESA, Dated September 13,2019

These redacted reports disclosed the potential for certain types of hazardous materials (e.g., asbestos, heavy metals, polychlorinated biphenyls (PCBs), creosote-treated wood) at the various facilities, consistent with information in the Definite Plan, Appendix O-3 Hazardous Materials Management Plan.

Demolition and disposal of structures containing the aforementioned hazardous materials, ~~or~~ as well as others determined as part of Phase ~~1~~I and Phase II investigations ~~(and Phase 2, as needed)~~, under the Proposed Project could result in exposure to quantities of hazardous, or acutely hazardous, materials that would be harmful to the public or the environment due to accidental releases and thus could result in a significant impact. Operation of construction equipment in close proximity to aquatic environments could involve equipment failures that would also result in the public or the environment being exposed to hazardous materials due to petroleum spills. Because the Proposed Project is located in a sensitive environment (i.e., along the Klamath River) and consists of substantial demolition activities, the increased amount of construction-related activity relative to existing conditions would increase the risk of exposing the public or the environment to quantities of hazardous, or acutely hazardous, materials that would be harmful. This would be a significant impact.

The Proposed Project includes an assessment of roads, intersections, bridges and culverts (Appendix B: *Definite Plan – Appendix K*) within the Area of Analysis for hazards and hazardous materials and proposes a number of improvements to help reduce the potential for accidental release of hazardous materials during transport of these materials to and from the dam sites. The proposed replacements and upgrades to transportation structures, as well as proposed construction-related traffic management, including signage, flaggers, and traffic coordination (Appendix B: *Definite Plan – Appendix O2*), would reduce the risk of traffic accidents that could result in exposure to quantities of hazardous, or acutely hazardous, materials that would be harmful to the public or the environment.

Further, existing federal and state regulations require the KRRC and its construction contractors to undertake a number of measures related to hazardous materials. KRRC is developing a dam safety program that would ensure that removal of the Proposed Project would be undertaken in a manner that minimizes risk to people, structures, infrastructure, and the natural resources of the Klamath River Basin (Appendix B: *Definite Plan – Section 3*). Such

removal would fully comply with FERC's dam safety requirements, and it would be consistent with FERC Engineering Guidelines (FERC 2017). In addition, the below list of state and federal regulations include requiring, for example, that the KRRC and its contractors keep an inventory of hazardous materials at each dam facility and the intention for final disposition of these materials. The KRRC and its contractors are required to describe the storage, spill prevention, and cleanup measures, including the deployment and maintenance of spill cleanup materials and equipment at each facility/site to contain any spill from Proposed Project activities. Onsite containment for storage of chemicals classified as hazardous is required to be away from watercourses and include secondary containment and appropriate management as specified in California Code of Regulations, Title 27, Section 20320.

The KRRC and its contractors are also required to comply with the terms and conditions in the State Water Board's *National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities* (Construction General Permit; State Water Board Order 2009-0009-DWQ, as amended by State Water Board Orders 2010-0014-DWQ and 2012-0006-DWQ), and ongoing amendments during the life of the Proposed Project.), Hazardous materials, substances, and waste within the Area of Analysis for hazards and hazardous substances are regulated by several other federal and state laws and policies, some of which are listed below. Compliance with required regulations would substantially minimize the potential impact of hazardous materials on the public and the environment during the routine transport, use, or disposal of hazardous materials. The following represent some of the many regulations for which activities would be subject.

Federal Regulations

- Resource Conservation and Recovery Act (42 USC 6901 et seq.)
- Hazardous Materials Transportation Act (49 USC Section 1801 et seq.)
- Clean Water Act (33 USC 1251 et seq.)
- Comprehensive Environmental Response Compensation and Liability Act and
- Superfund Amendment Reauthorization Act (SARA) (43 USC 9601 et seq.)
- 0 CFR 260-279 Federal Regulations on hazardous waste management
- 40 CFR 301 et seq. Emergency Planning and Community Right to Know Act
- Toxic Substances Control Act (15 USC 2601 et seq.)
- National Emissions Standards for Hazardous Air pollutants (NESHAP) 40 CFR Part 61
- Occupational Safety and Health Standards (29 CFR 1910)
- Environmental Protection Agency Protection of the Environment (40 CFR Part 761-PCBs)

State Regulations

- California Hazardous Waste Control Law (California Health and Safety Code [HSC] Section 25500 et seq.)
- Carpenter-Presley-Tanner Hazardous Substances Account Act (HSC Section 25300 et seq.)
- Unified Hazardous Waste and Hazardous Materials Management Regulatory Program (HSC Section 25404 et seq.)
- Cal/OSHA Regulations (CCR Title 8)
- Environmental Health Standards for the Management of Hazardous Waste (CCR Title 22 Division 4.5)

The Proposed Project also includes Appendix B: *Definite Plan – Appendix O3 Hazardous Materials Management Plan*. The Hazardous Materials Management Plan states that all hazardous materials removed within the Project Boundary would be either returned to the vendor, recycled, or managed and disposed of as hazardous waste at an approved hazardous waste facility in accordance with applicable regulations. Transformer oils would be tested for PCBs if no data exist. Any tanks that contain hazardous materials would be decontaminated prior to disposal. Universal hazardous waste (e.g., lighting ballasts, mercury switches, and batteries) would be handled per applicable federal and state universal waste regulations. The Hazardous Materials Management Plan notes that any additional hazardous materials noted during the Phase ~~1~~I site visits and Phase ~~2~~II investigations would be included in an updated Hazardous Materials Management Plan and the contractor would sample and test for asbestos, lead and PCB's at all structures to be removed. The Hazardous Materials Management Plan is required to comply with, among other regulations, California Health and Safety Code, title 27, division 20, chapter 6.95, sections 25500 through 25545, and California Code of Regulations title 19, division 2, chapter 4.

Overseeing development and implementation of the Final Hazardous Materials Management Plan falls within the scope of the State Water Board's water quality certification authority. While the KRRC has stated its intention to be consistent with the water quality certification from California, at this time the Hazardous Materials Management Plan is not finalized. Therefore, implementation of Mitigation Measure HZ-1 is required to reduce the short-term, construction-related risk of exposing the public and/or the environment to harmful quantities of hazardous, or acutely hazardous, materials during their transport, use, and disposal under the Proposed Project to less than significant.

Mitigation Measure HZ-1 − Hazardous Materials Management.
No later than six months following issuance of the FERC license surrender order, and prior to the start of pre-dam removal activities and any construction activities, the KRRC shall submit a Final Hazardous Materials Management Plan ~~(Final Hazardous Materials Management Plan)~~ to the State Water Board Deputy

Director for review and approval. The State Water Board has authority to review and approve any final Hazardous Materials Management Plan through its water quality certification under Clean Water Act Section 401. The State Water Board has issued a draft water quality certification[171] which sets forth monitoring and adaptive management requirements for any Hazardous Materials Management Plan to meet~~, as Condition 11~~. Additionally, the Oregon Department of Environmental Quality has issued a water quality certification[172] that sets forth water quality monitoring and adaptive management conditions for points upstream of California.

Footnotes:
[171] The State Water Board's draft water quality certification is available online at: https://www.waterboards.ca.gov/waterrights/water_issues/programs/water_quality_cert/docs/lower_klamath_ferc14803/lkp_dwqc.pdf (Accessed December 19, 2018).
[172] The Oregon Department of Environmental Quality's final water quality certification is available online at: https://www.oregon.gov/deq/FilterDocs/ferc14803final.pdf (Accessed December 21, 2018).

Consistent with the above, the Final Hazardous Materials Management Plan shall include any modifications to the proposed Hazardous Materials Management Plan developed in coordination with State Water Board staff that provide the same or better level of protection regarding procedures for proper disposal or abatement of hazardous materials encountered during Proposed Project activities; proper storage, containment, and response to spills caused by the Proposed Project; and proper removal and disposal of septic tanks as part of the Proposed Project.

The Final Hazardous Materials Management Plan shall also describe how the elements of the KRRC's proposed Health and Safety Plan (Appendix B: *Definite Plan – Appendix O4*), the Spill Prevention, Control, and Countermeasure Plan (Appendix B: *Definite Plan – Appendix O4*), the Emergency Response Plan (Appendix B: *Definite Plan – Appendix O4*), and the Traffic Management Plan (Appendix B: *Definite Plan – Appendix O2*) are coordinated together, and as such, adequately protect water quality with respect to hazardous materials management. <u>The Final Hazardous Materials Management Plan shall meet the monitoring and adaptive management requirements described in the final water quality certification.</u>

The KRRC shall implement the Final Hazardous Materials Management Plan upon receipt of State Water Board Deputy Director approval and any changes to the Hazardous Materials Management Plan must be approved by the State Water Board Deputy Director prior to implementation.

The KRRC shall provide monthly reporting to the State Water Board detailing the volumes of hazardous materials and wastes that were cleaned up and disposed of from site construction activities and any other modifications to the proposed Hazardous Materials Management Plan developed in coordination with State Water Board staff.

Significance
No significant impact with mitigation

Volume I Section 3.21.5 Hazards and Hazardous Materials – Potential Impacts and Mitigation – Potential Impact 3.21-4 The Proposed Project could be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, could result in substantial exposure to hazardous materials, paragraph 6 on page 3-1046:

Potential Impact 3.21-4 The Proposed Project could be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, could result in substantial exposure to hazardous materials.
The Proposed Project is not located on a site which is currently included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5. However, ~~no Phase 1 or 2 reports have been submitted to make the determination of whether portions of the Proposed Project Area should be included on the lists.~~ ~~T~~the type of use and activities and the length of time these activities have been occurring within the Proposed Project Area suggest the possibility that contaminated sites/soils exist on site. On December 30, 2019, the State Water Board received a submittal from PacifiCorp (PacifiCorp 2019a), which included redacted versions of Phase I and Phase II reports (KRRC 2019f, g, h, i, j, k, l, m, n, and o). As noted in the submittal, these reports included the following.

Phase I Environmental Site Assessments (ESA) documents

- Phase I ESA for the Lower Klamath Hydroelectric Project, Dated August 23, 2019
- Phase I ESA for the City of Yreka Diversion Dam, Dated July 10,2019
- Phase I ESA for the Fall Creek Hatchery, Dated July 10,2019

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- Iron Gate Hatchery and Fall Creek Hatchery, HBMS Revision I , Dated August 22, 2019
- City of Yreka Diversion Dam, HBMS Revision I, Dated August 27, 2019
- Iron Gate Hatchery Burn Pit, Phase II ESA, Dated September 13,2019

These redacted reports disclosed the potential for certain types of hazardous materials (e.g., asbestos, heavy metals, polychlorinated biphenyls (PCBs), creosote-treated wood) at the various facilities, consistent with information in the Definite Plan, Appendix O-3 Hazardous Materials Management Plan. ~~Therefore, the risk remains that contaminants exist on the site that could result in a substantial exposure that would be harmful to the public or the environment. The Proposed Project could also result in a significant impact if the project involved activity in areas that contained contaminated substances that would result in substantial exposure to the public or the environment. Crucial to this analysis would be the analysis of what contaminants exist on the site. This is typically ascertained by completion of a Phase 1 Environmental Analysis and, when necessary, a follow up with a Phase 2 Environmental Analysis.~~

Volume I Section 3.21.5 Hazards and Hazardous Materials – Potential Impacts and Mitigation – Potential Impact 3.21-4 The Proposed Project could be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, could result in substantial exposure to hazardous materials, paragraph 3 on page 3-1047:

In addition to the measures included in the Proposed Project, Mitigation Measure HZ-1 would be necessary to ensure that adherence to existing regulations are included in contractor bid documents. ~~This includes that the findings of the Phase 1 and Phase 2 Environmental Site Assessment reports would need to be added to the Hazardous Materials Management Plan and Health and Safety Plan.~~ With implementation of Mitigation Measure HZ-1, potential impacts due to exposure to hazardous materials during the proposed construction-related activities would be less than significant.

Volume I Section 3.21.5 Hazards and Hazardous Materials – Potential Impacts and Mitigation – Potential Impact 3.21-7 Proposed construction-related activities could impair implementation of, or physically interfere with, an adopted emergency response plan or emergency evacuation plan, paragraph 3 on page 3-1049.

The draft Traffic Management Plan (Appendix B: *Definite Plan − Appendix O2)* further notes that the KRRC's contractor would perform a risk assessment of all intersections and roadways as part of the final Traffic Management Plan. Implementation of ~~Recommended~~ Mitigation Measure TR-1 would require additional components beyond those listed as part of the Proposed Project (i.e., the final versions of the Traffic Management Plan and Emergency Response Plan) and these components would be necessary to adequately implement an

Emergency Response Plan that addresses short-term construction-related impacts, consisting of an increase in traffic on narrow rural roads from commuting workers, hauling of large equipment and disposal of wastes, to the point that the potential impact would be less than significant.

~~Overseeing development and implementation of the final Traffic Management Plan and Emergency Response Plan, including measures described in Recommended Measure TR-1, does not fall within the scope of the State Water Board's water quality certification authority. While the KRRC has stated its intention to reach enforceable good citizen agreements that will be finalized and implemented, at this time the Traffic Management Plan and Emergency Response Plan are not finalized and the State Water Board cannot require their implementation. Accordingly, t~~The State Water Board anticipates that implementation of the final Traffic Management Plan and Emergency Response Plan, including the aforementioned additional details in ~~Recommended~~ Mitigation Measure TR-1 and any modifications developed through the FERC process that provide the same or better level of protection for transportation and traffic would reduce impacts to a less than significant level. ~~However, because the State Water Board cannot ensure implementation of the final Traffic Management Plan and Emergency Response Plan, it has determined the impact in this Draft EIR to be significant and unavoidable.~~

Significance

~~*Significant and unavoidable impact*~~ *No significant impact with mitigation*

Volume I Section 3.21.5 Hazards and Hazardous Materials – Potential Impacts and Mitigation – Potential Impact 3.21-8 Proposed construction-related activities and/or removal of the Lower Klamath Project reservoirs could substantially increase the public's risk of loss, injury, or death associated with wildland fires, new paragraph 4 on page 3-1050:

KRRC's application for water quality certification of the Proposed Project, as submitted to the State Water Board in December 2019 (KRRC 2019a), includes the following additional information about the Fire Management Plan:

- "KRRC intends to avoid a material net increase of fire risk as compared to baseline conditions in the Project area as defined in the Definite Plan."
- "KRRC is developing an updated Fire Management Plan that will include effective and feasible strategies and concepts to enhance both short-term and long-term fire prevention, detection, and suppression in the Klamath River Basin, and will submit the updated Fire Management Plan with FERC in support of the pending surrender application."
- "The updated Fire Management Plan is being developed in consultation with federal, California, Oregon, and local fire agencies. During construction, these measures include, but are not limited to meeting or exceeding federal, Oregon, and California requirements for fire prevention and suppression during construction activities, implementation of best

management practices following National Fire Protection Association standards, and the designation of a safety officer on site that is responsible for overseeing fire responsibilities for construction operations 24 hours a day, seven days a week. The Fire Management Plan will also address long-term fire management to ensure that the Klamath River Basin's fire-fighting resources are not diminished due to the implementation of the Project, including the potential deployment of technology that will rapidly detect wildfire ignitions in the Basin allowing fire agencies to respond quickly to fire ignitions. KRRC is also consulting with fire agencies on identifying replacement water sources and access, including identification of aerial river access points."

- "In addition, KRRC has also contracted with Reax, a leading fire engineering firm that has assisted utilities throughout California (including PacifiCorp) to reduce operational fire risk. Reax will assist KRRC with the development of the updated Fire Management Plan to ensure that the measures set forth in the updated Fire Management Plan will effectively reduce short- and long-term fire risk as a result of the implementation of the Project".

Volume I Section 3.21.5 Hazards and Hazardous Materials – Potential Impacts and Mitigation Potential Impact 3.21-8, new paragraphs 2 and 3 on page 3-1051:

In their comment letter on the Draft EIR dated February 25, 2019 (please refer to comment SA4-1), CALFIRE notes *"…It is fair to say the possible impacts of the dam removal on firefighting would depend on a variety of factors including: Location of fire, type of fire, fire behavior, firefighting resources assigned to the fire, time of year when the fire occurs, the water flow of the Klamath River on the day of the fire, etc…. Ultimately the impact of the dam removals will have to be evaluated on a case by case basis. CAL FIRE is used to fighting wildland fires in a large variety of circumstances and will adapt to whatever conditions we encounter at each fire. Also CAL FIRE understands that the …(KRRC) will be working with CAL FIRE on KRRC's Fire Management Plan to address the analyzed issues."*

In its comment letter on the Draft EIR, dated February 26, 2019 (please refer to comment ORG 47-3), KRRC states *"As a condition of license surrender, KRRC will address any potential increased response time and associated wildland fire risk due to implementation of the Proposed Project."* KRRC further states *"KRRC continues to work with CAL FIRE to identify not only replacement sources of water, but ways in which KRRC can facilitate the reduction of overall emergency response times through communications and roadway improvements."* KRRC goes on to describe specific steps that it would take to implement replacement sources and reduce overall emergency response times under the Proposed Project.

3.21.6 References

Volume I Section 3.21.6 Hazards and Hazardous Materials – References, pages 3-1054 through 3-1055, includes the following revisions:

KRRC. 2019a. Request for section 401 water quality certification; application for surrender of license for major project and removal of project works; FERC Project No. 2082-063 and 14803-001 (Lower Klamath Project). Prepared by KRRC, Berkeley, California for State Water Resource Control Board, Sacramento, California.

KRRC. 2019f. Klamath River Renewal Project: Phase I Environmental Site Assessment for the Lower Klamath Hydroelectric Project. Dated August 23, 2019. Prepared by AECOM Technical Services, INC., Oakland, California and CDM Smith, Portland, Oregon for Klamath River Renewal Corporation.

KRRC. 2019g. 2019. Klamath River Renewal Project: Phase I Environmental Site Assessment for the City of Yreka Diversion Dam. Dated July 10,2019. Prepared by AECOM Technical Services, INC., Oakland, California and CDM Smith, Portland, Oregon for Klamath River Renewal Corporation.

KRRC. 2019h. Klamath River Renewal Project: Phase I Environmental Site Assessment for the Fall Creek Hatchery. Dated July 10, 2019. Prepared by AECOM Technical Services, INC., Oakland, California and CDM Smith, Portland, Oregon for Klamath River Renewal Corporation.

KRRC. 2019i. Klamath River Renewal Project: J.C. Boyle Development, Hazardous Building Materials Survey Revision I. Dated August 27, 2019. Prepared by AECOM Technical Services, INC., Oakland, California and CDM Smith, Portland, Oregon for Klamath River Renewal Corporation.

KRRC. 2019j. Klamath River Renewal Project: Copco No.1 Development, Hazardous Building Materials Survey Revision I. Dated August 22, 2019. Prepared by AECOM Technical Services, INC., Oakland, California and CDM Smith, Portland, Oregon for Klamath River Renewal Corporation.

KRRC. 2019k. Klamath River Renewal Project: Copco No.2 Development, Hazardous Building Materials Survey Revision 1. Dated August 22, 2019. Prepared by AECOM Technical Services, INC., Oakland, California and CDM Smith, Portland, Oregon for Klamath River Renewal Corporation.

KRRC. 2019l. Klamath River Renewal Project: Iron Gate Development, Hazardous Building Materials Survey Revision 1. Dated August 22, 2019. Prepared by AECOM Technical Services, INC., Oakland, California and CDM Smith, Portland, Oregon for Klamath River Renewal Corporation.

KRRC. 2019m. Klamath River Renewal Project: Iron Gate and Fall Creek Hatchery, Hazardous Building Materials Survey Revision I. Dated August 22, 2019. Prepared by AECOM Technical Services, INC., Oakland, California and CDM Smith, Portland, Oregon for Klamath River Renewal Corporation.

KRRC. 2019n. Klamath River Renewal Project: City of Yreka Diversion Dam, Hazardous Building Materials Survey Revision I. Dated August 27, 2019. Prepared by AECOM Technical Services, INC., Oakland, California and CDM Smith, Portland, Oregon for Klamath River Renewal Corporation.

KRRC. 2019o. Klamath River Renewal Project: Burn Pit at Iron Gate Hatchery, Phase II Soil Investigation. Dated September 13, 2019. Prepared by AECOM Technical Services, INC., Oakland, California and CDM Smith, Portland, Oregon for Klamath River Renewal Corporation.

PacifiCorp, 2019a. December 30, 2019 Letter to State Water Resources Control Board, RE: Response to the State Water Resources Control Board's November 15, 2019 Letter Requesting the Phase 1 and 2 Environmental Site Assessment Reports.

Other references cited as part of text included in the Section 3.21 list of revisions:

FERC (Federal Energy Regulatory Commission). 2017. Engineering Guidelines for the Evaluation of Hydropower Projects. Available at: https://www.ferc.gov/industries/hydropower/safety/guidelines/eng-guide.asp. [Accessed December 2018].

3.22 Transportation and Traffic

Volume I Section 3.22.2.1 Transportation and Traffic – Environmental Setting – Traffic Flow – Roadways – Copco Road, paragraph 4 on page 3-1060:

Copco Road is a paved, two-lane road in generally good pavement condition between I-5 and Ager Road with few pavement cracks or ruts and is approximately 32 ~~27~~ feet wide.

Volume I Section 3.22.2.3 Transportation and Traffic – Environmental Setting – Road Conditions – Road and Bridge Improvement/Replacements, paragraph 5 on page 3-1063:

- Access Road from Long Gulch Recreational Facility to Lakeview Road - some road surface rehabilitation during construction.
- ~~Access Road from Overlook Point Recreational Facility to Copco Road - some road surface rehabilitation during construction.~~

Volume I Section 3.22.4 Transportation and Traffic – Impact Analysis Approach, paragraph 3 on page 3-1068:

In addition, the major goal and objective of the Land Use and Circulation element of the County's general plan is "to protect the county's critical natural resources and still allow room for adequate growth and development. The Proposed Project would not conflict with the measures set forth in the Regional Transportation Plan or with the goal and objective of the Land Use and Circulation element of the County's general plan. ~~The Regional Transportation Plan does not contain measures or programs that would conflict with the Proposed Project in a manner that would adversely affect the environment.~~

Volume I Section 3.22.5 Transportation and Traffic – Potential Impacts and Mitigation Potential Impact 3.22-1 and Potential Impact 3.22-2, paragraph 2 on page 3-1070:

Recreational use trips associated with recreation at areas within the Area of Analysis other than Copco No. 1 and Iron Gate reservoirs may still occur during construction periods, but because Copco No. 1 and Iron Gate facilities would be closed, it is expected that continued recreational use traffic would be dispersed away from the immediate vicinity of Copco No. 1 and Iron Gate and would not overlap with construction traffic. Additional discussion of alternative recreational opportunities is described in Section 3.20 *Recreation*. <u>However non-reservoir-related traffic could still occur within the Area of Analysis and, while numbers of such traffic are unknown, when coinciding with peak construction activity, could result in potential conflicts on Copco Road, especially when considering large RV's and oversized construction equipment.</u>

Volume I Section 3.22.5 Transportation and Traffic – Potential Impacts and Mitigation Potential Impact 3.22-1 and Potential Impact 3.22-2, Table 3.22-6 Vehicle Trips (VT) for the Import/Export of Materials for the Proposed Project on page 3-1071:

Table 3.22-6. Vehicle Trips (VT) for the Import/Export of Materials for the Proposed Project.*

Dam	Estimated VT Imported	Estimated VT Exported	Total VT	Peak Duration	VT per Day
Copco No. 1	1,720	706	2,426	7 months	~~15~~ 12
Copco No. 2	Included in Copco No. 1 VT estimates	1,928	1,928+	6 months	~~14~~ 11
Iron Gate	380	746	1,126	4 months	~~12~~ 9
J.C. Boyle	200	1,024	1,224	4 months	~~13~~ 10

* VT numbers consider both full and empty returns. VT per Day is calculated by dividing Total VT by peak duration divided by an average 30-day month. Numbers rounded.

Source: Appendix B: *Definite Plan – Section 5, revised (S. Leonard, AECOM as KRRC Technical Representative, pers. comm., November 2018).*

Volume I Section 3.22.5 Transportation and Traffic – Potential Impacts and Mitigation Potential Impact 3.22-1 and Potential Impact 3.22-2, paragraph 1 on page 3-1071:

As noted in Section 3.22.2.1 *Traffic Flow*, the two major roads used for access would be Interstate 5 and Copco Road. Copco Road has an ADT of 485 and a LOS A capacity of 1300 ADT. Adding ~~391~~ 392 ADT from both worker trips (350 ADT) and waste movement (~~41~~ 42 ADT), Copco Road would remain at a LOS A. Likewise for Interstate 5, with an AADT of 20,900 and LOS A capacity of 25,400 AADT, there is sufficient capacity for added traffic (~~391~~ 392 ADT) to keep the LOS level at LOS A. These short-term additional trips would cease after the Proposed Project is completed.

Volume I Section 3.22.5 Transportation and Traffic – Potential Impacts and Mitigation Potential Impact 3.22-1 and Potential Impact 3.22-2, paragraph 1 on page 3-1072:

Finally, as noted above, the Proposed Project ~~would~~ is not in conflict with the measures or programs set forth in the Regional Transportation Plan or with the goals and objectives of the Land Use and Circulation elements of the County's general plan. ~~does not contain measures or programs that would conflict with the Proposed Project in a manner that would adversely affect the environment.~~

Volume I Section 3.22.5 Transportation and Traffic – Potential Impacts and Mitigation Potential Impact 3.22-1 and Potential Impact 3.22-2, paragraph 5 on page 3-1072 through paragraph 1 on page 3-1074:

~~It would be appropriate for the recommended~~ In its comments on the Draft EIR (ORG46) and in its application for water quality certification filed on December 3, 2019, the KRRC provided additional standards and commitments regarding the Traffic Management Plan. The terms and conditions relating to traffic and transportation in the final Traffic Management Plan and Emergency Response Plan ~~to~~ will provide implementation details consistent with all applicable regulatory permit requirements including the latest version of the Caltrans California Manual on Uniform Traffic Control Devices (Caltrans 2018b) and will be coordinated with the noted agencies (Caltrans, Siskiyou County, California Highway Patrol, CALFIRE, and other emergency response agencies) as part of the detailed design phase and prior to start of construction. ~~Recommended~~ Mitigation Measure TR-1 includes additional and feasible components beyond those listed as part of the Proposed Project that would reduce potential short-term construction-related impacts on performance of the circulation system and congestion. ~~However, overseeing development and implementation of the final Traffic Management Plan and Emergency Response Plan does not fall within the scope of the State Water Board's water quality certification authority. While the KRRC has stated its intention to reach enforceable "good citizen" agreements that will be finalized and implemented, at this time the Traffic Management Plan and Emergency Response Plan are not finalized and the State Water Board cannot require their implementation. Accordingly, t~~The State Water Board anticipates that implementation of the final Traffic Management Plan and Emergency Response Plan, including the aforementioned additional details and any modifications developed through the FERC process that provide the same or better level of protection for transportation and traffic, would be expected to ensure that impacts are lowered to less than significant. ~~Because the State Water Board cannot ensure the Traffic Management Plan's and Emergency Response Plan's implementation, it has determined the impact in this Draft EIR to be significant and unavoidable.~~

~~Recommended~~ Mitigation Measure TR-1 – Transportation and Traffic.

A. The KRRC and/or its contractor(s) shall develop a final Traffic Management Plan that provides:

1. Implementation details consistent with all applicable regulatory requirements including the latest version of the Caltrans California Manual on Uniform Traffic Control Devices (MUTCD, Caltrans 2018b), Caltrans Traffic Management Plan (TMP) Guidelines, Oregon Department of Transportation (ODOT) Oregon Supplement to the MUTCD, Federal Highway Administration MUTCD, ODOT Traffic Control Plans Design Manual, and ODOT TMP Project Level Guidance Manual. ~~and coordination~~KRRC will coordinate with the noted agencies (Caltrans, ODOT, Siskiyou and Klamath County Public Works and Sheriff's Departments, California Highway Patrol and Oregon State Police, CALFIRE, Oregon Department of Forestry [ODF] Fire Division, and other emergency response agencies) as part of the detailed design phase and prior to start of construction. Potential

conflicts with bicycle and pedestrian use, as well as transit and school bus service, need to be addressed in the Traffic Management Plan. The final version of the Traffic Management Plan, after coordination with the above referenced agencies, shall be received by the State Water Board prior to the start of construction.

2. Each road, bridge, and culvert improvement project included in the Proposed Project, or any other road, bridge, or culvert improvement project that is identified as necessary for the Proposed Project, shall be constructed consistent with the latest version of the Caltrans Highway Design Manual (Caltrans 2018c), Caltrans Standard Plans, Caltrans Standard Specifications, or ODOT Highway Design Manual, ODOT, Standard Drawings and Standard Details, and ODOT Standard Specifications, or equivalent, and shall not conflict with any applicable plan, ordinance, or policy regarding performance of the transportation system, traffic safety and/or congestion management within the Area of Analysis. Construction shall not begin until all final designs for road, bridge, and culvert improvement projects included in the Proposed Project have been received and approved, as necessary, by the county and other responsible agencies.
3. The KRRC shall be responsible for repairing and/or rehabilitating any Siskiyou County roadways within the traffic and transportation Area of Analysis that are damaged or otherwise adversely impacted by Proposed Project activities, such that they are in a condition equal to or better than they were before dam removal activities.

B. The KRRC and/or its construction contractor(s) shall develop an Emergency Response Plan with details and procedures to be put in place to help prevent incidents, to ensure preparedness in the event incidents occur, and to provide a systematic and orderly response to emergencies through coordination with emergency response agencies, as described in Appendix B: *Definite Plan − Appendix O4*.

Significance

~~*Significant and unavoidable impact*~~ *No significant impact with mitigation*

Volume I Section 3.22.5 Transportation and Traffic – Potential Impacts and Mitigation Potential Impact 3.22-3, paragraph 2 on page 3-1074:

Roads, bridges, and culverts in the transportation and traffic Area of Analysis currently serve rural residential and extensive recreational uses (Section 3.22.2.3 *Road Conditions*). Some of the roadways originally may have been built for the construction of the Lower Klamath Project dams and appear to have served adequately for that purpose. However, the existing conditions of the roadways and other infrastructure are not adequate for all of the construction activities included in the Proposed Project, as described in Appendix B: *Definite Plan − Appendix K*. As described in Impacts 3.22-1 and 3.22.-2, the improvements may include five bridges (two of them over the Klamath River) that need to be

replaced: four bridges for construction purposes, and one bridge post-construction because it is built on reservoir sediment. There are 13 or more culverts that need replacement. As described in Appendix B: *Definite Plan − Appendix K,* there are portions of 20.3 miles of road that would need partial road improvements. Some descriptions note that sections of roads are in poor condition but no improvements are proposed. These sections of roads may not be up to a standard for the transportation of construction equipment, adequate for emergency response, or in a condition adequate for future use after dam removal activities have been completed; however, as described in Appendix B: *Definite Plan − Appendix K*, there will be pavement rehabilitation as part of the proposed Project, which will address the deficiencies in the existing road conditions to the extent necessary.

Volume I Section 3.22.5 Transportation and Traffic – Potential Impacts and Mitigation Potential Impact 3.22-3, paragraph 4 on page 3-1074:

Implementation of ~~Recommended~~ Mitigation Measure TR-1 ~~would~~ requires additional components beyond those listed as part of the Proposed Project ~~(i.e., the final versions of the Traffic Management Plan and Emergency Response Plan)~~ and these components ~~would be~~ are necessary to reduce potential traffic and transportation hazards due to a design feature or incompatible uses to a less than significant level. ~~Overseeing development and implementation of the final Traffic Management Plan and Emergency Response Plan, including measures described in Recommended Measure TR-1, does not fall within the scope of the State Water Board's water quality certification authority. While the KRRC has stated its intention to reach enforceable "good citizen" agreements that will be finalized and implemented, at this time the Traffic Management Plan and Emergency Response Plan are not finalized and the State Water Board cannot require their implementation. Accordingly, t~~The State Water Board anticipates that implementation of the final Traffic Management Plan and Emergency Response Plan, including the aforementioned additional details in ~~Recommended~~ Mitigation Measure TR-1 and any modifications developed through the FERC process that provide the same or better level of protection for transportation and traffic, would be expected to ensure that impacts to less than significant. ~~However, because the State Water Board cannot ensure implementation of the final Traffic Management Plan and Emergency Response Plan, it has determined the impact in this Draft EIR to be significant and unavoidable.~~

Significance

~~*Significant and unavoidable impact*~~ *No significant impact with mitigation*

Volume I Section 3.22.5 Transportation and Traffic – Potential Impacts and Mitigation Potential Impact 3.22-4, paragraph 3 on page 3-1075:

The Proposed Project includes an Emergency Response Plan that addresses transportation-related emergency concerns (e.g., emergency access and response), while a final Emergency Response Plan, with additional details, would be required from the construction contractor (Appendix B: *Definite Plan − Appendix O4*). The Proposed Project considers how emergency access and response would be provided during the time of construction activity and how it would be coordinated with the contractor's Health and Safety Plan, Spill Prevention and Response Plan and Fire Management Plan. (Appendix B: *Definite Plan − Appendices O1 through O4*.) Emergency response is also discussed in Section 3.17 *Public Services* and Section 3.21 *Hazards and Hazardous Materials*, which address impacts related to emergency response providers as well as the risk of increased hazards such as wildfires and adequate access for abating wildland fires. Implementation of ~~Recommended~~ Mitigation Measure TR-1 ~~would~~ requires additional details and procedures to be put in place to help prevent incidents, to ensure preparedness in the event incidents occur, and to provide a systematic and orderly response to emergencies through coordination with emergency response agencies, as described in Appendix B: *Definite Plan − Appendix O4*, which would render potential traffic and transportation impacts of the Proposed Project to levels similar to baseline conditions. However, because wildfires can spread at a rapid speed and involve high risks, any amount of additional response time compared with existing conditions could result in a substantial increased risk of loss, injury, or death involving wildland fires and this would be a significant impact.

~~Overseeing development and implementation of the final Emergency Response Plan, including the aforementioned additional details in Recommended Measure TR-1, does not fall within the scope of the State Water Board's water quality certification authority. While the KRRC has stated its intention to reach enforceable "good citizen" agreements that will be finalized and implemented, at this time the Emergency Response Plan is not finalized and the State Water Board cannot require its implementation. Accordingly, t~~The State Water Board anticipates that implementation of the final Emergency Response Plan, including the aforementioned additional details in ~~Recommended~~ Mitigation Measure TR-1 and any modifications developed through the FERC process that provide the same or better level of protection for transportation and traffic, would reduce impacts to a less than significant level. ~~Since the State Water Board cannot ensure the Emergency Response Plan's implementation, it has determined the impact in this Draft EIR to be significant and unavoidable.~~

Significance

~~*Significant and unavoidable impact*~~ *No significant impact with mitigation*

Volume I Section 3.22.5 Transportation and Traffic – Potential Impacts and Mitigation Potential Impact 3.22-5, paragraph 1 on page 3-1077:

If an unacceptable level of risk to non-motorized users is deemed to persist, KRRC's contractor will arrange appropriate detours to allow safe and adequate continued movement for such users ~~to allow continued movement for such users~~ (Appendix B: *Definite Plan – Appendix O2*).

Volume I Section 3.22.5 Transportation and Traffic – Potential Impacts and Mitigation Potential Impact 3.22-5, paragraphs 2 and 3 on page 3-1077:

~~It would be appropriate for the recommended~~ The terms and conditions relating to traffic and transportation ~~to~~ will include ~~Recommended~~ Mitigation Measure TR-1 as part of the detailed design phase and prior to start of construction. ~~Recommended~~ Mitigation Measure TR-1 includes additional components beyond those listed as part of the Proposed Project and would ensure that potential short-term construction-related impacts on the safety of all users of the roadways within the Area of Analysis would be less than significant.

~~Overseeing development and implementation of the final Traffic Management Plan does not fall within the scope of the State Water Board's water quality certification authority. While the KRRC has stated its intention to reach enforceable "good citizen" agreements that will be finalized and implemented, at this time the Traffic Management Plan is not finalized and the State Water Board cannot require its implementation. Accordingly, t~~The State Water Board anticipates that implementation of the final Traffic Management Plan, including any modifications developed through the FERC process that provide the same or better level of protection for Transportation and Traffic resource, would reduce impacts to a less than significant level. ~~However, because the State Water Board cannot ensure the Traffic Management Plan's implementation, it has determined the impact in this Draft EIR to be significant and unavoidable.~~

Significance
~~*Significant and unavoidable impact*~~ *No significant impact with mitigation*

3.22.6 References

Volume I Section 3.22.6 Transportation and Traffic – References, page 3-1078, includes the following revisions:

Caltrans. 2019. California Manual on Uniform Traffic Control Devices (CA MUTCD, 2014, Revision 4 (2019). Available at: http://www.dot.ca.gov/trafficops/camutcd/. [Accessed January 2020]

Other references cited as part of text included in the Section 3.22 list of revisions:

Caltrans. 2018b. California Manual on Uniform Traffic Control Devices (CA MUTCD, 2014, Revision 3 (2018). Available at: http://www.dot.ca.gov/trafficops/camutcd/. [Accessed January 2020]

Caltrans. 2018c. Highway Design Manual, Sixth Edition. Available at: http://www.dot.ca.gov/design/manuals/hdm.html. [Accessed January 2020].

3.23 Noise

3.23.4 Impact Analysis Approach

Volume I Section 3.23.4 Noise – Impact Analysis Approach, paragraph 6 on page 3-1091:

Minor changes in proposed construction activities between the 2012 EIS/EIR analysis and the Proposed Project are primarily due to the timing associated with removing Iron Gate Dam, Copco No. 1 Dam, and Copco No. 2 Dam, and incorporation of road, bridge, and culvert improvement activities into the Proposed Project, some of which could occur outside of the peak construction period for dam removal (see Section 2.7 Proposed Project).

3.23.5 Potential Impacts and Mitigation

Volume I Section 3.23.5 Noise – Potential Impacts and Mitigation, paragraph 3 on page 3-1093:

While sporadic activities would occur throughout these periods and are analyzed herein, the ~~following analysis is~~ noise and vibration impact modeling results are focused on the six-month period during the peak of the construction-related activity, when the three California dams would be removed.

Volume I Section 3.23.5 Noise – Potential Impacts and Mitigation – Potential Impact 3.23-1 Use of standard construction equipment could exceed Siskiyou County General Plan criteria for maximum allowable noise levels from construction equipment, paragraph 5 on page 3-1093:

Given the maximum allowable noise levels identified in the Siskiyou County General Plan Noise Element (Siskiyou County 1978), any use of dozers, jackhammers, and/or tractors during the Proposed Project, whether during the six-month peak of construction activities (i.e., dam and powerhouse removal), and/or during pre- or post-dam removal construction activities (i.e., hatchery modifications; road, bridge, and culvert improvement activities; recreation area facilities removal; City of Yreka water supply pipeline replacement), would constitute an exceedance of County maximum allowable noise levels and this would be a significant impact.

Volume I Section 3.23.5 Noise – Potential Impacts and Mitigation – Potential Impact 3.23-1 Use of standard construction equipment could exceed Siskiyou County General Plan criteria for maximum allowable noise levels from construction equipment, paragraph 1 on page 3-1094:

Therefore, this impact would be significant and unavoidable for construction-related activities that would use dozers, jackhammers, and/or tractors.

3.23.6 References

References cited as part of text included in the Section 3.23 list of revisions:

Siskiyou County. 1978. Siskiyou County General Plan Noise Element.

3.24 Cumulative Effects

3.24.1 Introduction

3.24.1.1 Analysis Approach

Volume I Section 3.24.1.1 Cumulative Effects – Introduction – Analysis Approach, paragraph 5 on page 3-1103:

We note that the existing conditions analyses included consideration of the NMFS and USFWS 2013 Joint Biological Opinion (2013 BiOp) flow requirements for the USBR Klamath Irrigation Project (NMFS and USFWS 2013), which served as the operational flow requirement for the Klamath River at the time of the Notice of Preparation for the Lower Klamath Project EIR (i.e., December 22, 2016), as well as the flows specified in the NMFS and USFWS 2019 biological opinions (2019 BiOp) for the USBR Klamath Irrigation Project (NMFS 2019; USFWS 2019), which are the current operational flow requirement for the Klamath River (see 3.1.6 *Introduction – Summary of Available Hydrology Information for the Proposed Project*). but tThe cumulative effects analysis considers the additional court-ordered winter-spring surface flushing flows and deep flushing flows, as well as emergency dilution flows, that became were a requirement in between February 2017 and March 2019 (U.S. District Court 2017). Additionally, measures PacifiCorp has committed to undertake as part of the KHSA upon certain triggers related to implementation of the Proposed Project are considered in this cumulative effects' analysis.

Volume I Section 3.24.1.1 Cumulative Effects – Introduction – Analysis Approach, Table 3.24-1. List of Planned, Approved, or Reasonably Foreseeable Projects (Plus Wildfires) that Would Potentially Result in Related or Cumulative Effects When Combined with the Proposed Project (prepared September 2018), on pages 3-1106 to 3-1146 [note that only rows with modifications and their headers have been included below]:

Table 3.24-1. List of Planned, Approved, or Reasonably Foreseeable Projects (Plus Wildfires) that Would Potentially Result in Related or Cumulative Effects When Combined with the Proposed Project (prepared September 2018, with minor modifications made in October 2019).

Applicant or Implementing Agency	Project/Program Name	Location	Timeframe	Reference	Website
Riverine Restoration Projects					
National Fish and Wildlife Foundation	Klamath Basin Restoration Program~~—current applicants include Combined PacifiCorp, Klamath River Coho Enhancement Fund and USBR, Klamath River Coho Habitat Restoration Program~~2018 grants issued to: Lower Scott Valley Stream Habitat Restoration: Phase 2; Water Dedication Development in the Scott River Basin; Reducing Road Sourced Sediment Loading for Scott River Tributaries on EcoTrust Lands; Lower Bear Creek Stream and Floodplain Habitat Enhancement to Benefit Native Salmonids; South Fork Scott River Floodplain Restoration and Increased Habitat Complexity for Coho Salmon;	Klamath Basin	Grants have been~~adverti sed in 2018, soon to be~~ announced	NFWF 2018	https://www.nfwf.org/klamathbasin/Documents/2018grantslate.pdf~~https://www.nfwf.org/klamathbasin/Pages/2018rfp.aspx~~

Applicant or Implementing Agency	Project/Program Name	Location	Timeframe	Reference	Website
	Reduce Entrainment of Native Fishes through Installation of Fish Screens on the Wood River; Channel Reconnection and Water Transfer to Restore Threemile and Crane Creek Critical Habitat; Scott River Beaver Dam Analogues: Implementation, Monitoring and Passage Assessment; Water Quality and Fisheries Habitat Restoration for Anadromous Fish in Blue Creek; Enhancing and Protecting Water for Salmon through Voluntary Dedications in the Shasta River Basin; Upper Sycan Bull Trout Critical Habitat Preservation; Water Transactions to Benefit Chinook Salmon and Support the Shasta River Water Transaction Program; Creating and Restoring Off-Channel and Side Channel Habitat along Humbug and Seiad Creeks; Upper Sprague Riparian Protection and Enhancement to Improve Water Quality for Native Fish; and Increase Habitat Complexity in the Wood River and Sprague River to Benefit Native Fish				

Applicant or Implementing Agency	Project/Program Name	Location	Timeframe	Reference	Website
PacifiCorp	Coho Enhancement Fund: PacifiCorp has agreed to make annual payments of $510,000 into the Coho Enhancement Fund for each year that the permit (authorizing the potential incidental take of SONCC coho salmon) is in effect even though PacifiCorp has already made payments of $510,000 per year into the Coho Enhancement Fund for 2009, 2010, 2011 and 2012	Klamath Basin	2009–2020	PacifiCorp 2012 (pp. 141–142)	https://www.pacificorp.com/content/dam/pcorp/documents/en/pacificorp/energy/hydro/klamath-river/habitat-conservation-plans/KR_Coho_HCP_Feb162012Final.pdf~~http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Hydro/Hydro_Licensing/Klamath_River/KR_Coho_HCP_Feb162012Final.pdf~~
California Department of Transportation, District 2–Northeastern California	Fort Goff Creek Fish Passage Improvement—prevent entrainment of fish into an existing water diversion ditch where they could be injured or killed over a two-acre project area; conserve water for the benefit of salmon and steelhead trout in Fort Goff Creek and the Klamath River	Fort Goff Creek, Siskiyou County, CA; water diversion/fish exclusion structure will be constructed at same site as current water diversion, which is at RM	Funded in 2012; on hold 2018	USDA Forest Service 2018a	https://www.fs.fed.us/sopa/components/reports/sopa-110505-2018-04.pdf ~~https://www.fs.fed.us/sopa/components/reports/sopa-110505-2018-04.pdf~~

Applicant or Implementing Agency	Project/Program Name	Location	Timeframe	Reference	Website
		0.6 on Fort Goff Creek			
Karuk Tribe, Fisheries Department	Lower Seiad Creek Channel Restoration—restoration of 4,000 lineal feet of stream; also known as part of the Klamath River Riparian Habitat Restoration—part of the Klamath River Coho Enhancement Fund (2010-0500-015)	Seiad Creek intersection with the Klamath River, CA	2015–2018	NFWF 2016b	https://www.nfwf.org/klamathriver/Documents/krcef_2015_totalprojects.pdf
Yurok Tribe	Restoring Off-Estuary Habitat in Hoppaw Creek, Klamath River—rearing habitat for natal and non-natal juvenile Coho salmon in an off-estuary tributary of the Klamath River; restoration effectiveness will be assessed; part of the Klamath River Coho Enhancement Fund (2010-0500-020)	Hoppaw Creek is a 3rd order stream that enters the Klamath River 2.6 miles upstream of the Pacific Ocean, Del Norte County, CA	Funded in 2013; ongoing in 2016	NFWF 2016b~~NFWF 2016~~	https://www.nfwf.org/klamathriver/Documents/krcef_2015_totalprojects.pdf
PacifiCorp	Gravel Enhancement below Iron Gate Dam for Coho Salmon–gravel augmentation program is to be implemented in the Klamath River downstream of Iron Gate dam to improve coho spawning and rearing habitat	Iron Gate Dam	Funded in 2014; gravel placed in 2014, 2016, and 2017	NFWF 2016b~~NFWF 2016~~	https://www.nfwf.org/klamathriver/Documents/krcef_2015_totalprojects.pdf

Applicant or Implementing Agency	Project/Program Name	Location	Timeframe	Reference	Website
Terrestrial Resource Management, Conservation and Restoration					
California Wildlife Conservation Board	Climate Adaptation and Resiliency Program—created by AB109; program funds are to be used for climate adaptation and resiliency projects that will result in enduring benefits to wildlife, including: grants for the acquisition of perpetual conservation easements and long-term conservation agreements; natural and working lands adaptation and resiliency planning	CA	Applications closed August 2018	CAWCB 2018a~~b~~	https://www.wcb.ca.gov/Programs/Climate-Adaptation
Water Flow and Water Quality Resource Management Projects					
U.S. Bureau of Reclamation, National Marine Fisheries Service (NMFS), and U.S. Fish and Wildlife Service	Re-consultation of the 2013 Joint Biological Opinion Flows (2013 BiOp Flows) for the Klamath Irrigation Project, including the 2017 court-ordered flushing and emergency dilution flows	Klamath River dams and downstream reaches	From the Court Order on February 8, 2017 until March 31, 2019, after which the 2019 BiOp Flows became the new	U.S. District Court 2017	https://www.govinfo.gov/content/pkg/USCOURTS-cand-3_16-cv-04294/pdf/USCOURTS-cand-3_16-cv-04294-7.pdf

Applicant or Implementing Agency	Project/Program Name	Location	Timeframe	Reference	Website
			operational standard for the Klamath River		
California Natural Resources Agency	The Water Quality, Supply, and Infrastructure Improvement Act of 2014 (Proposition 1) authorizes $7.545 billion in general obligation bonds to fund ecosystems and watershed protection and restoration, water supply infrastructure projects, including surface and groundwater storage, and drinking water protection	CA wide	In progress since 2014	California Natural Resources Agency ~~2015~~2018	http://bondaccountability.resources.ca.gov/p1.aspx
California Wildlife Conservation Board	Proposition 1 Stream Flow Enhancement Program—Proposition 1 authorized the Legislature to appropriate $200 million to the Wildlife Conservation Board (WCB) to administer the California Stream Flow Enhancement Program (Program). The Program awards grant funding on a competitive basis to projects representing the mission of the WCB, and address the three goals of the California Water Action Plan: reliability, restoration, and resilience	CA	Applications for the 2018 Proposal Solicitation Notice and Application closed September 2018; projects must be complete by 2023	CAWCB 2018b~~a~~	https://www.wcb.ca.gov/Programs/Stream-Flow-Enhancement

Applicant or Implementing Agency	Project/Program Name	Location	Timeframe	Reference	Website
California Wildlife Conservation Board (California Stream Flow Enhancement Program FY 2016/17)	Hart Ranch Instream Flow Enhancement—proposal is to consider the allocation for an implementation grant to California Trout (CalTrout) for a cooperative project with United States Fish and Wildlife Service (USFWS), Natural Resources Conservation Service (NRCS), The Nature Conservancy (TNC), and UC Davis Center for Watershed Sciences to dedicate instream, through a California Water Code section 1707 transfer, 1.5 cfs of cold water to the Little Shasta River through a combination of on-farm efficiency savings and voluntary flow contributions, located on privately-owned land six miles east of Montague in Siskiyou County	Little Shasta River, six miles east of Montague, Siskiyou County	In planning phase, 2017	CalTrout ~~2017~~2018	https://caltrout.org/2017/03/caltrout-receives-grants-fish-passage-improvement-projects/
California Department of Water Resources	Sustainable Groundwater Management Act (SGMA)—high and medium priority basins are required to halt overdraft and bring groundwater basins into balanced levels of pumping and recharge	CA	Signed in 2014, currently in progress	DWR 2019~~8~~	https://water.ca.gov/Programs/Groundwater-Management/SGMA-Groundwater-Management
Siskiyou County	In Siskiyou County, Butte Valley, Shasta Valley, and Scott River Valley, as well as the Tulelake sub-	Butte Valley, Shasta Valley, Scott River Valley, and	Signed in 2014, currently in progress	Siskiyou County 2015a,b	https://www.co.siskiyou.ca.us/sites/default/files/fileattachments/board_of_supervisors/meeting/1

Applicant or Implementing Agency	Project/Program Name	Location	Timeframe	Reference	Website
	basin, are designated as medium priority basins under SGMA	Tulelake sub-basin, Siskiyou County, CA			2671/bos_20151013_minutes.pdf~~https://www.co.siskiyou.ca.us/sites/default/files/public_docs/PLN-20151013_BOS-MEMO_ReSGMA-Update_v1002_WithAttachments.pdf~~
Scott River Water Trust	Emergency Stream Augmentation for the Scott River—to benefit salmon	French Creek, Miners Creek, and the mainstem Scott River	Funded in 2014	NFWF 2016b	https://www.nfwf.org/klamathriver/Documents/krcef_2015_totalprojects.pdf
Scott River Water Trust	Improving Streamflow for Coho Salmon in the Scott River	Scott River sub-basin, CA	Funded in 2010	NFWF 2016b	https://www.nfwf.org/klamathriver/Documents/krcef_2015_totalprojects.pdf
Montague Water Conservation District	MWCD-Shasta River Flow Enhancement Project	The southern portion of the Shasta River watershed, centered near Dwinnell Reservoir in Siskiyou County, CA	Funded in 2013	NFWF 2016b	https://www.nfwf.org/klamathriver/Documents/krcef_2015_totalprojects.pdf
City of Yreka (partly funded by a Flood Hazard Reduction grant	City of Yreka 2016 Greenway Master Plan and Flood Hazard Reduction Project—includes:	Yreka Creek and other	~~In planning phase,~~	City of Yreka 2016	http://www.ci.yreka.ca.us/DocumentCenter/View/693/2016-Greenway-

Applicant or Implementing Agency	Project/Program Name	Location	Timeframe	Reference	Website
from the California Department of Water Resources)	enhancing fish habitat, recreational opportunities, educational opportunities, improved law enforcement and public security, Coho recovery, flood hazard reduction, water quality improvement, stormwater management in small tributaries, trail system expansion and linkages, widening of Yreka Creek, excavations adjacent to Yreka Creek, overflow floodwater channels, removing soils from the floodway, expanding greenway corridors	streams, Yreka, CA	~~2016~~Final EIR, 2017		Master-Plan-Environmental-Impact-Report-PDF ~~https://ci.yreka.ca.us/sites/ci.yreka.ca.us/assets/files/_Yreka_2016_Greenway_Master_Plan_DEIR.pdf~~
IM1 – Interim Measures Implementation Committee (IMIC)	The IMIC is comprised of representatives from PacifiCorp, other parties to the KHSA (as amended on November 30, 2016), and non-signatory representatives from the State Water Board and Regional Water Board (see KHSA Appendix B, Section 3.2). The purpose of the IMIC is to advise on implementation of the Non-Interim Conservation Plan Interim Measures set forth in Appendix D of the Amended KHSA.	CA and OR	~~Ongoing~~ Would not continue and cease to exist when KHSA is fully implemented	KHSA 2016	https://www.doi.gov/sites/doi.gov/files/uploads/FINAL%20KHSA%20PDF.pdf

Applicant or Implementing Agency	Project/Program Name	Location	Timeframe	Reference	Website
U.S. Bureau of Reclamation, U.S. Fish and Wildlife Service, Klamath Water Users Association, irrigation districts, Oregon Department of Environmental Quality, North Coast Regional Water Quality Control Board	Klamath Watershed ~~Stewardship~~ Partnership works with landowners, agencies, and other partners to conserve, enhance, and restore natural resources of the Klamath Basin through education, consultation, ~~and~~ restoration, and planning. ~~Various water quality improvement projects and practices are generally implemented in the Upper Klamath River, Lower Klamath Lake, Lost River, Klamath Irrigation Project~~	OR	Ongoing	KWP 2018	https://www.klamathpartnership.org/~~http://www.klamathpartnership.org/programs.html~~
Wildfire					
CAL_FIRE	2016 Fires in CA—Old, Moffett, Gap, Grade, Tully, Summit, Stafford, Table, Bailey, Pony, and Mill Fires; Acres burned: Del Norte (105 acres), Humboldt (768 acres), Siskiyou (844 acres), Trinity (4 acres)	CA	2016	CAL_FIRE 2016	https://www.fire.ca.gov/incidents/2016/ ~~http://cdfdata.fire.ca.gov/incidents/incidents_archived?archive_year=2016&pc=20&cp=1~~
ODF	2016 Fires in OR—5,661-acre Withers Fire northeast of Klamath Falls	OR	2016	ODF 2016	https://www.oregon.gov/ODF/Documents/Fire/2016_Protection_Division_Fire_Season_Report.pdf ~~https://www.OR.gov/ODF/Documents/Fire/2016~~

Applicant or Implementing Agency	Project/Program Name	Location	Timeframe	Reference	Website
					~~_Protection_Division_Fire_Season_Report.pdf~~
~~CALFire~~CAL FIRE	2017 Fires in CA—Miller Complex, Eclipse, Young, and Orleans Fires	CA	2017	~~CALFIRE~~CAL FIRE 2017	https://www.fire.ca.gov/incidents/2017/ ~~http://cdfdata.fire.ca.gov/incidents/incidents_archived?archive_year=2017~~
~~CALFire~~CAL FIRE	2018 Fires in CA—Mill Creek 1, Natchez, Klamathon, Watson Creek, Iron Gate, Cherry, Steamboat, Lott, Johnson, Petersburg, Meamber, Martin, Grape, Ager, and Shastina Fires	CA	2018	CAL_FIRE 2018	http://www.fire.ca.gov/current_incidents
ODF	2018 Fires in OR—Watson Creek Fire in OR	OR	2018	ODF 2018	https://www.oregon.gov/ODF/Documents/AboutODF/KlamathLakeDistrictAnnualReport.pdf ~~http://wildfireORdeptofforestry.blogspot.com/2018/08/watch-out-for-watson-creek-fire.html~~

Applicant or Implementing Agency	Project/Program Name	Location	Timeframe	Reference	Website
Forest and Wildfire Management Projects					
USDA Forest Service—Klamath National Forest (Federal Lands)	Crawford Vegetation Management Project—thinning in stands for forest health and fuels reduction, with fuel treatments, including under-burning and pile burning on about 1,600 acres; Water Board Waiver Category B	Happy Camp Ranger District, Klamath National Forest	In progress; implementation expected in 2019	USDA Forest Service 2018a; Elberlien 2018	https://www.fs.fed.us/sopa/components/reports/sopa-110505-2018-04.pdf
USDA Forest Service—Klamath National Forest (Federal Lands)	Steamboat Oak Habitat Improvement—fuels reduction and oak woodland habitat improvement and retention for improved defensible space adjacent to the CAL FIRE Deadwood Camp, improved wildlife habitat, increased fire resiliency, and overall forest health over an area of 45.5 acres	Scott River Ranger District, Klamath National Forest; 5 miles north of Fort Jones, CA, Siskiyou County; located on the ridge between Soares and Steamboat Gulch adjacent to the ~~CALFIRE~~CAL FIRE Deadwood Camp in the	In planning phase, 2018; expected implementation 2018	USDA Forest Service 2018a	https://www.fs.fed.us/sopa/components/reports/sopa-110505-2018-04.pdf

Applicant or Implementing Agency	Project/Program Name	Location	Timeframe	Reference	Website
		McAdams Creek Drainage			
USDA Forest Service—Klamath National Forest (Federal Lands)	Somes Bar Integrated Fire Management—remove fuels prior to prescribed burning in plantations 40 years and older, and mature natural stands while enhancing cultural and ecological plant species; shaded fuel breaks are proposed, and temporary roads are considered on a case by case basis over a project area of 5,570 acres	Scott River Ranger District, Klamath National Forest	In planning phase, 2018	USDA Forest Service 2018a; USDA Forest Service 2018c	https://www.fs.fed.us/sopa/components/reports/sopa-110505-2018-04.pdf
TCRCD	California Fire Safe Council CWPP Implementation Phase I: OR Mountain area of Weaverville—mechanical chipping and thinning over 1.2 miles of roadside shaded break; 50 acres completed to date	OR Mountain area of Weaverville, including OR St and Dutch Ln	Work initiated in 2017	TCRCD 2019~~8b~~	http://www.tcrcd.net/index.php/2014-02-05-08-30-03/forest-health
Cannabis Cultivation Projects					
City of Yreka	A City Council-initiated Ordinance entitled "Non-Medical Marijuana Cultivation Regulation and the Prohibition of Commercial Cannabis Activity, Manufacture, Testing, Dispensing, Sales, Distribution and Delivery within all Zoning Districts in the City of Yreka" (note that indoor	City of Yreka limits	Adopted, 2017	Yreka Planning Commission 2017	http://www.ci.yreka.ca.us/AgendaCenter/ViewFile/Agenda/_07192017-43 ~~http://ci.yreka.ca.us/sites/ci.yreka.ca.us/assets/files/P_C_Mintues_7_19_17.pdf~~

Applicant or Implementing Agency	Project/Program Name	Location	Timeframe	Reference	Website
	cultivation is regulated, not prohibited)				
Other Agricultural and Rural Residential Projects					
Siskiyou County, Agritourism Technical Advisory Committee, Planning	AG1, AG2, and RR Zoning Modifications for Agritourism	Siskiyou County, CA	In planning phase, 2018	Siskiyou County 2018a	https://www.co.siskiyou.ca.us/sites/default/files/fileattachments/planning_commission/page/1881/tac_20180606_agritourismtacresolution_signed20180517.pdf ~~https://www.co.siskiyou.ca.us/sites/default/files/public_docs/TAC_20180606_AgritourismTACResolution_Signed20180517.pdf~~
Siskiyou County, Multispecies Livestock Technical Advisory Group, Planning	AG1, AG2, and RR Zoning Modifications to allow certain pastured hog and poultry operations	Siskiyou County, CA	In planning phase, 2018	Siskiyou County 2018b	https://www.co.siskiyou.ca.us/sites/default/files/fileattachments/planning_commission/page/1881/tac_20180606_multispeciestacresolution_signed20180517.pdf ~~https://www.co.siskiyou.ca.us/sites/default/files/public_docs/TAC_20180606_MultispeciesTAC~~

Applicant or Implementing Agency	Project/Program Name	Location	Timeframe	Reference	Website
					~~Resolution_Signed20180517.pdf~~
JH Ranch; planning processing by Siskiyou County	Planned Development (PD) Plan Amendment for JH Ranch—increase the amount of land in the existing PD District from 79 acres to 201 acres, and modify the PD to accommodate existing operations; retain existing maximum capacity of 482 persons; retain and renovate guest cabins, tent-like cabins, staff cabins, homes, and bunk cabins	French Creek Road, Siskiyou County	In planning phase, 2016	Siskiyou County 2018c	https://www.co.siskiyou.ca.us/community-development/page/jh-ranch-project ~~https://www.co.siskiyou.ca.us/content/planning-division-jh-ranch-documentation~~
Kidder Creek Orchard; planning processing by Siskiyou County	Kidder Creek Orchard Camp Zone Change and Use Permit—rezoning 170 acres from Timberland Production District to Rural Residential Agricultural (40-acre minimum parcel size); increase of allowable camp occupancy from 165 to 844; increase of physical camp size from 333 acres to 580 acres; structures, recreation features, a pond, and ancillary activities	South Kidder Creek Road, 2 miles west of SH 3, south of Greenview in the Scott Valley, Siskiyou County	In planning phase, 2018	Siskiyou County2018d	https://www.co.siskiyou.ca.us/community-development/page/kidder-creek-orchard-camp ~~https://www.co.siskiyou.ca.us/content/planning-kidder-creek-orchard-camp~~
Grady Padgett	Cannaworx Zone Change—rezone 44 acres from Open Space to Non-Prime Agricultural, Initial Study / Mitigated Negative Declaration	21635 Walker Road, 11 miles southwest of Yreka, Klamath River,	Adopted, 2018	Siskiyou County 2018e; CEQAnet 2019	https://ceqanet.opr.ca.gov/2018052063~~https://www.co.siskiyou.ca.us/sites/default/files/public_docs/PLN-~~

Applicant or Implementing Agency	Project/Program Name	Location	Timeframe	Reference	Website
		Siskiyou County, CA			~~20180525_Z1505_CannaworxNOA_NOI.pdf~~
Gary Black	Grenada Irrigation District, Huseman Relocation Instream Phase	Shasta River, CA	Funded in 2010	NFWF 2016b	https://www.nfwf.org/klamathriver/Documents/krcef_2015_totalprojects.pdf
Mining and Mining Withdrawal Projects					
USDA Forest Service—Klamath National Forest (Federal Lands)	Brooks Mine—existing Brooks mining claim with a new plan of operations over an area of 20 acres; mining using backhoe, 2.5-cubic-yard dump truck, grizzly, and trammel; opening existing road to new extraction site; Water Board Waiver Category A	Happy Camp Ranger District, Klamath National Forest; near Humbug Creek	~~On hold, 2018~~Cancelled, 2019	USDA Forest Service 2018a; USDA Forest Service 2019	https://www.fs.fed.us/sopa/components/reports/sopa-110505-2018-04.pdf https://www.fs.usda.gov/projects/klamath/landmanagement/projects
Infrastructure and Energy Projects					
Siskiyou County Public Works	Guys Gulch Road Realignment—Guys Gulch Bridge and Approaches; Schulmeyer Gulch Bridge Approaches	Intersection of Guys Gulch and Old Highway 99 Intersection of Schulmeyer Gulch and Old Highway 99	In Progress, 2017–2018	Siskiyou County 2017a	https://www.co.siskiyou.ca.us/publicworks/project/guysschulmeyer-gulch-bridges ~~https://www.co.siskiyou.ca.us/content/public-works-contract-16-07-guysschulmeyer-gulch-bridges~~

Applicant or Implementing Agency	Project/Program Name	Location	Timeframe	Reference	Website
Siskiyou County Public Works	Salmon River Road Flood Damage Repair—Federal Emergency Aid Relief Project	Salmon River Road, M.P. 5.76	In Progress, 2018	Siskiyou County 2018f; 2018g	https://www.co.siskiyou.ca.us/sites/default/files/fileattachments/board_of_supervisors/meeting/11181/bos_20171017_minutes.pdf ~~https://www.co.siskiyou.ca.us/content/public-works-contract-17-02-salmon-rv-rd-flood-damage-repair-at-mp-576~~
Siskiyou County Public Works	Wooley Creek Bridge Rehabilitation and Pier Repair	Wooley Creek Bridge (Bridge 2C-016)	Pending, 2018	Siskiyou County 2018h~~g~~; Siskiyou County 2018i	https://www.co.siskiyou.ca.us/sites/default/files/fileattachments/board_of_supervisors/meeting/10261/bos_20181002_minutes.pdf ~~https://www.co.siskiyou.ca.us/content/public-works-fap-no-brlo-5902080-wooley-creek-bridge-rehabilitation-and-pier-repair~~
Siskiyou County, Planning	Denny Point Tower—80-foot lattice communications tower, cellular equipment shelters, electrical backup generators, cellular equipment cabinets, a foot access	Near 3801 McConaughy Gulch Road, Etna, Siskiyou County, CA	In planning phase, 2018	Siskiyou County 2018j~~h~~	[link no longer available] ~~https://www.co.siskiyou.ca.us/sites/default/files/~~

Applicant or Implementing Agency	Project/Program Name	Location	Timeframe	Reference	Website
	road, and trench for lines over a 7,000-sqare-foot project area				~~public_docs/PC_20180615_DraftISMND_UP1804_Topsites-Plank.pdf~~
Del Norte County Community Development Department, Engineering Division	Hunter Creek Bridge Replacement Project	Requa Road at Hunter Creek, Klamath, CA	In planning phase, 2018; construction anticipated in 2020	Del Norte County ~~2017a~~2019	http://www.co.del-norte.ca.us/departments/community-development-department/engineering-division/projects
City of Yreka	Ringe Pool Facility Condition Assessment—options include: (1) short- and long-term repairs, (2) replacing the existing facility with new pools, (3) demolishing the facility and returning it to lawn; 0.88-acre site	Ringe Memorial Swim Center, Knapp St, Yreka	In planning phase, 2018	McCelland Architecture + Planning 2018	https://ci.yreka.ca.us/DocumentCenter/View/675/Ringe-Pool-Feasibility-Study-PDF ~~https://ci.yreka.ca.us/sites/ci.yreka.ca.us/assets/files/Ringe_FCA_Full_Report.09.17.18.pdf~~

Applicant or Implementing Agency	Project/Program Name	Location	Timeframe	Reference	Website
City of Yreka	Proposed Mitigated Negative Declaration and Initial Study: Yreka Water Supply and Storage Improvements—includes public water system improvements, water tank replacements, installation of water mains, and installation of a new well	City of Yreka, unincorporated area of Siskiyou County, with improvements at: Lower Humbug Water Tank Site, Shasta Belle Water Tank Site, and Davis Well Site	In initial planning phase, 2017	City of Yreka 2017	https://ci.yreka.ca.us/DocumentCenter/View/668/Proposed-Mitigated-Negative-Declaration---Yreka-Water-Supply-and-Storage-Improvements-Project-PDF ~~http://ci.yreka.ca.us/sites/ci.yreka.ca.us/assets/files/P_C_Mintues_12_20_17.pdf~~
Yurok Tribe	Coastal Grading Permit—waterline and storage tank replacement	Requa Area, Klamath, Del Norte County, CA	In planning phase, 2017	Del Norte County 2017~~b~~a	http://countyofdelnorte.us/agendas/agenda_management/agendas/PLN1216.pdf
Resighini Rancheria	Extension of Time for a Coastal Grading Permit for Road Improvements and Culvert Replacement	Klamath Beach Road, and Waukell and Juniors Creek, Klamath, Del Norte County, CA	In planning phase, 2018	Del Norte County 2017b~~8~~	http://countyofdelnorte.us/agendas/agenda_management/agendas/PLN1256.pdf

Applicant or Implementing Agency	Project/Program Name	Location	Timeframe	Reference	Website
Other Rezoning and Development Projects					
Siskiyou County (Siskiyou County Planning/Board of Supervisors)	Siskiyou County Jail Project—39,000 square feet on an 84-acre parcel	269 Sharps Road, Yreka, Siskiyou County	In initial planning phase, 2018	Siskiyou County 2018ki	https://www.co.siskiyou.ca.us/sites/default/files/fileattachments/board_of_supervisors/meeting/10521/bos_20180619_minutes.pdf ~~https://www.co.siskiyou.ca.us/sites/default/files/public_docs/PLN-20180521_NOI_MND.pdf~~
Karuk Tribe	Karuk Tribe Casino Project / Rain Rock Casino—36,497 sq-ft	City of Yreka, CA—Tribal Trust land and land held in fee title by the Tribe	Under construction , 2017	Siskiyou County 2018jl; Karuk Tribe 2019	http://www.karuk.us/index.php/88-info/342-karuk-casino ~~https://www.co.siskiyou.ca.us/content/planning-division-karuk-tribe-casino-project~~
Cross Development, with City of Yreka as lead agency	Yreka Dollar General Retail Store Project—includes a parking lot, landscaping / tree planting, a retaining wall, and stormwater retention areas on a 3.43-acre parcel	North side of Montague Road / State Route 3 between N. Main St and Deer Creek Way	In planning phase, 2018	City of Yreka 2018	http://www.ci.yreka.ca.us/AgendaCenter ~~http://ci.yreka.ca.us/planning-commission/minutes~~

Applicant or Implementing Agency	Project/Program Name	Location	Timeframe	Reference	Website
Sousa Ready Mix, LLC; with City of Yreka as lead agency	Sousa Ready Mix Concrete Batch Plant Project—Conditional Use Permit to allow the construction of a 4.26-acre concrete batch plant, complete with a small portable office trailer, aggregate storage area, truck and auto parking, precast concrete area, and concrete truck washout basin	319 South Phillipe Lane, Yreka, CA	In planning phase, 2016	City of Yreka 2018	http://www.ci.yreka.ca.us/AgendaCenter ~~http://ci.yreka.ca.us/planning-commission/minutes~~
Fruit Growers Supply Company, with City of Yreka as lead agency	Fruit Growers Supply Company Sawmill Project: Initial Study / Mitigated Negative Declaration	Industrial area at the eastern edge of Yreka, CA; accessed via South Phillipe Lane 229 South Phillipe Lane, Yreka, CA	In planning phase, 2018	City of Yreka 2018	http://www.ci.yreka.ca.us/AgendaCenter ~~http://ci.yreka.ca.us/planning-commission/minutes~~
SK Yreka Inc.	Consideration of proposed categorical exemption and Conditional Use Permit to construct, establish, and operate a new gas station and convenience store in the Commercial Tourist Zone	1801 Fort Jones Road, Yreka, CA	In planning phase, 2017	City of Yreka 2018	http://www.ci.yreka.ca.us/AgendaCenter ~~http://ci.yreka.ca.us/planning-commission/minutes~~

Applicant or Implementing Agency	Project/Program Name	Location	Timeframe	Reference	Website
Campora Propane (Contractor Rick Bettis)	Consideration of proposed Categorical Exemption and Conditional Use Permit for construction establishment and operation of a fuel storage yard facility with two 30,000-gallon bulk propane storage tanks in the Light Industrial Zone	1420 Mill Road, Yreka, CA	In planning phase, 2016	City of Yreka 2018	http://www.ci.yreka.ca.us/AgendaCenter ~~http://ci.yreka.ca.us/planning-commission/minutes~~
Debora Behm	Consideration of proposed Categorical Exemption and Conditional Use Permit for the establishment and operation of a Microbrewery	204 W. Miner St, CA	In planning phase, 2016	City of Yreka 2018	http://www.ci.yreka.ca.us/AgendaCenter ~~http://ci.yreka.ca.us/planning-commission/minutes~~
Del Norte County	Off-Highway Motor Vehicle Recreation (OHV) Grants Program, Plan, and actions	Del Norte County	Plan completed, 2018	Del Norte County 2018b	http://www.co.del-norte.ca.us/departments/community-development-department/planning-division/documents ~~http://www.co.del-norte.ca.us/departments/community-development-department/planning-division/del-norte-county-ohv-planning-project~~

3.24.2 Water Quality

Volume I Section 3.24.2 Cumulative Effects – Water Quality, paragraph 2 on page 3-1148:

The non-project activity types are included in Table 3.24-1~~)~~.

Volume I Section 3.24.2 Cumulative Effects – Water Quality – Potential Cumulative Impact 3.24-1 Long-term water quality effects of the Proposed Project in combination with restoration, flow enhancement, and water quality improvement projects, paragraph 1 on page 3-1149:

In combination with restoration, flow enhancement, and water quality improvement projects, the Proposed Project would help to offset the effects of climate change on late summer/fall water temperatures, where climate change is expected to increase these temperatures in the Klamath Basin on the order of 1.8–5.4°F between 2012 and 2061 (Bartholow 2005; Perry et al. 2011).

Volume I Section 3.24.2 Cumulative Effects – Water Quality – Potential Cumulative Impact 3.24-2 Short-term increases in suspended sediments under the Proposed Project in combination with the 2017 court-ordered flushing and emergency dilution flows, paragraph 3 on page 3-1150 through paragraph 1 on page 3-1151:

Potential Cumulative Impact 3.24-2 ~~-~~Short-term increases in suspended sediments under the Proposed Project in combination with the 2017 court-ordered flushing and emergency dilution flows.
Formal consultation of the NMFS and USFWS 2013 Joint Biological Opinion (2013 BiOp) (NMFS and USFWS 2013) for the USBR Klamath Irrigation Project was reinitiated in 2017 to improve management of *Ceratanova Shasta (C. Shasta)* infection among coho salmon in the Klamath River. During the interim period February 2017 to March 2019 ~~Until formal consultation is completed and a new biological opinion (BiOp) is issued~~, USBR ~~is~~ was required to manage *C. Shasta* by releasing additional winter-spring surface flushing flows and deep flushing flows, as well as emergency dilution flows (U.S. District Court 2017). The Lower Klamath Project Draft EIR acknowledged the re-initiation of consultation on the 2013 BiOp Flows by considering the 2017 court-ordered flushing and emergency dilution flow requirements downstream of Iron Gate Dam as interim flow requirements until completion of formal consultation (see Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*). The flushing and emergency dilution flow requirements ~~are~~ were analyzed in addition to 2013 BiOp flow requirements~~, which remain in effect until formal consultation is completed~~ for this cumulative effects analysis because at the time of the Draft EIR it was acknowledged that these flows may have occurred during the period when the Proposed Project would occur. ~~, the 2017 flow requirements (i.e., 2013 BiOp Flows plus the 2017 court-ordered flushing and emergency dilution flows) or the to-be-determined new BiOp flow requirements may be in~~

~~effect since USBR's consultation with NMFS and USFWS on the 2013 BiOp Flows for the Klamath Irrigation Project is currently underway and is expected to be completed by August of 2019 (see also Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*). At this time, estimates of flows that will be required under the future Klamath Irrigation Project biological opinion are speculative, so they are not included in hydrologic modeling. Potential new BiOp flow requirements under the Proposed Project are speculative in part because the fish disease conditions that prompted the flushing and emergency dilution flow requirements would be reduced due to increased dispersal of spawners and carcasses, transport of bedload, and establishment of variable flows, even if infection is not eliminated (see Section 3.3.5.5 *Fish Disease and Parasites*). Thus, it is not clear whether flushing and emergency dilution flow requirements would continue under a new BiOp after dam removal. It is also not clear if the prior location of Iron Gate Dam would remain as the compliance point if the flushing and emergency dilution flows continued. However, the 2017 flow requirements are the most reasonable assumption for conditions until formal consultation is completed and a new BiOp is issued. This is different from the existing conditions flow requirements, since the flushing flow requirements were imposed after issuance of the Notice of Preparation.~~

The 2017 flow requirements for the USBR Klamath Irrigation Project ~~are~~ were generally the same as the 2013 BiOp Flows analyzed as existing conditions under the individual resource sections for the Proposed Project, but they also included new flushing and emergency dilution flows based on the management guidance from *Measures to Reduce Ceratanova Shasta Infection of Klamath River Salmonids: A Guidance Document* (Hillemeier et al. 2017; U.S. District Court 2017). The management guidance specifieds surface and deep flushing flows downstream of Iron Gate Dam to dislodge and flush out polychaete worms attached to the streambed that host *C. Shasta*, and emergency dilution flows downstream of Iron Gate Dam to reduce disease conditions in the Klamath River, if specific disease criteria ~~are~~ were exceeded. In the 2013 BiOp, Iron Gate Dam ~~is~~ was the compliance point for flow requirements. Iron Gate Dam ~~is~~ was assumed to be the compliance point for the 2017 court-ordered flushing and emergency dilution flows for this cumulative effects analysis since the injunction specifies~~s~~d the flushing and emergency flows be modeled on the management guidance and the management guidance specified the flows occur downstream of Iron Gate Dam. Surface flushing flows of at least 6,030 cfs for a 72-hour period ~~are~~ were required to be met by USBR every year between November 1 and April 30 to scour riverbed sediments (i.e., scour fine sediment from approximately 20 to 30 percent of the surface of the streambed). USBR ~~is~~ was also required to release deep flushing flows averaging at least 11,250 cfs over a single 24-hour period between February 15 and May 31 every other year to scour fine sediment from between gravels and cobbles (i.e., armor layer) on the streambed and potentially move individual armor layer particles, if such a flow ~~does~~ did not occur naturally. Deep flushing flows were first required in 2017, so according to the court order they would have been required again in 2019 and

2021. The timing of surface and deep flushing flows within the specified period ~~is~~ was left to the discretion of USBR, but the USBR was required to coordinate with the parties[101] specified in the U.S. District Court case regarding the timing and magnitude of the flushing flows. Emergency dilution flows of 3,000 cfs (potentially increasing to 4,000 cfs) up to a maximum volume of 50,000 acre-feet ~~may~~ were also ~~be~~ potentially required to be released by USBR from Iron Gate Dam between April 1 to June 15, if fish disease thresholds in the Klamath River downstream of Iron Gate Dam ~~are~~ were exceeded. USBR, as part of their management of the Klamath Irrigation Project, ~~is~~ was required to reserve the 50,000 acre-feet in case the emergency dilution flow release ~~is~~ was needed.

This ~~P~~potential ~~C~~cumulative ~~I~~impact analysis examines whether the Proposed Project in combination with the 2017 flow requirements (i.e., 2013 BiOp Flows plus the 2017 court-ordered flushing and emergency dilution flows) potentially would have a short-term significant cumulative effect on suspended sediments, with the incremental contribution of the Proposed Project being cumulatively considerable. Although the 2013 BiOp Flows are no longer the operational standard for the Klamath River, and the 2017 court-ordered flushing and emergency dilution flows are no longer required (see Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*), the analysis of the 2017 court-ordered flushing and emergency dilution flow requirements remains in this cumulative effects analysis because at the time of the Draft EIR it was acknowledged that these flows may have occurred during the period when the Proposed Project would occur and retaining the analysis does not change any significance determinations. The 2019 Biological Opinion flows (2019 BiOp Flows) are now the current operational flow requirement for the Klamath River and the 2019 BiOp Flows are assessed as a second CEQA baseline in the Lower Klamath River Final EIR analyses for water quality and other resource areas (see Section 3.1.6 *Introduction – Summary of Available Hydrology Information for the Proposed Project*). As discussed in Potential Impact 3.2-3, the Proposed Project would result in a significant and unavoidable short-term impact on suspended sediment by causing suspended sediment to be greater than 100 mg/L over a continuous two-week period (i.e., the suspended sediment significance criteria), especially during the reservoir drawdown period from November to March. This impact evaluates the potential change in significance to that impact in light of the 2017 flow requirements.

Volume I Section 3.24.2 Cumulative Effects – Water Quality – Potential Cumulative Impact 3.24-2 Short-term increases in suspended sediments under

[101] Parties refer to Yurok Tribe, Pacific Coast Federation of Fishermen's Associations, Institute for Fisheries Resources, Klamath Riverkeeper, Hoopa Valley Tribe, National Marine Fisheries Service, Klamath Water Users Association, Sunnyside Irrigation District, Ben DuVal, Klamath Drainage District, Klamath Irrigation District, and Pine Grove Irrigation District.

the Proposed Project in combination with the 2017 court-ordered flushing and emergency dilution flows, paragraph 1 on page 3-1152:

In years where reservoir drawdown flows would not meet the magnitude or duration of flushing flow requirements (Figures 3.24-1 and ~~3.25-2~~ 3.24-2), surface and/or deep flushing flow releases may still be required.

Volume I Section 3.24.2 Cumulative Effects – Water Quality – Potential Cumulative Impact 3.24-2 Short-term increases in suspended sediments under the Proposed Project in combination with the 2017 court-ordered flushing and emergency dilution flows, Figure 3.24-1 Proposed Project Modeled Drawdown Flow Downstream of Iron Gate Dam and Iron Gate Reservoir Elevation for Representative Wet and Above Normal Water Year Types caption on page 3-1153:

Surface annual flushing flows of at least 6,030 cfs for 72 hours would occur between November 1 and April 30, while deep flushing flows of at least ~~11, 250~~ 11,250 cfs for 24 hours would occur every other year starting in 2017 (i.e., odd numbered years) between February 15 and May 31.

Volume I Section 3.24.2 Cumulative Effects – Water Quality – Potential Cumulative Impact 3.24-2 Short-term increases in suspended sediments under the Proposed Project in combination with the 2017 court-ordered flushing and emergency dilution flows, Figure 3.24-2 Proposed Project Modeled Drawdown Flow Downstream of Iron Gate Dam and Iron Gate Reservoir Elevation for Representative Median and Dry Water Year Types caption on page 3-1154:

Surface annual flushing flows of at least 6,030 cfs for 72 hours would occur between November 1 and April 30, while deep flushing flows of at least ~~11, 250~~ 11,250 cfs for 24 hours would occur every other year starting in 2017 (i.e., odd numbered years) between February 15 and May 31.

Volume I Section 3.24.2 Cumulative Effects – Water Quality – Potential Cumulative Impact 3.24-2 Short-term increases in suspended sediments under the Proposed Project in combination with the 2017 court-ordered flushing and emergency dilution flows, paragraph 1 on page 3-1155:

If required, emergency dilution flows (3,000 to 4,000 cfs) are unlikely to increase SSCs and/or durations due to re-wetting and mobilization of remaining floodplain and reservoir sediment deposits, because ~~they~~ these flows are below the thresholds recognized for coarse and fine particle entrainment (see ~~USBR 2012~~ USBR [2012]).

Volume I Section 3.24.2 Cumulative Effects – Water Quality – Potential Cumulative Impact 3.24-2 Short-term increases in suspended sediments under

the Proposed Project in combination with the 2017 court-ordered flushing and emergency dilution flows, paragraph 1 on page 3-1155:

Overall, exceedances of disease thresholds that would trigger emergency dilution flows would be unlikely ~~In~~ in the short term, particularly in dam removal year 2, and thus there would be no cumulative impact due to an increase in SSCs from emergency dilution flows associated with the 2017 court-ordered flows.

Volume I Section 3.24.2 Cumulative Effects – Water Quality – Potential Cumulative Impact 3.24-2 Short-term increases in suspended sediments under the Proposed Project in combination with the 2017 court-ordered flushing and emergency dilution flows, paragraph 2 on page 3-1155:

Overall, the short-term combined impact of the Proposed Project and the 2017 flow requirements (i.e., 2013 BiOp plus 2017 court-ordered flushing and emergency dilutions flows) would result in a cumulative increase in the SSCs during water years when reservoir drawdown flows are less than the surface and/or deep flushing flows.

Volume I Section 3.24.2 Cumulative Effects – Water Quality – Potential Cumulative Impact 3.24-2 Short-term increases in suspended sediments under the Proposed Project in combination with the 2017 court-ordered flushing and emergency dilution flows, paragraph 2 on page 3-1155:

Thus, the Proposed Project under the 2013 BiOp combined with the 2017 court-ordered flow requirements would potentially have a short-term cumulatively considerable impact in the in the Hydroelectric Reach, the Middle and Lower Klamath River, and the Klamath River Estuary.

Volume I Section 3.24.2 Cumulative Effects – Water Quality – Potential Cumulative Impact 3.24-2 Short-term increases in suspended sediments under the Proposed Project in combination with the 2017 court-ordered flushing and emergency dilution flows, paragraph 3 on page 3-1155:

As such, the combined impact of the Proposed Project and the 2017 flow requirements would not be cumulatively considerable in the long term.

Volume I Section 3.24.2 Cumulative Effects – Water Quality – Potential Cumulative Impact 3.24-3 Long-term water quality effects of the Proposed Project in combination with forest and wildfire management activities, paragraph 1 on page 3-1156:

The main water quality parameters potentially adversely impacted by these activities would be water temperature~~, since~~ due to vegetation removal allow~~s~~ing more solar radiation to reach streams and the surrounding floodplain surfaces, and suspended sediment due to vegetation removal, prescribed burns, fuel

treatments, and road construction and usage increasing erosion. The North Coast Regional Water Quality Control Board's Forest Activities Program issues waste discharge requirements and general waivers with terms and conditions to address the potential water quality problems potentially associated with a range of forest management activities on private and on US Forest Service lands (North Coast Regional Board 2018~~c~~9a). Reasonably foreseeable forest and wildfire management projects within or near the water quality Area of Analysis are included in Table 3.24-1.

Volume I Section 3.24.2 Cumulative Effects – Water Quality – Potential Cumulative Impact 3.24-4 Short-term and long-term water quality effects of the Proposed Project in combination with wildfires, paragraph 1 on page 3-1158:

While wildfires potentially would increase SSCs occasionally in the long term if eroded sediments from a burn area during heavy rain entered the Klamath River, there would be no cumulative effect on water temperature or SSCs from the Proposed Project and wildfires since the SSCs would have resumed natural background levels.

Volume I Section 3.24.2 Cumulative Effects – Water Quality – Potential Cumulative Impact 3.24-6 Long-term water quality effects of the Proposed Project in combination with grazing and other agricultural projects, paragraph 5 on page 3-1159:

These require compliance with best management practices designed to meet state water quality requirements~~.~~ (North Coast Regional Board ~~2018a~~2019b).

Volume I Section 3.24.2 Cumulative Effects – Water Quality – Potential Cumulative Impact 3.24-6 Long-term water quality effects of the Proposed Project in combination with grazing and other agricultural projects, paragraph 5 on page 3-1159:

Grazing (and other agricultural projects) are required to meet the requirements of the non-point source discharge policy, the prohibition against unpermitted discharges, and the North Coast Regional Water Quality Control Board's Agricultural Lands Discharge Program (North Coast Regional Board 2019c). These require compliance with best management practices designed to meet state water quality requirements~~.~~ (North Coast Regional Board 2018~~a~~).

Volume I Section 3.24.2 Cumulative Effects – Water Quality – Potential Cumulative Impact 3.24-7 Long-term water quality effects of the Proposed Project in combination with mining projects, paragraph 2 on page 3-1160:

Potential Cumulative Impact 3.24-7 Long-term water quality effects of the Proposed Project in combination with mining projects.

Mining projects within the water quality Area of Analysis and the Klamath Basin were evaluated to determine if there would be a cumulative effect with the Proposed Project. Mining projects may impact multiple water quality parameters, including increasing suspended sediment and inorganic or organic contaminants. ~~Most of the anticipated mining projects are not within the water quality Area of Analysis or the vicinity of the mainstem Klamath River (Table 3.24-1) and they would be unlikely to impact water quality conditions within the Area of Analysis. Projects in the vicinity of the water quality Area of Analysis include the Brooks Mine, an existing mine located approximately five miles south of the Klamath River, near Humbug Creek, California.~~ The only planned mining project within the water quality Area of Analysis at the time of the Draft EIR was the Brooks Mine, but this project has now been cancelled (Table 3.24-1) (USDA 2019). Any existing mining operations impacts on water quality within the Area of Analysis are accounted for in the analysis of the existing conditions. While there are potential water quality impacts from mining, these projects would be required to adhere to local, state, and/or federal mining regulations to protect water quality and implement project-specific measures to manage and reduce potential water quality impacts. Storm water management, waste discharge permits, and monitoring would all likely be necessary for any mining projects adjacent to water ways. As mining projects are required to implement such measures to reduce water quality impacts and there are currently no known planned mining projects within the water quality Area of Analysis in addition to those occurring under existing conditions, the combined effect of the Proposed Project and mining would not result in further impacts to water quality. As such, there would be no significant cumulative water quality impact due the Proposed Project and mining projects.

3.24.3 Aquatic Resources

Volume I Section 3.24.3 Cumulative Effects – Aquatic Resources – Potential Cumulative Impact 3.24-11 Effects of short-term increases in suspended sediments on aquatic resources under the Proposed Project in combination with 2017 court-ordered flushing and emergency dilution flows, paragraphs 2 and 3 on page 3-1163:

Potential Cumulative Impact 3.24-11 Effects of s~~S~~hort-term increases in suspended sediments on aquatic resources under the Proposed Project in combination with 2017 court-ordered flushing and emergency dilution flows.

As discussed in Potential Cumulative Impact 3.24-2, the short-term combined impact of the Proposed Project and the 2017 court-ordered flow requirements (i.e., 2013 BiOp plus the court ordered flushing and emergency dilutions flows) would result in a cumulative increase in the suspended sediment concentrations during water years when reservoir drawdown flows are less than the surface and/or deep flushing flows. The 2017 court-ordered flushing flows ~~are released~~

were required to be released from Iron Gate Dam for the purpose of disrupting the nidus downstream of Iron Gate Dam and reducing disease risk. Although the 2013 BiOp Flows are no longer the operational standard for the Klamath River, and the 2017 court-ordered flushing and emergency dilution flows are no longer required (see Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*), the analysis of the court-ordered flushing and emergency dilution flow requirements remains in this cumulative effects analysis because at the time of the Draft EIR it was acknowledged that these flows may have occurred during the period when the Proposed Project would occur and retaining the analysis does not change any significance determinations.

High concentrations of suspended sediment and bedload sediment released during dam removal year 2 is anticipated to effectively scour and disrupt the periphyton intermediate host of the key fish diseases, and thus it is not likely that the flushing flows and emergency dilution flows ~~are highly unlikely to~~ would have been required during the same period of impacts from the Proposed Project. In addition, the incremental effect of the increased suspended sediment on aquatic resources under the 2017 court-ordered flushing flows would be dwarfed by the substantial sediment volumes of sediment predicted to occur under the Proposed Project (described in detail in Appendix E). Therefore, the impacts predicted for aquatic resources under the Proposed Project (described in Section 3.3.5.9 *Aquatic Resource Impacts*) are no lesser, nor higher, when considered cumulatively with the 2017 court-ordered flushing and emergency dilution flows.

Significance

No significant cumulative impact in the short term

Volume I Section 3.24.3 Cumulative Effects – Aquatic Resources – Potential Cumulative Impact 3.24-12 Long-term effects on aquatic resources from the Proposed Project in combination with forest and wildfire management activities, paragraph 4 on pages 3-1163 to 3-1164:

The North Coast Regional Water Quality Control Board's Forest Activities Program issues waste discharge requirements and general waivers with terms and conditions to address the potential water quality problems potentially associated with a range of forest management activities on private and on USDA Forest Service lands (North Coast Regional Board 2019a).

Volume I Section 3.24.3 Cumulative Effects – Aquatic Resources – Potential Cumulative Impact 3.24-15 Long-term effects on aquatic resources from the Proposed Project in combination with grazing projects and agriculture projects, paragraph 1 on page 3-1166:

Grazing (and other agricultural projects) are required to meet the requirements of the non-point source discharge policy, the prohibition against unpermitted

discharges, and the North Coast Regional Water Quality Control Board's Agricultural Lands Discharge Program (North Coast Regional Board 2019c).

3.24.4 Phytoplankton and Periphyton

Volume I Section 3.24.4 Cumulative Effects – Phytoplankton and Periphyton – Potential Cumulative Impact 3.24-16 Long-term phytoplankton and periphyton effects from the Proposed Project in combination with habitat restoration, flow enhancement, and water quality improvement projects, paragraph 1 on page 3-1168:

However, the conversion of reservoir areas to free-flowing river reaches would result in a significant and unavoidable impact on periphyton conditions because the newly created free-flowing river reaches would provide additional low-gradient habitat suitable for periphyton growth (Potential Impact 3.4-4). The extent, duration, or biomass of nuisance periphyton may increase within these newly created free-flowing river reaches. Short-term and long-term nutrient increases from the release of sediment-associated nutrients or the lack of interception of nutrients behind the Lower Klamath Project dams due to the Proposed Project would be less than significant for phytoplankton and periphyton growth and habitat conditions, so they would have no significant impact on phytoplankton or periphyton (~~and~~ Potential Impacts 3.4-1, 3.4-3, and 3.4-5).

Volume I Section 3.24.4 Cumulative Effects – Phytoplankton and Periphyton – Potential Cumulative Impact 3.24-17 Short-term and long-term phytoplankton and periphyton effects from the Proposed Project in combination with 2017 court-ordered flushing and emergency dilution flows, paragraph 5 on page 3-1168 through paragraph 2 on page 3-1169:

Potential Cumulative Impact 3.24-17 Short-term and long-term phytoplankton and periphyton effects from the Proposed Project in combination with 2017 court-ordered flushing and emergency dilution flows.

Formal consultation was reinitiated in 2017 on the NMFS and USFWS 2013 Joint Biological Opinion. During the interim period February 2017 to March 2019 ~~Until formal consultation is completed and a new biological opinion (BiOp) issued~~, USBR ~~is~~ was required to continue adhering to the 2013 BiOp Flow requirements while also releasing additional winter-spring surface and deep flushing flows and potentially emergency dilution flows (U.S. District Court 2017). ~~New BiOp Flows would alter the hydrodynamic (i.e., flow) conditions in the Klamath River within the phytoplankton and periphyton Area of Analysis. The potential new BiOp flow requirements under the Proposed Project are speculative since the fish disease conditions that prompted the flushing and emergency dilution flow requirements would be reduced due to increased dispersal of spawners and carcasses, transport of bedload, and establishment of variable flows, even if infection itself is not eliminated (see Section 3.3.5.5 *Fish Disease and Parasites*). Further, if flushing and emergency dilution flow requirements were to continue under a new~~

~~BiOp, it is not clear if the prior location of Iron Gate Dam would remain as the compliance point. Thus, this cumulative effects analysis analyzes only the 2017 flow requirements (i.e., 2013 BiOp Flows plus the 2017 court-ordered flushing and emergency dilution flows), which although not part of the existing conditions (2016), are considered to be a reasonably foreseeable flow condition until formal consultation is completed and a new BiOp is issued (see Potential Cumulative Impact 3.24-2 for more details).~~ Although the 2013 BiOp Flows are no longer the operational standard for the Klamath River, and the 2017 court-ordered flushing and emergency dilution flows are no longer required (see Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*), the analysis of the court-ordered flushing and emergency dilution flow requirements remains in this cumulative effects analysis because at the time of the Draft EIR it was acknowledged that these flows may have occurred during the period when the Proposed Project would occur and retaining the analysis does not change any significance determinations. The 2019 Biological Opinion flows (2019 BiOp Flows) are now the current operational flow requirement for the Klamath River and the 2019 BiOp Flows are assessed as a second CEQA baseline in the Lower Klamath River Final EIR analyses for water quality and other resource areas (see Section 3.1.6 *Introduction – Summary of Available Hydrology Information for the Proposed Project*).

The Proposed Project and 2017 court-ordered flow requirements would decrease favorable growth conditions and optimum habitat availability for phytoplankton or periphyton since ~~they are~~ the 2017 court-ordered flow requirements were designed to limit periphyton establishment along the streambed, which also limits favorable habitat for the polychaete worm that hosts fish parasites (e.g., *C. shasta*) (see Section 3.3.5.5 *Fish Disease and Parasites*). Additionally, an increase in the frequency of higher flushing flows and emergency dilution flows between November and June would have increased turbulent flows in the Klamath River, reducing the extent of slow-water habitat that favors phytoplankton growth. The Proposed Project would eliminate slow-water habitat in the reservoir areas and convert those areas into more turbulent free-flowing reaches that would not support extensive phytoplankton blooms, including blue-green algae blooms (Potential Impact 3.4-2). As such, the cumulative effect of the Proposed Project combined with an increase in the frequency of flushing flows and emergency dilution flows would result in a beneficial effect by further reducing the availability of slow-water habitat that supports nuisance and/or noxious phytoplankton blooms.

The increase in the frequency of higher flushing flows and emergency dilution flows between November and June under the 2017 flow requirements would have also increased sediment movement and streambed scour in the Klamath River, reducing conditions where periphyton could establish along the streambed when flushing flows or emergency dilution flows are occurring. As discussed in Section 3.4.5.2 *Periphyton*, the Proposed Project drawdown flows would mobilize streambed sediments and scour periphyton attached to the streambed,

especially at higher flows that move larger sediments like cobbles (Potential Impact 3.4-3). Although the Proposed Project would result in an increase in periphyton and a potentially significant and unavoidable short-term and long-term increase in nuisance periphyton- along the Hydroelectric Reach due to the conversion of the reservoir areas to a free-flowing river and elimination of hydropower peaking operations, the cumulative effect of an increase in the frequency of higher flushing flows and emergency dilution flows would be beneficial and reduce the extent, duration, and biomass of nuisance periphyton.

Volume I Section 3.24.4 Cumulative Effects – Phytoplankton and Periphyton – Potential Cumulative Impact 3.24-18 Short-term and long-term phytoplankton and periphyton effects from the Proposed Project in combination with forest and wildfire management projects, paragraph 4 on page 3-1170:

While phytoplankton and periphyton are not directly addressed by the North Coast Regional Water Quality Control Board's Forest Activities Program, the program issues waste discharge requirements and general waivers with terms and conditions to address the potential water quality problems (e.g., water temperature or suspended sediment increases) potentially associated with a range of forest management activities on private and on USDA Forest Service lands (North Coast Regional Board 2019a~~8c~~).

Volume I Section 3.24.4 Cumulative Effects – Phytoplankton and Periphyton – Potential Cumulative Impact 3.24-18 Short-term and long-term phytoplankton and periphyton effects from the Proposed Project in combination with forest and wildfire management projects, paragraph 5 on page 3-1170:

Vegetation removal and temporary or permanent road construction and usage for tree removal (i.e., logging) would potentially increase phytoplankton and periphyton growth in the local vicinity of the project due to increases in solar radiation and water temperature ~~or reductions in suspended sediment~~, but these activities also would potentially decrease local phytoplankton and periphyton growth by increasing suspended sediment and reducing the solar radiation available for photosynthesis. ~~revegetating~~ Revegetating areas, enhancing riparian cover along meadow streams, and decommissioning or downgrading roads ~~to reduce suspended sediment delivery to streams activities~~ also would have potentially opposing effects on ~~decrease~~ phytoplankton and periphyton growth since revegetation and enhanced riparian cover would potentially decrease local phytoplankton and periphyton growth by reducing solar radiation and water temperature ~~or increasing suspended sediment~~, but decommissioning or downgrading roads would potentially increase local phytoplankton and periphyton growth by reducing suspended sediments and increasing the solar radiation available for photosynthesis.

Volume I Section 3.24.4 Cumulative Effects – Phytoplankton and Periphyton – Potential Cumulative Impact 3.24-21 Short-term and long-term phytoplankton

and periphyton effects from the Proposed Project in combination with grazing and agricultural projects, paragraph 3 on page 3-1173:

Grazing and agricultural projects are required to meet the requirements of the North Coast Regional Water Quality Control Board's Agricultural Lands Discharge Program, including a series of waivers of waste discharge requirements when applicants comply with best management practices designed to meet state water quality requirements, the State Nonpoint Source Policy, and the TMDLs in specific watersheds (North Coast Regional Board 2018~~a~~, North Coast Regional Board 2019a).

Volume I Section 3.24.4 Cumulative Effects – Phytoplankton and Periphyton – Potential Cumulative Impact 3.24-22 – Potential Cumulative Impact 3.24-22 Short-term and long-term phytoplankton and periphyton effects from the Proposed Project in combination with mining, paragraph 2 on page 3-1174:

Potential Cumulative Impact 3.24-22 Short-term and long-term phytoplankton and periphyton effects from the Proposed Project in combination with mining.

~~Most of the anticipated mining projects are not within the phytoplankton and periphyton Area of Analysis or the vicinity of the mainstem Klamath River (Table 3.24-1), so they would not impact phytoplankton and periphyton conditions within the Area of Analysis. Projects in the vicinity of the phytoplankton and periphyton Area of Analysis include the Brooks Mine, an existing mine located approximately five miles south of the Klamath River, near Humbug Creek, California.~~ The only planned mining project within the phytoplankton and periphyton Area of Analysis at the time of the Draft EIR was the Brooks Mine near Humbug Creek, California, but this project has now been cancelled (Table 3.24-1) (USDA 2019). Any existing mining operations impacts on the phytoplankton and periphyton Area of Analysis are accounted for in the analysis of the existing conditions. Mining could potentially alter light availability for phytoplankton and periphyton in the Klamath River by increasing suspended sediment conditions, but since mining projects would be required to adhere to local, state, and/or federal mining regulations to protect water quality and implement project-specific measures to manage and reduce potential water quality impacts, there would be no cumulative impact. Stormwater management, waste discharge permits, and monitoring would all likely be necessary for any mining projects adjacent or draining to waterways. Mining projects implementing such project-specific measures would reduce their impacts on phytoplankton and periphyton growth. There are no significant adverse phytoplankton or periphyton impacts due to suspended sediment concentrations under the Proposed Project (Potential Impact 3.4-4 and Potential Impacts 3.4-1, 3.4-2, 3.4-3, and 3.4-5). As the Proposed Project would not have a significant adverse impact on phytoplankton and periphyton related to mining ~~cultivation~~ and there are no closely related mining projects that would, in combination with the Proposed Project, have a significant and adverse impact, there would be no significant cumulative

phytoplankton or periphyton impacts in the short term or long-term due to the Proposed Project and mining projects.

3.24.5 Terrestrial Resources

Volume I Section 3.24.5 Cumulative Effects – Terrestrial Resources – Potential Cumulative Impact 3.24-24 Short-term effects on terrestrial resources from the Proposed Project in combination with 2017 court-ordered flushing and emergency dilution flows, paragraph 6 on page 3-1175 through paragraph 4 on page 3-1176:

Potential Cumulative Impact 3.24-24 Short-term effects on terrestrial resources from the Proposed Project in combination with 2017 court-ordered flushing and emergency dilution flows.

The 2013 BiOp Flows ~~have been~~ are analyzed under the individual resource sections for the Proposed Project as the operational flow requirement for the Klamath River at the time of the Notice of Preparation for the Lower Klamath Project EIR (i.e., December 22, 2016). ~~Potential Impact 3.24-1 in Section 3.24.2 *Cumulative Water Quality Effects* provides background and context regarding agency re-consultation on the 2013 Joint Biological Opinion.~~ Although the 2013 BiOp Flows are no longer the operational standard for the Klamath River, and the 2017 court-ordered flushing and emergency dilution flows are no longer required (see Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*), the analysis of the court-ordered flushing and emergency dilution flow requirements remains in this cumulative effects analysis because at the time of the Draft EIR it was acknowledged that these flows may have occurred during the period when the Proposed Project would occur and retaining the analysis does not change any significance determinations.

~~For the reasons set out in Potential Impact 3.24-1, this analysis only considers the 2017 court-ordered flow requirements, which are not part of the existing conditions, and are a reasonably foreseeable flow condition; this analysis does not consider the potential new BiOp. The court-ordered flushing and emergency dilution flows are required primarily to reduce *C. Shasta* infection of Klamath River salmonids.~~ Potential Impact 3.24-1 determines that it is unlikely that there would be exceedances of disease thresholds that would have triggered 2017-mandated emergency dilution flows ~~In~~ in the short term, particularly in dam removal year 2; therefore, emergency dilution flows are not expected to temporally overlap with the Proposed Project. 2017 court-ordered flushing flows may have overlapped in space and time with the Proposed Project, and thus they are the focus of ~~this~~ the below analysis.

Sediment discharge, sedimentation, and impacts to channel morphology from the Proposed Project are not expected to substantially adversely impact in-channel and riparian vegetation downstream of Iron Gate Dam (Potential Impact 3.5-4). This is because vegetation growing within, or along, the river channel margins can likely withstand, or revegetate following, this scale of perturbation, which is

not dissimilar to seasonal and inter-annual river system dynamics over the past century. Conversely, sediment discharge, sedimentation, and changes to channel morphology would result in potentially significant impacts to the foothill yellow-legged frog (Potential Impact 3.5-16).

In years where reservoir drawdown flows alone would not have meet the magnitude or duration of the 2017 court-ordered flushing flow requirements, surface and/or deep flushing flows may be implemented to meet the 2017 court-ordered flow requirements, which would be additional to flows from the Proposed Project. Although the magnitude of flows would not be greater than assessed in Section 3.5.5 *[Terrestrial Resources] Impacts and Mitigation*, there are one to two months when flushing flows may have occurred outside of the Proposed Project reservoir drawdown period (November 1 to March 15) since surface flushing flows potentially would have occurred until April 30 and deep flushing flows potentially would have occurred until May 31. Given that the 2017 court-ordered surface and/or deep flushing flows are were within the range of flows modeled for the Proposed Project, it is unlikely that sediment discharge, sedimentation, and impacts to channel morphology, would exceed what in-channel riparian vegetation can withstand, or that vegetation would not revegetate in a few years, due to the combination of flushing flows and reservoir drawdown.

With regard to wildlife, the combination of the Proposed Project and the 2017 court-ordered surface and/or deep flushing flows would extend the period of high flows that could scour foothill yellow-legged frog eggs or displace tadpoles (Potential Impact 3.5-16); however, since reservoir drawdown flows would be expected to remain below the 10-year flood event under the Proposed Project, the incremental impact of the Proposed Project to potential scour of foothill yellow-legged frog eggs would not be cumulatively considerable.

Significance
No significant cumulative impact on riparian vegetation or wildlife

Volume I Section 3.24.5 Cumulative Effects – Terrestrial Resources – Potential Cumulative Impact 3.24-25 Short-term effects on terrestrial resources from forest and wildfire management, paragraph 1 on page 3-1177:

The Proposed Project would also result in noise and habitat modifications that would have significant short-term impacts on terrestrial wildlife species before mitigation (Potential Impact 3.5-10 for amphibians, and reptiles, and gray wolf and Potential Impact 3.5-13 for bald and golden eagles), and a significant and unavoidable impacts on some other terrestrial wildlife species (Potential Impacts 3.5-10 for other special-status wildlife species, 3.5-11, 3.5-12, 3.5-13, and 3.5-14).

Volume I Section 3.24.5 Cumulative Effects – Terrestrial Resources – Potential Cumulative Impact 3.24-26 Short-term effects on terrestrial resources from the Proposed Project in combination with wildfire, paragraph 3 on page 3-1177:

The Proposed Project would also result in noise and habitat modifications that would have significant short-term impacts on terrestrial wildlife species before mitigation (Potential Impact 3.5-10 for amphibians, ~~and~~ reptiles, and gray wolf and Potential Impact 3.5-13 for bald and golden eagles), and a significant and unavoidable impacts on some other terrestrial wildlife species (Potential Impacts 3.5-10 for other special-status wildlife species, 3.5-11, 3.5-12, ~~3.5-13,~~ and 3.5-14).

Volume I Section 3.24.5 Cumulative Effects – Terrestrial Resources – Potential Cumulative Impact 3.24-27 Short-term and long-term effects on terrestrial resources from the Proposed Project in combination with agriculture, including cannabis cultivation, paragraph 3 on page 3-1178:

The Proposed Project would also result in noise and habitat modifications that would have significant short-term impacts on terrestrial wildlife species before mitigation (Potential Impact 3.5-10 for amphibians, ~~and~~ reptiles, and gray wolf and Potential Impact 3.5-13 for bald and golden eagles), and a significant and unavoidable impacts on some other terrestrial wildlife species (Potential Impacts 3.5-10 for other special-status wildlife species, 3.5-11, 3.5-12, ~~3.5-13,~~ and 3.5-14).

Volume I Section 3.24.5 Cumulative Effects – Terrestrial Resources – Potential Cumulative Impact 3.24-28 Short-term effects on terrestrial resources from the combination of the Proposed Project and mining, paragraph 4 on page 1179 and paragraph 1 on page 3-1180:

The Proposed Project includes ground-disturbing activities (i.e., construction) that would have significant short-term impacts on wetlands and riparian habitats before mitigation (Potential Impact 3.5-1), and ground-disturbing activities (i.e., construction and dam removal) that would have significant and unavoidable impacts on special-status plant species and rare natural communities (Potential Impacts 3.5-7 and 2.5-8). The Proposed Project would also result in noise and habitat modifications that would have significant short-term impacts on terrestrial wildlife species before mitigation (Potential Impact 3.5-10 for amphibians, ~~and~~ reptiles, and gray wolf and Potential Impact 3.5-13 for bald and golden eagles), and a significant and unavoidable impacts on some other terrestrial wildlife species (Potential Impacts 3.5-10 for other special-status wildlife species, 3.5-11, 3.5-12, ~~3.5-13,~~ and 3.5-14). Mining projects within the Primary Area of Analysis for terrestrial resources (Table 3.24-1) could also result in ground disturbance. Most other mining projects are withdrawal or remediation projects, renewals of existing permits in Del Norte County, or are situated in the Salmon River sub-basin (far from the Hydroelectric Reach), with the exception of the new Plan of

Operations for the existing Brooks Mine, which has been cancelled since the Draft EIR (Table 3.24-1) (USDA 2019). ~~The new plan of operations for the Brooks Mine is near the expected hydrological and sedimentation footprint from dam removal, which extends downstream to Humbug Creek.~~ Although details of implementation methods for mining projects are currently speculative, these projects would be required to adhere to state and/or federal guidelines, which would ensure that sensitive habitats (e.g., wetlands), rare natural communities, and special-status plant species are inventoried prior to project implementation and avoided, or that mitigation is applied where necessary. Given that there are no expected ~~only~~expected mining projects within the Primary Area of Analysis for terrestrial resources, ~~is a new plan of operations~~ there would be no significant ground-disturbing impact to terrestrial resources from the combination of the Proposed Project and other closely related mining projects.

Mining projects (Table 3.24-1) within or near the Primary Area of Analysis for terrestrial resources may result in reduced water quality affecting special-status terrestrial species such as amphibians and reptiles. ~~The majority of mining projects are located outside of the terrestrial Primary Area of Analysis. A new (20-acre) Plan of Operations for the existing Brooks Mine (Table 3.24-1) is near the expected hydrological and sedimentation footprint from dam removal, which extends downstream to Humbug Creek.~~ Impacts from mining projects on water quality, and terrestrial wildlife that use waterways, would be anticipated to be less than significant, since there are no known planned mining projects within the Primary Area of Analysis for terrestrial resources and mining projects would be required to adhere to existing water quality regulations and implement project-specific measures (e.g., storm water management). Although the Proposed Project would result in significant and unavoidable adverse impacts due to short-term water quality impacts (as described in Cannabis Cultivation above), there are no closely related mining~~grazing~~ projects that would, in combination with the Proposed Project, result in further significant and adverse impacts to water quality that would cumulatively affect terrestrial wildlife. Thus, there would be no cumulative water quality impacts on terrestrial wildlife due to the Proposed Project in combination with closely related mining projects.

Volume I Section 3.24.5 Cumulative Effects – Terrestrial Resources – Potential Cumulative Impact 3.24-29 Short-term effects on terrestrial resources from the Proposed Project in combination with development and infrastructure projects, paragraph 3 on page 3-1180:

The Proposed Project would also result in noise and habitat modifications that would have significant short-term impacts on terrestrial wildlife species before mitigation (Potential Impact 3.5-10 for amphibians, ~~and~~ reptiles, and gray wolf and Potential Impact 3.5-13 for bald and golden eagles), and a significant and unavoidable impacts on some other terrestrial wildlife species (Potential Impacts 3.5-10 for other special-status wildlife species, 3.5-11, 3.5-12, ~~3.5-13,~~ and 3.5-14).

3.24.6 Flood Hydrology

Volume I Section 3.24.6 Cumulative Effects – Flood Hydrology, paragraphs 3 through 5 on page 3-1181:

Existing conditions for flood hydrology are detailed in Section 3.6.2 *[Flood Hydrology] Environmental Setting*, which provides a description of basin hydrology including precipitation; reservoirs; major rivers and tributaries; lakes; springs and seeps providing measurable flow; historical stream flows; and flood hydrology. Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project* also provides relevant information related to recent management decisions that dictate Klamath River flows downstream of Iron Gate Dam. These include the 2013 BiOp Flows, ~~and~~ the 2017 court-ordered flushing and emergency dilution flows, and the 2019 BiOp Flows. Section 3.6.2 *[Flood Hydrology] Environmental Setting* includes consideration of major past or ongoing projects that have impacted, or currently impact, flood hydrology resources.

This cumulative impact analysis focuses on the potential impacts of the Proposed Project combined with other closely related projects that are not already considered in the analysis of flood hydrology resource area effects (Section 3.6 *Flood Hydrology*). Non-project activity types within the flood hydrology Area of Analysis with the potential for significant cumulative flood hydrology effects are included in Table 3.24-1.

Significance criteria for cumulative flood hydrology effects are the same as defined in Section 3.6.3 *[Flood Hydrology] Significance Criteria* for the flood hydrology resource.

Volume I Section 3.24.6 Cumulative Effects – Flood Hydrology – Potential Cumulative Impact 3.24-30 Short-term and long-term flood hydrology effects from the Proposed Project in combination with other non-project activities, paragraph 1 on page 3-1182:

Formal consultation of the 2013 BiOp ~~f~~Flows was reinitiated in 2017 to improve management of *Ceratanova shasta (C. shasta)* infection among coho salmon in the Klamath River. In 2017, a court order required USBR to implement three specific flows in the Klamath River, as measured immediately downstream of Iron Gate Dam: annual winter-spring surface flushing flows, biennial winter-spring deep flushing flows, and spring-summer emergency dilution flows (U.S. District Court 2017a–c). Although the 2013 BiOp Flows are no longer the operational standard for the Klamath River, and the 2017 court-ordered flushing and emergency dilution flows are no longer required (see Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*), the analysis of the 2017 court-ordered flushing and emergency dilution flow requirements remains in this cumulative effects analysis because at the time of the Draft EIR it was

acknowledged that these flows may have occurred during the period when the Proposed Project would occur and retaining the analysis does not change any significance determinations. After the issuance of the Lower Klamath Project Draft EIR on December 27, 2018, the applicable biological opinion and the operational flow requirements for the Klamath River changed in March 2019, when the new biological opinions were issued by NMFS (2019) and USFWS (2019). The 2019 BiOp Flows are now the current operational flow requirement for the Klamath River (see Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*). ~~Although specific flow details for a new BiOp resulting from re-consultation are speculative at this time, f~~Flow changes in the Klamath River due to the ~~a new BiOp (or the~~ 2017 court-ordered flushing and emergency dilution flows ~~[~~(U.S. District Court 2017~~]~~), as originally analyzed in the Draft EIR, ~~are not~~ would not ~~expected to~~ alter flood hydrology or the FEMA 100-year floodplain in the flood hydrology Area of Analysis. This is because ~~BiOp'~~biological opinions specify minimum flow releases and do not impact peak flows during flood events.

Volume I Section 3.24.6 Cumulative Effects – Flood Hydrology – Potential Cumulative Impact 3.24-30 Short-term and long-term flood hydrology effects from the Proposed Project in combination with other non-project activities, paragraph 3 on page 3-1182:

Although the Proposed Project would result in significant and unavoidable adverse impacts due to exposing structures to a substantial risk of damage due to flooding (Potential Impact 3.6-3), there are no closely related projects that would, in combination with the Proposed Project, result in further significant and adverse flood hydrology impacts. Thus, there would be no significant cumulative flood hydrology impacts due to the Proposed Project and flow release and floodplain development projects. Additionally, there would be beneficial cumulative effects due to the Proposed Project and habitat restoration projects.

3.24.7 Groundwater

Please refer to Volume I Section 3.24.7 *Cumulative Effects – Groundwater*.

3.24.8 Water Supply/Water Rights

Volume I Section 3.24.8 Cumulative Effects – Water Supply/Water Rights – Potential Cumulative Impact 3.24-32 Cumulative water supply and water rights impacts from the combination of the Proposed Project and other potential non-project activities, page 3-1184, paragraph 5:

The 2017 flow requirements (i.e., 2013 BiOp Flows plus the 2017 court-ordered flushing and emergency dilution flows) included winter-spring (November 1–April 30) surface flushing flows every year to scour surface riverbed sediments, deep flushing flows between February 15 and May 31 every other year to scour and disturb larger riverbed sediments, and emergency dilution flows between April 1

to June 15, if disease thresholds ~~are~~ were exceeded (see Cumulative Potential Impact 3.24-2 for further discussion). As there is sufficient water released from the Lower Klamath Project under existing conditions, ~~and from~~ under the 2017 flow requirements, and under the 2019 BiOp to satisfy downstream water rights, ~~and a new BiOp would be more likely to increase than decrease flows,~~ there would be no significant cumulative impact to water supply/water rights in the hydroelectric reach or downstream of Iron Gate Dam from the combination of the Proposed Project and the re-consultation of the 2013 BiOp. In a parallel process, USBR has initiated renegotiation for a new Upper Klamath Basin agreement, which would be informed by the final 2019 BiOp flow requirements, ~~under the 2013 BiOp re-consultation~~ regarding water rights among agricultural irrigators, Native American tribes, and environmental uses (Herald and News 2017; Herald and News 2018). However, at this time the outcome of the renegotiation for Upper Klamath Basin water rights is speculative and is not analyzed as part of the cumulative effects.

3.24.9 Air Quality

Please refer to Section 3.24.9 *Cumulative Effects – Air Quality* that was recirculated on December 21, 2019.

3.24.10 Greenhouse Gas Emissions

Please refer to Section 3.24.10 *Cumulative Effects – Greenhouse Gas Emissions and Energy* that was recirculated on December 21, 2019.

3.24.11 Geology, Soils, and Mineral Resources

Volume I Section 3.24.11 – Cumulative Effects – Geology, Soils, and Mineral Resources – Potential Cumulative Impact 3.24-40 Short-term soil disturbance, erosion, and sedimentation effects from the Proposed Project in combination with other construction projects, paragraph 7 on page 3-1191:

The Proposed Project would also not have a significant sedimentation impact downstream of Cottonwood Creek~~the Lower Klamath Project reservoirs~~, or the sedimentation would be beneficial, although there would be a significant and unavoidable impact in the Middle Klamath River from Iron Gate Dam to Cottonwood Creek (Potential Impact 3.11-5).

Volume I Section 3.24.11 Cumulative Effects – Geology, Soils, and Mineral Resources – Potential Cumulative Impact 3.24-41 Short-term soil disturbance, erosion, and sedimentation effects from the Proposed Project in combination with wildfire, mining, forest and wildfire management, and agriculture, paragraphs 2 and 3 on page 3-1192:

Potential Cumulative Impact 3.24-41 Short-term soil disturbance, erosion, and sedimentation effects from the Proposed Project in combination with wildfire, mining, forest and wildfire management, and agriculture.
Non-construction sediment-generating activities, such as wildfire, forest and wildfire management, mining and agriculture, would be subject to separate planning standards and requirements than for construction activities assessed in Potential Cumulative Impact 3.24-402 above. Wildfires are a naturally recurring event in the Klamath Basin, and have the potential to result in substantial erosion and sediment delivery if rainfall events occur before vegetation reestablishes. Increased sediment delivery would be most likely if a wildfire occurred late in the fire season (fall), and a combination of the Proposed Project and rain storms occurred shortly following the fire. As discussed in Potential Cumulative Impact 3.24-4, this could increase suspended sediment and sedimentation additional to the Proposed Project, and the water quality impact could be significant. The combination of geology and soils impacts under the Proposed Project and wildfires would also be significant, if temporal and spatial overlap occurs. However, given that most geology and soil impacts, including soil disturbance, erosion, and sedimentation impacts, associated with the Proposed Project in isolation would not be significant (see Potential Impacts 3.11-2, 3.11-3, 3.11-5, and 3.11-6), significant short-term sedimentation impacts are only expected in one reach of the Middle Klamath River – from Iron Gate Dam to Cottonwood Creek, and these impacts would likely be small or spatially restricted compared with flooding on large areas of bare ground exposed by wildfire, the incremental impact of the Proposed Project would not be cumulatively considerable.

Most known forest and wildfire management projects are not close to the mainstem Klamath River, except the Somes Bar Integrated Fire Management Project (approximately 90 miles downstream of Humbug), and Crawford Vegetation Management Project (approximately 70 miles downstream of Humbug), as well as the Oak Fire Roadside Hazard Tree Proposal downstream of Happy Camp, although this project is buffered from the Klamath River by Highway CA-96. Most mining projects described in the assessment of existing conditions for the Proposed Project are withdrawal or remediation projects, or are situated in tributaries far from the Hydroelectric Reach, apart from the new Plan of Operations for the existing Brooks Mine, which has been cancelled since the Draft EIR (Table 3.24-1) (USDA 2019). ~~The new plan of operations for the Brooks Mine (Table 3.24-1) is near the expected hydrologic and sedimentation footprint from Lower Klamath Project dam removal, which extends through the Hydrologic Reach and the Middle Klamath River from Iron Gate Dam to Humbug Creek.~~ Most agricultural projects, including cannabis cultivation projects, are also captured by existing conditions, or are situated far from the Hydroelectric Reach, except for the adopted Cannaworx Zone Change near Humbug. The Cannaworx Zone Change would convert Open Space to Non-Prime Agricultural zoned land, thus supporting agricultural activities on previously agriculture-free land. Based on the above information, the soil disturbance, erosion, and sedimentation impact of the Proposed Project, in combination with forest and

wildfire management, mining-related activities, and agricultural activities, would not be cumulatively significant.

Volume I Section 3.24.11 – Cumulative Effects – Geology, Soils, and Mineral Resources – Potential Cumulative Impact 3.24-42 Short-term hillslope instability, effects to earthen dam embankments, and/or bank erosion from the Proposed Project in combination with other potential non-project activities, paragraphs 3 through 5 on page 3-1193:

Potential Cumulative Impact 3.24-42 Short-term hillslope instability, effects to earthen dam embankments, and/or bank erosion from the Proposed Project in combination with other potential non-project activities.
Slope stability analyses conducted for the Proposed Project indicate that segments of the Copco No. 1 Reservoir rim and adjacent slopes have a potential for slope failure that could impact existing roads and/or private property. These areas include approximately 1,780 linear feet of shore-parallel length with potential impacts outside of the reservoir rim, including 430 linear feet along Copco Road on the north shore, and approximately 1,350 linear feet adjacent to private property on the south shore~~3,700 linear feet of slopes along Copco Road and approximately 2,800 linear feet of slope adjacent to private property~~ (Appendix B: *Definite Plan* – Appendix E – Section 3.4.4 *Slope Stability Analysis Results,* and Figure 3.5, slope segments S5, S11, S12, and N11). Up to eight parcels in these areas have existing habitable structures that could potentially be impacted. The impact of the Proposed Project on hillslope instability in reservoir rim areas would be significant. Implementation of Mitigation Measure GEO-1 would reduce the cumulative impact to less than significant. No other projects have been identified that would cause hillslope instability along the rim or slopes adjacent to the rim of Copco No. 1 Reservoir (or the rims of Iron Gate or Copco No. 2 reservoirs) (Table 3.24-1); therefore, there would be no cumulative impact.

Analyses of embankment stability during drawdown at the earthen dams (i.e., Iron Gate Dam and J.C. Boyle Dam) indicate that the proposed reservoir drawdown rates would not result in substantial embankment instability (Appendix B: *Definite Plan*). Small, shallow slumping along the upstream embankment slopes due to the potential strength loss of surficial materials during drawdown would not threaten the structural integrity of the embankments or deliver a substantial amount of sediment. No other projects have been identified that would cause embankment instability at Iron Gate Dam and J.C. Boyle Dam (Table 3.24-1); therefore, there would be no cumulative impact related to embankment stability.

Drawdown flow rates for the Proposed Project are similar to existing and historical flow rates, and would be adjusted according to the water year type, thus substantial bank erosion is not expected (Potential Impact 3.11-4). As discussed in Potential Impact 3.24-2 *[Water Quality]*, 2017 flow requirements (i.e., 2013 BiOp Flows plus the 2017 court-ordered flushing and emergency

dilution flows) are within the range of flows modeled under the Proposed Project; therefore, there would not be any cumulative impact related to bank erosion. Note that although the 2013 BiOp Flows are no longer the operational standard for the Klamath River, and the court-ordered flushing and emergency dilution flows are no longer required (see Volume I Section 3.1.6 *Introduction – Summary of Available Hydrology Information for the Proposed Project*), the analysis of the court-ordered flushing and emergency dilution flow requirements remains in this cumulative effects analysis because at the time of the Draft EIR it was acknowledged that these flows may have occurred during the period when the Proposed Project would occur and retaining the analysis does not change any significance determinations.

3.24.12 Historical Resources and Tribal Cultural Resources

Volume I Section 3.24.12 Cumulative Effects – Historical Resources and Tribal Cultural Resources – Potential Cumulative Impact 3.24-46 Short-term historical and trial cultural resources effects of the Proposed Project in combination with 2017 court-ordered flushing and emergency dilution flows, paragraph 3 on page 3-1196 through paragraph 3 on page 3-1197:

Potential Cumulative Impact 3.24-46 Short-term historical and tribal cultural resources effects of the Proposed Project in combination with 2017 court-ordered flushing and emergency dilution flows.
The 2013 BiOp Flows are ~~have been~~ analyzed under the individual resource sections for the Proposed Project as the operational flow requirement for the Klamath River at the time of the Notice of Preparation for the Lower Klamath Project EIR (i.e., December 22, 2016). Potential Impact 3.24-2 in Section 3.24.2 *Cumulative Water Quality Effects* provides background and context regarding agency re-consultation on the 2013 BiOp, which was completed following the issuance of the Draft EIR in December 2018, and the cumulative effects analysis. ~~For the reasons set out in Potential Impact 3.24-2, this analysis only considers the 2017 court-ordered flow requirements, which were imposed after issuance of the Notice of Preparation (i.e., are not part of the existing conditions), and are a reasonably foreseeable flow condition; this analysis does not consider the potential new BiOp.~~ Although the 2013 BiOp Flows are no longer the operational standard for the Klamath River, and the 2017 court-ordered flushing and emergency dilution flows are no longer required (see also Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*), the analysis of the court-ordered flushing and emergency dilution flow requirements remains in this cumulative effects analysis because at the time of the Draft EIR it was acknowledged that these flows may have occurred during the period when the Proposed Project would occur and retaining the analysis does not change any significance determinations.

The existing 100-yr floodplain in the Middle Klamath River downstream of Iron Gate Dam between RM 190 and 171, defined as *Subarea 2*, would increase slightly under the Proposed Project, and associated flooding and erosion may

have a significant and unavoidable impact on historical and tribal cultural resources along this reach of the Klamath River, (Potential Impacts 3.12-3 and 3.12-14). In other reaches of the Klamath River, the floodplain is not expected to change (Potential Impacts 3.12-3 and 3.12-14). There are no closely related development projects that would, in combination with the Proposed Project, have a significant and adverse impact on flooding in *Subarea 2* (Table 3.24-1), where the floodplain is expected to increase under the Proposed Project. During the period when the Proposed Project would occur, the 2017 flow requirements (i.e., 2013 BiOp Flows plus the 2017 court-ordered flushing and emergency dilution flows) ~~would be in effect (see Cumulative Impact 3.24-1 for additional detail). However, these flow requirements are~~ would not have been ~~not~~ sufficiently high as to increase flooding risk, thus there would be no cumulative flooding and/or erosion impacts to historical and tribal cultural resources located within the 100-year floodplain.

As mentioned in Impact 3.24-45 above, the Proposed Project would benefit the cultural riverscape and ecosystem health, including tribal fisheries resources, by dam removal and elimination of hatchery production (Potential Impact 3.12-9). The 2017 flow requirements would have improved Klamath River fishery tribal cultural resource by reducing the incidence of fish disease (see Section 3.3.5.5 *Fish Disease and Parasites*), and in combination with the removal of upstream migration barriers (i.e., the Lower Klamath Project dams) and improvements to the quality of riverine habitat in the Middle Klamath River and the Hydroelectric Reach (see Section 3.3.5.8 *Aquatic Habitat*), there would be a cumulative beneficial effect on the fishery tribal cultural resource.

Volume I Section 3.24.12 Cumulative Effects – Historical Resources and Tribal Cultural Resources – Potential Cumulative Impact 3.24-47 Historical and tribal cultural resources effects from the Proposed Project in combination with development projects, paragraph 4 on page 3-1197:

Potential Cumulative Impact 3.24-47 ~~Short-term and/or long-term h~~ Historical and tribal cultural resources effects from the Proposed Project in combination with development projects.

Tribal Cultural Resources

Significant and unavoidable ~~short-term~~ ground-disturbing construction-related impacts on archaeological and non-archaeological tribal cultural resources (TCRs) would occur even with mitigation for the 4 to 8-year period of dam removal and restoration activities under the Proposed Project (Potential Impacts 3.12-1, 3.12-4, 3.12-5).

Volume I Section 3.24.12 Cumulative Effects – Historical Resources and Tribal Cultural Resources – Potential Cumulative Impact 3.24-47 Historical and tribal cultural resources effects from the Proposed Project in combination with development projects, paragraph 3 on page 3-1198:

Significant and unavoidable ~~short-term~~ ground-disturbing construction-related impacts on historic-period archaeological resources would occur with mitigation for the 4 to 8-year period of dam removal and restoration activities under the Proposed Project (Potential Impacts 3.12-12, 3.12-15, 3.12-16).

3.24.13 Paleontologic Resources

Volume I Section 3.24.13 Cumulative Effects – Paleontologic Resources, paragraph 6 on page 3-1198:

Existing conditions for paleontologic resources are as described in Section 3.13.2~~3.14.2~~ [Paleontologic Resources] *Environmental Setting*. The majority of bedrock deposits within the Area of Analysis for paleontologic resources are not fossil-bearing units. Two mapped geologic units that contain paleontologic resources are present within the Area of Analysis: (1) the unnamed diatomite deposit at Copco No. 1 Reservoir; and (2) the Hornbrook Formation. The diatomite deposit is determined to be of Low Paleontologic Potential. The fossils in the Hornbrook Formation are documented to include megafossils and microfossils, but it is not known if the fossil abundance varies spatially within this geologic unit. The Klamath River cuts across the Hornbrook Formation in the region of Hornbrook, California, along approximately three river miles (Figure 3.13-2). Sub-units within the Hornbrook formation are described in Section 3.13.2~~3.14.2~~ [Paleontologic Resources] Environmental Setting. Section 3.13.2~~3.14.2~~ also includes consideration of major past or ongoing projects that have impacted, or currently impact, paleontologic resources.

Volume I Section 3.24.13 Cumulative Effects – Paleontologic Resources – Potential Cumulative Impact 3.24-48 Long-term paleontologic resources effects from the Proposed Project in combination with other non-project activities, paragraph 3 on page 3-1199:

As there are no closely related projects that would, in combination with the Proposed Project, result in cumulative flood hydrology impacts (see Section 3.24.6 *Cumulative Effects – Flood Hydrology ~~Effects~~*) there would be no cumulative downcutting and erosion impacts related to altered flood flows within the Klamath River.

3.24.14 Land Use and Planning

Volume I Section 3.24.14 *Cumulative Effects – Land Use and Planning*, *paragraph 2 on page 3-1200*:

Significance criteria for cumulative land use and planning~~aquatic resources~~ impacts are the same as defined in Section 3.14.3 *[Land Use and Planning] Significance Criteria*.

3.24.15 Agriculture and Forestry

Volume I Section 3.24.15 Cumulative Effects – Agriculture and Forestry – Potential Cumulative Impact 3.24-53 Short-term and long-term effects to forestry resources from the combination of the Proposed Project and wildfire, paragraph 3 on page 3-1202:

Potential Cumulative Impact 3.24-53 Short-term and long-term effects to forestry resources from the combination of the Proposed Project and wildfire.

3.24.16 Population and Housing

Volume I Section 3.24.16 Cumulative Effects – Population and Housing, paragraphs 4 and 5 on page 3-1203:

The nature of the ~~above listed~~ relevant projects is that they could increase population growth and create housing demand, especially during construction periods when additional workers would be present.

Significance criteria for cumulative population and housing~~aquatic resources~~ impacts are the same as defined in Section 3.16.3 *[Population and Housing] Significance Criteria*.

Volume I Section 3.24.16 Cumulative Effects – Population and Housing – Potential Cumulative Impact 3.24-54 Short-term and long-term population and housing effects from the Proposed Project in combination with residential and industrial development projects, paragraph 6 on pages 3-1203 to 3-1204:

However, given that the temporary population increase due to the Proposed Project would be small (0.4 percent) (Potential Impact 3.16-2), and many~~ost~~ workers for the Proposed Project are anticipated to be sourced from Yreka and smaller nearby communities, the Proposed Project's use of vacant units would be minimal, and the incremental impact on population and housing would not be cumulatively considerable.

3.24.17 Public Services

Volume I Section 3.24.17 Cumulative Effects – Public Services, paragraph 4 on page 3-1204:

Existing conditions for public services are described in Section 3.17.2 [Public Services] Environmental Setting, which describes fire protection, police, medical services, schools, parks, and other public facilities within the Area of Analysis. Fire protection in the Area of Analysis is provided via cooperative fire protection agreement with ~~CALFIRE~~CAL FIRE.

Volume I Section 3.24.17 Cumulative Effects – Public Services, new paragraph 1 on page 3-1205:

Significance criteria for cumulative public services impacts are the same as defined in Section 3.17.3 *[Public Services] Significance Criteria* for the resource.

Volume I Section 3.24.22 Cumulative Effects – Public Services – Potential Cumulative Impact 3.24-55, paragraph 1 on page 3-1205:

The Proposed Project could result in a significant short-term impact if it resulted in substantial increased emergency response times within the Area of Analysis. Other projects and activities that could potentially impact emergency response times include multiple thinning and forest fuel reduction projects in the Happy Camp, Oak Knoll, Salmon River, Scott River, and Goosenest Ranger Districts of the Klamath National Forest, the Brooks Mine (cancelled since the Draft EIR), fiber optic cable installation along Highway 96, PacifiCorp powerline replacement in the Happy Camp Ranger District, Guys Gulch Road Realignment, Wooley Creek Bridge Rehabilitation, KHSA (IM)-16 Water Diversion Projects, and construction of the Yreka Nanocellulose Facility, Siskiyou County Jail, Rain Rock Casino, Sousa Ready Mix Concrete Batch Plant, and the Fruit Growers Supply Company Sawmill (Table 3.24-1). These projects are unlikely to overlap in space and time with the Proposed Project's potential impacts to public services response times or emergency service routes, with the exception of KHSA (IM)-16 Water Diversion Projects and the Yreka Nanocellulose Facility, Siskiyou County Jail, Rain Rock Casino, Sousa Ready Mix Concrete Batch Plant, and Fruit Growers Supply Company Sawmill projects. If these projects occur at the same time as the Proposed Project, they could add to the increased emergency response times from the Proposed Project described as Potential Impact 3.17-1. ~~Although t~~The Emergency Response Plan, Fire Management Plan, Traffic Management Plan (TMP), and Hazardous Materials Management Plan to be prepared per Mitigation Measure~~s~~ HZ-1 and ~~Recommended~~ Mitigation Measure TR-1 would take into account any other construction projects occurring at the same time that could potentially slow emergency services access in the affected area~~, the State Water Board cannot ensure the TMP's and Emergency Response Plan's implementation~~. As with Potential Cumulative Impact 3.24-65, the combination of the Proposed Project, mitigation measures HZ-1 and TR-1, and one or more other construction projects within the Area of Analysis would be unlikely to result in significant impacts to traffic and transportation. ~~However, because the State Water Board has determined that short-term construction-related impacts of the Proposed Project would be significant and unavoidable with respect to traffic flow, road safety, road conditions, emergency access, public transit, and non-motorized transportation, unless and until KRRC reaches enforceable 'good citizen' agreements through the FERC process, it has determined the incremental contribution of the Proposed Project in this Draft EIR to be cumulatively considerable.~~ In its comments on the Draft EIR (ORG46) and in its application for water quality certification filed on December 3, 2019, the

KRRC provided additional standards and commitments regarding the Traffic Management Plan. The State Water Board anticipates that implementation of Mitigation Measure TR-1 would reduce short-term construction-related impacts of the Proposed Project to less than significant with respect to traffic flow, road safety, road conditions, emergency access, public transit, and non-motorized transportation, and the analysis above finds no significant overlapping transportation and traffic impacts from other projects; therefore, there would be no significant cumulative impact.

Significance

~~*Cumulatively considerable*~~ *No significant cumulative impact*

Volume I Section 3.24.17 Cumulative Effects – Public Services – Potential Cumulative Impact 3.24-55, paragraph 1 on page 3-1206:

The Proposed Project could expose people or structures to a risk of loss, injury, or death involving wildland fires by reducing reservoir storage (Potential Impact 3.17-2, and Potential Cumulative Impact 3.21-8). The 2017 court-ordered flushing and emergency dilution flows could have changed flows from upstream of the Proposed Project and affected the volume of water available for firefighting in the Area of Analysis; however, ~~and~~ the timing of the 2017 flows ~~is~~ was likely to have had a beneficial effect during wildfire season should they have been required during Proposed Project reservoir drawdown. Note that although the 2013 BiOp Flows are no longer the operational standard for the Klamath River, and the 2017 court-ordered flushing and emergency dilution flows are no longer required (see Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*), the analysis of the court-ordered flushing and emergency dilution flow requirements remains in this cumulative effects analysis because at the time of the Draft EIR it was acknowledged that these flows may have occurred during the period when the Proposed Project would occur and retaining the analysis does not change any significance determinations.

3.24.18 Utilities and Service Systems

Volume I Section 3.24.18 Cumulative Effects – Utilities and Service Systems, paragraph 5 on page 3-1206:

Potential cumulative impacts to water supply, including consideration of the City of Yreka's water supply infrastructure, are addressed in Section 3.24.8 *Cumulative Effects [Water Supply/Water Rights].*

Volume I Section 3.24.18 Cumulative Effects – Utilities and Service Systems, paragraph 1 on page 3-1207:

The Anderson Landfill had an estimated remaining capacity of 11,914,025 cubic yards (72 percent of capacity remaining) in 2008, with an anticipated closure date of 2055 (CalRecycle 2017~~a~~).

Volume I Section 3.24.18 Cumulative Effects – Utilities and Service Systems – Potential Cumulative Impact 3.24-56 Short-term and long-term utilities and service system effects from the Proposed Project in combination with non-project activities, new paragraph 3 on page 3-1207:

Significance criteria for cumulative utilities and service systems impacts are the same as defined in Section 3.18.3 *[Utilities and Service Systems] Significance Criteria* for the resource.

3.24.19 Aesthetics

Volume I Section 3.24.19 Cumulative Effects – Aesthetics, paragraph 4 on page 3-1208 to paragraph 5 on page 3-1211:

~~The Area of Analysis for aesthetics is the Klamath River from the Oregon-California state line to the Klamath River Estuary.~~ The Primary Area of Analysis for aesthetics is within the viewshed of the Lower Klamath Project reservoirs, which includes the proposed Limits of Work in California (i.e., Copco No. 1, Copco No. 2, and Iron Gate dams, reservoirs, ~~and~~ associated facilities, and the areas identified as construction/demolition areas and staging areas), plus a buffer to the ridgeline of surrounding the reservoirs (Figure 3.19-1). The secondary Area of Analysis for aesthetics includes those areas within view of the Klamath River downstream from Iron Gate Dam to the confluence with the Shasta River (RM 179.5), as well as the portion of the Klamath River extending upstream from Copco No. 1 Reservoir to the Oregon-California border, because these river reaches may be affected by removal of the upstream dams.

Existing conditions for aesthetics are defined in Section 3.19.2 *[Aesthetics] Environmental Setting*. ~~The~~ Within the Primary Area of Analysis ~~for aesthetic resources contains~~, the Lower Klamath Project dams and associated facilities except three [all associated with J.C. Boyle in Oregon] are located in areas that have been designated as a as a Bureau of Land Management (BLM) Visual Resource Management (VRM) Class III ~~visual resources, for which the~~ area by a Resource Management Plan or have been classified as a Class III area because the area has not been given a specific VRM class by BLM (PacifiCorp 2004) (see Section 3.19.2.1 *PacifiCorp Analysis and Bureau of Land Management Methodology*). The objective of Class III areas is to partially retain the existing character of the landscape~~, with only moderate change from a project such as~~. Using BLM's VRM methodology, all of the Proposed Project~~. The variety of color, vegetation, landforms, adjacent scenery, scarcity, cultural modifications, and the presence of water within the Area of Analysis leads to a BLM Class A (distinctive~~ area has high scenic quality, rating A for inherent scenic attractiveness~~) classification for scenic quality. The~~ of the landscape. Both the Primary and Secondary Area of Analysis for aesthetics also has~~ve~~ a High BLM visual sensitivity classification, meaning the public seeks a high level of visual quality in the landscape, and a foreground-middleground distance zone

classification. ~~Additionally~~In addition to the BLM classifications, Klamath River components are part of the National (and state) Wild and Scenic Rivers (WSR) System, because of their free-flowing condition and "outstandingly remarkable" values. ~~The~~There are three Scenic Byways located along the Klamath River and within the Klamath and Six Rivers National Forests, although only a small portion of the "State of Jefferson" National Forest Scenic Byway~~, and "Bigfoot" National Forest Scenic Byway are also situated~~ is within the Area of Analysis. Section 3.19.2 *[Aesthetics] Environmental Setting* includes consideration of major past or ongoing projects that have impacted, or currently impact, aesthetics resources.

~~This cumulative impact analysis focuses on the potential impacts of the Proposed Project combined with other closely related projects that are not already considered in the analysis of utilities and service systems resource area effects (Section 3.18).~~

This cumulative impact analysis focuses on the impact of the Proposed Project and other projects that are not already considered in the analysis of aesthetics resource area effects (Section 3.19) due to actions and elements included in the Proposed Project (Section 2). Non-project activity types within the aesthetics Area of Analysis with the potential for significant cumulative land use and planning impacts include (Table 3.24-1):

- Large-scale construction projects;
- 2017 court-ordered flushing and emergency dilution flows, or other hydrological impacts that change flow characteristics, open water conditions, channel morphology, or turbidity;
- Water discharges that visually affect water quality;
- Riverine restoration projects;
- Changes or removal of historic structures;
- Near-channel infrastructure projects (i.e., bridges, culverts); and
- Large-scale infrastructure projects~~.~~;
- Mining projects; and
- Forest management;

Significance criteria for cumulative aquatic resources impacts are the same as defined in Section 3.19.3 *[Aesthetics] Significance Criteria*.

Potential Cumulative Impact 3.24-57 Short-term and long-term scenic vista effects from the loss of open water from the Proposed Project in combination with other non-project activities.

~~The~~Under the Proposed Project ~~would have no significant impact from the loss of open water vistas, because open water and lake vistas~~, the existing scenic reservoir view would be ~~altered in favor of more natural river,~~ replaced with riverine and canyon~~, and valley vistas, there are numerous open-water lakes in the region, and visual quality for~~ scenic views, which would be a substantial change. However, since the ~~public~~VRM class would remain Class III (i.e., would

not be ~~substantially~~ degraded) at the associated scenic vistas, the long-term change is not considered to be adverse (Potential Impact 3.19-1). ~~No other~~ The USDA Forest Service Lucky Penny project, which is a local timber harvest project that involves thinning of existing stands (no clear-cut silviculture) to improve forest resiliency and reduce catastrophic wildfires, is among the set of planned and reasonably foreseeable projects listed in Table 3.24-1. However, treatments for this project would take place in the headwaters of Cold Creek and Deer Creek, which are well outside of the Primary and Secondary Area of Analysis for aesthetics, and these treatments are projected to be completed prior to dam removal. No other non-project activities that would result in ~~loss of open water~~significant adverse impacts to scenic vistas in the reservoir or riverine viewsheds within the Area of Analysis have been identified (Table 3.24-1), thus there would be no significant cumulative impacts to scenic vistas ~~due to the Proposed Project and other closely related projects~~in the reservoir viewsheds affected by the loss of open water.

Significance
No significant cumulative impact

Potential Cumulative Impact 3.24-58 Short-term and long-term scenic resources effects from the Proposed Project in combination with restoration, flow enhancement, and water quality improvement projects, and other non-project activities.
~~The Proposed Project could affect~~Potential Impact 3.19-2 considered the visual effect of changes to flow characteristics within sections of Klamath River classified as WSR~~. Potential changes to flow characteristics include the timing, duration, and magnitude of~~ or WSR eligible. The hydrologic changes that would occur under the Proposed Project (i.e., smoother hydrograph due to the elimination of relatively rapid changes in flows~~, which can affect channel morphology; however~~ from dam releases during the dry season, lower flows in the late summer and higher flows in the late fall, and lack of attenuation of large storm events during the wet season) would not be readily noticeable to the casual observer from key vistas along the Klamath River in the aesthetics secondary Area of Analysis downstream of Iron Gate Dam, and they would not result in a loss of, or substantial adverse change to, scenic elements of a designated WSR reach. Further, although some short-term changes in sediment composition and temporary sediment deposition are expected, the Proposed Project would not have ~~flow characteristics that are visually similar to existing conditions and~~significant adverse impacts on visual ~~impacts related to changes~~aspects of channel morphology (i.e., shape of the river channel ~~morphology would not be significant~~and/or presence of boulders, cobble, gravel, sand bars) (Potential Impact 3.19-2). ~~Other~~Restoration, flow enhancement, and water quality improvement projects (Table 3.24-1) have the potential to alter ~~river~~hydrology and visual aspects of channel morphology and result in a cumulative impact~~. Potential Impact 3.24-1 in Section 3.24.2 *Cumulative Water Quality Effects* provides background and context regarding agency re-~~

~~consultation on the 2013 BiOp, and Potential Impact 3.24-24 provides a summation of the approach taken in this document. As for Potential Impact 3.24-24, the~~ , thus are considered here.

The 2017 court-ordered flushing flows are ~~the focus of this analysis. Surface and deep flushing flows would reflect a more natural regime, thus could have either no impact or beneficial effects to river channel morphology in combination with the Proposed Project.~~within the range of flows modeled under the Proposed Project, thus potential changes to hydrology and river channel morphology would be similar to the Proposed Project (i.e., less than significant). The combination of the Proposed Project and the 2017 court-ordered flushing flows would have no more than a moderate change to visual aspects of key vistas along the Klamath River and would reflect a more natural flow regime. There would be no significant cumulative aesthetic impact in the short term, and either no significant cumulative aesthetic impact or a beneficial enhancement of visual aspects of hydrology and channel morphology in the long term. Note that although the 2013 BiOp Flows are no longer the operational standard for the Klamath River, and the court-ordered flushing and emergency dilution flows are no longer required (see Volume I Section 3.1.6 *Introduction – Summary of Available Hydrology Information for the Proposed Project*), the analysis of the court-ordered flushing and emergency dilution flow requirements remains in this cumulative effects analysis because at the time of the Draft EIR it was acknowledged that these flows may have occurred during the period when the Proposed Project would occur and retaining the analysis does not change any significance determinations.

~~The Proposed Project~~ Potential Impact 3.19-3 found that there would ~~result in significant and unavoidable short-term~~ be no loss of, or substantial adverse change to, scenic elements of the landscape as viewed from a vista point, community, recreation site area, trail, scenic highway, or designated WSR reach due to visual changes in water quality ~~due to elevated suspended sediment concentrations during~~. In the short term, there would be no significant impact due to reduced water clarity associated with reservoir drawdown ~~(Potential Impact 3.2-3); however, the visual quality (water clarity) impact from this would~~ , which is not ~~be a significant impact as the contrast is expected to be weak to moderate (i.e., not a visually noticeable change from~~atypical in winter and early spring under existing conditions ~~for most of the drawdown period) and spatially limited (decreasing downstream)~~ (Potential Impact 3.19-3). The only other closely related project that might result in an adverse cumulative visual water clarity impact is the 2017 court-ordered flushing flows. While there may be ~~an increase in the duration of elevated suspended sediment concentrations~~a decrease in water clarity in years when the Proposed Project reservoir drawdown flows do not meet the surface and/or deep flushing flow requirements and the 2017 court-ordered flushing flows are still required to occur until either April 30 (surface flushing flows) or May 31 (deep flushing flows) (see Potential Cumulative Impact 3.25-1 for more details); reduced clarity conditions would be

of short duration (i.e., 24 to 72 hours) and spatially limited. Overall, there would ~~not~~ be ~~a~~no significant short-term cumulative visual quality impact due to the Proposed Project and the 2017 court-ordered flushing flows.

In the long term, ~~the~~ there would be a beneficial ~~reductions of~~aesthetic impact from the Proposed Project due to reduced seasonal ~~nuisance algae~~algal blooms ~~would have no impact on aesthetics~~originating from the Lower Klamath Project reservoirs (Potential Impact 3.~~18~~19-3). The 2017 court-ordered flushing flows would improve management of *C. Shasta,* which could have adverse visual water quality outcomes if left uncontrolled. Similarly, other restoration projects occurring within the Klamath Watershed, such as the Long-Term Plan to Protect Adult Salmon in the Lower Klamath River, would reduce nutrients and thus the prevalence of seasonal alga~~e~~l blooms (Table 3.24-1). The Proposed Project, in combination with riverine restoration projects, would have beneficial cumulative effects on visual water quality in the long term.

Significance

No significant cumulative impact from short-term changes in water quality including increased turbidity and reduced clarity

Beneficial cumulative impact due to long-term changes in visual water quality from reduced algal blooms

Potential Cumulative Impact 3.24-59 Short-term and long-term visual character and quality effects from the Proposed Project in combination with other ground disturbing and construction activities.

Exposure of Bare Sediment and Rock

The Proposed Project would ~~potentially~~ impact the visual character and quality of the site and its surroundings. Substantial areas of bare sediment and rock would be exposed in previously inundated areas after reservoir drawdown and dam removal, and would remain exposed until vegetation establishes, which would result in a significant impact in the short term for the primary aesthetics Area of Analysis (Potential Impact 3.19-4). Existing wetland vegetation on the reservoir shorelines may also die. Other closely related activities that could cause a similar change in visual character within the ~~Lower Klamath Project reservoir footprints~~primary aesthetics Area of Analysis include mining ~~and~~, near-channel infrastructure~~. However, no reasonably foreseeable~~, large-scale construction projects ~~involving such activities within the reservoir footprints have been~~, and forestry and wildfire management projects. Only one of the anticipated mining, construction, infrastructure, and forest and wildfire management projects identified ~~(~~in Table 3.24-1~~);~~ overlaps with the aesthetics Primary or Secondary Area of Analysis. This is the Lucky Penny forest and wildfire management project, and as stated in Impact 3.24-57, no treatment would occur within the aesthetics Area of Analysis; therefore, ~~there would be no~~other projects would not expose bare ground within the viewsheds or result in a significant cumulative visual impact.

~~Replacement of the Yreka water supply pipeline, bridges, culverts, roads, and recreational facilities would result in minor visual changes compared to existing conditions, which would not constitute a significant short-term or long-term impact (Potential Impacts 3.19-5 and 3.19-6). Although there are other projects of this nature within the Klamath Basin, none of them are within the aesthetics Area of Analysis; therefore, the combination of the Proposed Project and other construction-related projects would not result in a significant cumulative visual impact.~~

Removal of Lower Klamath Project Dams and Historic Structures
In general, the aesthetic effects of removing the Lower Klamath Project dam complexes would be beneficial, because the resulting view would be better aligned with the predominant natural features of the characteristic landscape (Potential Impact 3.11-5). The Proposed Project involves the removal of historic structures (Copco No. 1 Hydroelectric Powerhouse and Dam; Copco No. 2 Hydroelectric Powerhouse; and Copco No. 2 Wooden Stave Penstock) (Potential Impact 3.19-5~~).~~); however, these particular structures are not visible from any scenic highways or river sections and there would be no aesthetic impact associated with their removal. Separate from the Proposed Project, no other historic structures have recently been removed, or are known to be planned for removal, in the aesthetics Area of Analysis (Table 3.24-1). Thus, there would be no significant cumulative ~~scenic historic resource~~aesthetic impact resulting from the ~~Proposed Project~~removal of the Lower Klamath Dams and historic structures and other closely related projects.

~~Additionally, there would be potential~~

Yreka Water Supply Pipeline, Bridges, Roads, Culverts, and Recreational Facilities
Replacement of the Yreka Water Supply Pipeline, and replacement and upgrades of bridges, roads, and culverts would result in minor visual changes compared to existing conditions, which would not constitute a significant short-term or long-term impact in the context of the existing landscape (Potential Impact 3.19-5). Potential new recreational facilities have not yet been designed and sited. They would be subject to a restoration plan and are unlikely to be inconsistent with the aesthetics significance criteria, but because the State Water Board cannot ensure implementation of measures in the Final Restoration Plan that would minimize potential aesthetic impacts, the visual impacts of new recreation facilities is significant and unavoidable. Although there are other projects of this nature (e.g., infrastructure and development projects) within the Klamath Basin, none of them are within the aesthetics Area of Analysis; therefore, the combination of the replaced, upgraded, or new infrastructure of the Proposed Project and other projects would not result in a significant cumulative visual impact.

Visual Construction Impacts

Potential short-term impacts to visual character and quality due to Proposed Project construction activities, including the presence of vehicles and equipment, temporary structures, temporary access roads, upgrades of existing bridges, roads, and culverts, equipment storage, stockpiles, ~~and~~ demolition~~.~~, onsite disposal of concrete, removal of recreational facilities, and fugitive dust are considered. The Proposed Project would have temporary weak (the element can be seen, but does not attract attention) to strong (the element demands attention, would not be overlooked, and dominates the landscape) visual contrasts associated with construction activities and would generate dust, but ~~most nearby recreational facilities with views of the~~ any change to the characteristic landscape from stockpiles and equipment would be moderated by existing alterations from the Lower Klamath Project, and there would be no degradation of the VRM classification or a substantial adverse effect on scenic vistas. Additionally, construction ~~site~~ would ~~be closed~~occur for ~~the duration of the~~ a period less than one year, most dust would settle out within approximately 300 ft of the source, and recreational facilities affected by demolition and construction ~~period~~would be closed, thus ~~the impact would not be significant~~a substantial number of people would not be affected by the temporary change in views from demolition and construction (Potential Impact 3.19-6). Although it is possible that there would be small-scale construction activities within the Area of Analysis at the same time as the Proposed Project, no overlapping large-scale construction projects are anticipated that would, in combination with the Proposed Project, result in reasonably foreseeable significant and adverse aesthetics impacts~~.~~ (see Table 3-24-1). Thus, there would be no short-term cumulative aesthetics impacts due to the construction activities associated with the Proposed Project~~.~~ and other construction projects. Since the concrete disposal areas at Iron Gate Dam and Copco No. 1 and Copco No. 2 dams would be graded and revegetated to conform with landform, vegetation, color, and adjacent scenery in the area, there would be no long-term cumulative aesthetics impact due to onsite disposal of concrete from the dam structures under the Proposed Project.

Significance

No significant cumulative impact

Potential Cumulative Impact 3.24-60 Short-term light and glare effects from the Proposed Project in combination with other construction projects.

Temporary lighting would be erected for nighttime construction activities under the Proposed Project, and security lighting may be required during deconstruction (Potential Impact 3.19-7). Although the Proposed Project would result in significant and unavoidable adverse impacts due to construction-related lighting, there are no closely related, spatially and temporally overlapping projects that would, in combination with the Proposed Project, result in further ~~significant and adverse~~substantial light or glare impacts that would adversely affect day or nighttime views in the area (Table 3.24-1). Thus, there would be no

significant cumulative aesthetics impacts due to short-term light~~ing~~ and glare under the Proposed Project.

Significance
No significant cumulative impact

3.24.20 Recreation

Volume I Section 3.24.20 Cumulative Effects – Recreation, paragraph 7 on page 3-1211:

~~Within the Klamath Basin, t~~The Klamath, Scott, Salmon, Sprague, Sycan, Smith, and Trinity rivers, and Wooley Creek have segments classified as having Wild and Scenic values under ~~the WSRA.~~ Section 2(a)ii of the Wild and Scenic Rivers Act [WSRA]). Additionally, there are extensive public and private recreational opportunities along the Klamath River and within several lakes/reservoirs. Developed recreational facilities, including: Agency Lake, Upper Klamath Lake, the Link River Trail, and the Keno Impoundment/Lake Ewauna, and activity specific recreational resources, including whitewater boating, fishing, camping, and other opportunities on the Klamath River, are described in Section 3.30.2 *[Recreation] Environmental Setting*.

Volume I Section 3.24.20 Cumulative Effects – Recreation, paragraph 1 on page 3-1212:

- Water flow changes~~ and whitewater boating~~.

Volume I Section 3.24.20 Cumulative Effects – Recreation – Potential Cumulative Impact 3.24-61 Short-term and long-term recreation effects from the Proposed Project in combination with development projects, paragraph 3 on page 3-1212 through paragraph 1 on page 3-1213:

Proposed Project short-term construction-related impacts on existing recreational opportunities would not be significant (Potential Impact 3.20-1) for the following reasons: a number of reservoirs, lakes, and rivers are present within and adjacent to the Klamath Basin that provide similar recreational opportunities as areas where access would be restricted during Proposed Project construction; several existing recreational sites are located away from where dust and noise would be generated during Proposed Project construction; turbidity impacts would be short-term and primarily during the winter when turbidity is naturally high and recreational use for non-contact (e.g., boating) and contact recreation (e.g., swimming and fishing) is relatively low; and water quality and clarity would improve with distance downstream of Iron Gate Dam, as sediments are flushed downstream and into the Pacific Ocean. Additionally, effects on the environment due to the construction of new or expansion of existing recreational facilities associated with the Proposed Project would not have a significant impact

(Potential Impact 3.20-4). Although there is potential for other large-scale construction projects in the Klamath Basin to temporally overlap with the Proposed Project, such as the Sousa Ready Mix Concrete Plant and the potential nanocellulose facility, these projects would be located in Yreka (Table 3.24-1). Such projects in Yreka are not close enough to the Proposed Project reservoir footprints and/or the Middle Klamath River immediately downstream of Iron Gate Dam (where turbidity impacts would be greatest) to result in a significant cumulative impact to recreation or the environment. There may be some overlapping, small-scale construction projects in more proximal locations (Table 3.24-1), but there are no other reasonably foreseeable construction projects that would contribute to a short-term adverse cumulative impact on recreation in the area where the Copco No. 1, Copco No. 2, and Iron Gate dams are proposed for removal (Table 3.24-1). Thus, the Proposed Project, in combination with other construction projects, would not have a significant adverse cumulative impact on recreational opportunities, or on the environment from the development of recreational facilities, in the Area of Analysis.

The Proposed Project would not have significant long-term impacts on reservoir-based recreation activities and facilities (Potential Impact 3.20-2), or substantial or accelerated physical deterioration of other regional facilities (Potential Impact 3.20-3).

Volume I Section 3.24.20 Cumulative Effects – Recreation – Potential Cumulative Impact 3.24-62 Short-term and long-term recreation effects from the Proposed Project in combination with other restoration, flow enhancement, and water quality improvement projects, paragraphs 3 and 4 on page 3-1213:

The Proposed Project would improve scenery, recreation, fisheries, and wildlife values in the long term (which are values specified in the Wild and Scenic River Act Section 7(a)) on the California Klamath Wild and Scenic River segments that are ~~both~~ designated or~~and~~ eligible for listing) and scenic river designations or eligibility for listing would not be compromised (Potential Impact 3.20-7). Other aquatic habitat restoration, flow enhancement, and water quality improvement projects along the Klamath River and its tributaries (see Table 3.24-1) would include placement of off-channel habitat features, floodplain restoration, incorporation of large wood into tributaries to the Klamath River, increases in stream flow, and reduction in water quality pollutants. These types of projects would have a beneficial cumulative effect on recreation associated with wild and scenic values in the long term.

The Proposed Project would be beneficial with respect to ~~the~~ river-based recreational fishing in the Hydroelectric Reach, Middle Klamath River downstream of Humbug Creek, and the Lower Klamath River because it would: restore volitional fish passage, improve long-term water quality, likely increase recreational fish species, and implement the Recreation Facilities Plan for the Hydroelectric Reach (Potential Impact 3.20-6). There would be no significant

impact to, or loss of, other river-based recreation, for the Middle Klamath River between Iron Gate Dam and Humbug Creek under the Proposed Project, because there is only one structure that is expected to be within the post-dam removal 100-year floodplain that is not in the floodplain under existing conditions and downstream flood control would be implemented (Potential Impact 3.20-6). Other restoration projects (Table 3.24-1) would also improve fisheries by restoring habitat; therefore, the Proposed Project in combination with other restoration projects would be beneficial for recreational fishing.

Volume I Section 3.24.20 Cumulative Effects – Recreation – Potential Cumulative Impact 3.24-63 Short-term and long-term whitewater boating effects from the combination of the Proposed Project and water flow changes, paragraph 6 on page 3-1213:

The 2017 court-ordered flushing flows (interim flows until re-consultation of the 2013 BiOp ~~is~~was completed, see also Potential Cumulative Impact 3.24-1) would increase water flows during relatively short (i.e., 24 to 72 hours) controlled periods (see Potential Cumulative Impact 3.24-1), which could provide periodic benefits to whitewater boaters. Note that although the 2013 BiOp Flows are no longer the operational standard for the Klamath River, and the court-ordered flushing and emergency dilution flows are no longer required (see Volume I Section 3.1.6 *Introduction – Summary of Available Hydrology Information for the Proposed Project*), the analysis of the court-ordered flushing and emergency dilution flow requirements remains in this cumulative effects analysis because at the time of the Draft EIR it was acknowledged that these flows may have occurred during the period when the Proposed Project would occur and retaining the analysis does not change any significance determinations. No projects have been identified that would substantially reduce flows and result in a significant cumulative impact on whitewater boating opportunities in combination with the Proposed Project (Table 3.24-1).

3.24.21 Hazards and Hazardous Materials

Volume I Section 3.24.21 Cumulative Effects – Hazards and Hazardous Materials, new paragraph 5 on page 3-1214:

Significance criteria for cumulative hazards and hazardous materials impacts are the same as defined in Section 3.21.3 *[Hazards and Hazardous Materials] Significance Criteria* for the resource.

Volume I Section 3.24.21 Cumulative Effects – Hazards and Hazardous Materials – Potential Cumulative Impact 3.24-64 Short-term and long-term hazards and hazardous materials effects from the Proposed Project in combination with non-project activities, paragraphs 1 through 3, on page 3-1215:

~~No non-project activity types within the hazards and hazardous materials Area of Analysis that could be located on a hazardous materials site, projects that could~~

~~result in a safety hazard within two miles of airports, or that could impair implementation emergency response or emergency evacuation plans (Potential Impacts 3.21-5, 3.21-6, and 3.21-7), would have the potential for significant incremental short- or long-term cumulative impacts related to hazards and hazardous substances because none of these activities would overlap in type, location, or time with anticipated impacts under the Proposed Project.~~

The Proposed Project could result in substantial exposure for the public or environment to hazards or hazardous materials due to routine transport, use, or disposal of hazardous materials, potential accidental release of hazardous materials, or be located on a hazardous site (Potential Impacts 3.21-1, 3.21-2, and 3.21-43), and would require implementation of Mitigation Measure HZ-1 to reduce potential impacts to less than significant. The Proposed Project would not require handling of hazardous substances within one-quarter mile of a school, nor activities within two miles of an airport (Potential Impacts 3.21-3, 3.21-5, and 3.21-6). Although the Campora Propane and Pacific Connector Gas Pipeline projects are in development and may present additional hazards or hazardous materials ~~similar~~ risks, both projects are too distant from the Lower Klamath Project dam complexes in California to cause significant impacts in the Area of Analysis. Thus, there would be no cumulative impact.

The Proposed Project could have a significant and unavoidable impact on emergency response and evacuation (Potential Impact 3.21-7), and the associated cumulative impacts are discussed in Potential Cumulative Impact 3.24-55.

The Proposed Project would result in a significant and unavoidable long-term impact due to reduction in reservoir storage for fighting wildland fires (Potential Impact 3.21-8) because the State Water Board cannot ensure the implementation of Recommended Measure PS-1, which would require a Fire Management Plan after reaching agreement with ~~CALFIRE~~CAL FIRE on a long-term water source replacement for helicopter and ground crews (including construction and utilization of proposed dry hydrants, dip ponds or other alternatives). ~~While the effects of new BiOp flow requirements for the Klamath Irrigation Project are speculative, t~~The 2017 flow requirements (i.e., 2013 BiOp Flows plus the 2017 court-ordered flushing and emergency dilution flows) would periodically increase the volume of water entering the Hydroelectric Reach and the Middle Klamath River immediately downstream of Iron Gate Dam by requiring 24-hr to 72-hr periods of higher flows into May and June. While this short period of inflow and limited periodicity is not sufficient to be beneficial with respect to fighting wildland fires, the 2017 flow requirements would not reduce the volume of water available for firefighting during the spring and early summer months (see also Potential Cumulative Impact 3.24-1) and there would be no cumulative impact to water supply. Note that although the 2013 BiOp Flows are no longer the operational standard for the Klamath River, and the 2017 court-ordered flushing and emergency dilution flows are no longer required (see Section 3.1.6

Summary of Available Hydrology Information for the Proposed Project), the analysis of the court-ordered flushing and emergency dilution flow requirements remains in this cumulative effects analysis because at the time of the Draft EIR it was acknowledged that these flows may have occurred during the period when the Proposed Project would occur and retaining the analysis does not change any significance determinations.

3.24.22 Transportation and Traffic

Volume I Section 3.24.22 Cumulative Effects – Transportation and Traffic, new paragraph 6 on page 3-1216:

Significance criteria for cumulative transportation and traffic impacts are the same as defined in Section 3.22.3 *[Transportation and Traffic] Significance Criteria* for the resource.

Volume I Section 3.24.22 Cumulative Effects – Transportation and Traffic – Potential Cumulative Impact 3.24-65, paragraphs 1-4 on page 3-1217 and paragraph 1 on page 3-1218:

Potential Cumulative Impact 3.24-65 Short-term and long-term traffic and transportation effects from the Proposed Project in combination with non-project activities.

As described in Section 3.22.5 *[Transportation and Traffic] Potential Impacts and Mitigation*, ~~the Proposed Project would result in significant and unavoidable~~ short-term impacts of the Proposed Project on~~to~~ traffic flow, road safety, road conditions, emergency access, public transit, and non-motorized transportation would be less than significant with mitigation ~~, unless and until KRRC reaches enforceable 'good citizen' agreements that are finalized and implemented through the FERC process and that include proposed items for the final TMP and Emergency Response Plan (Appendix B: *Definite Plan – Appendices O1 through O4*), as well as the additional components included in Recommended Measure TR-1~~ (see Potential Impacts 3.22-1 through 3.22-5). Mitigation shall include a Traffic Management Plan and Emergency Response Plan.

The Proposed Project is not located within two miles of an airport nor would it result in a change in air traffic patterns that would result in a substantial safety risks (Potential Impact 3.22-6). Therefore, there would be no cumulative impacts related to air traffic due to the Proposed Project in combination with non-project activities within the traffic and transportation Area of Analysis.

It is possible that some riverine restoration projects, such as projects under the Klamath Basin Restoration Program, forest and wildfire management projects, and road repair projects, could overlap temporally, but they are unlikely to occur close enough to Proposed Project construction areas to contribute to a cumulative impact. The closest known forest and wildfire management projects are not within the Area of Analysis for transportation and traffic (i.e., Somes Bar

Integrated Fire Management Project; approximately 90 miles downstream of Humbug, and Crawford Vegetation Management Project; approximately 70 miles downstream of Humbug) and so would not overlap spatially with the Proposed Project. The Proposed Project includes road, bridge, and improvement projects associated with the primary access roads (Copco Road, Ager-Beswick Road, Lakeview Road), so other road repair projects occurring at the same time as the Proposed Project would necessarily be located elsewhere.

Other potential construction projects identified in Table 3.24-1 (e.g., Sousa Ready Mix Concrete Batch Plant Project, Siskiyou County jail development, and a potential nanocellulose facility development) are all located in Yreka, and as such, would not be likely to require use of the primary access roads associated with the Proposed Project (Copco Road, Ager-Beswick Road, Lakeview Road) for which short-term impacts to traffic flow, road safety, road conditions, emergency access, public transit, and non-motorized transportation could occur. California segments of Interstate 5, which would be used by workers and for hauling equipment and supplies to and from the Proposed Project, could be used by one or more of the potential other construction projects for the same reasons and during the same time period, although the smaller scale of the other projects would be unlikely to result in a high number of vehicle trips relative to the Proposed Project. Since Interstate 5 has sufficient capacity for added traffic (391 ADT) associated with the Proposed Project to keep the LOS level at LOS A (see Potential Impact 3.22-1), the combination of the Proposed Project and one or more other construction projects within the Area of Analysis would be unlikely to result in significant impacts to traffic and transportation. In its comments on the Draft EIR (ORG46) and in its application for water quality certification filed on December 3, 2019, the KRRC provided additional standards and commitments regarding the Traffic Management Plan. The State Water Board anticipates that implementation of Mitigation Measure TR-1 would reduce short-term construction-related impacts of the Proposed Project to less than significant with respect to traffic flow, road safety, road conditions, emergency access, public transit, and non-motorized transportation, and the analysis above finds no significant overlapping transportation and traffic impacts from other projects; therefore, there would be no significant cumulative impact. ~~However, because the State Water Board has determined that short-term construction-related impacts of the Proposed Project would be significant and unavoidable with respect to traffic flow, road safety, road conditions, emergency access, public transit, and non-motorized transportation, unless and until KRRC reaches enforceable 'good citizen' agreements through the FERC process (as described above), it has determined the incremental contribution of the Proposed Project in this Draft EIR to be cumulatively considerable.~~

Significance

~~*Cumulatively considerable*~~ *No significant cumulative impact*

3.24.23 Noise

Volume I Section 3.24.23 Cumulative Effects – Noise, paragraph 6 on page 3-1218:

Significance criteria for cumulative noise and vibration impacts are the same as defined in Section 3.23.3 *[Noise] Significance Criteria*.

3.24.24 References

Volume I Section 3.24.24 Cumulative Effects – References, pages 3-1219 through 3-1225, includes the following revisions:

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4 ALTERNATIVES

4.1 Alternatives Section/Overview

4.1.1 Alternatives Section

4.1.1.1 Alternatives Carried Forward for More Detailed Analysis

No Project Alternative

Volume I Section 4.1.1.1 [Alternatives Selection/Overview] Alternatives Selection – Alternatives Carried Forward for More Detailed Analysis – No Project Alternative, paragraph 1 on page 4-3:

No Project Alternative

CEQA Guidelines section 15126.6(e)(2) states that the No Project analysis shall discuss the existing conditions at the time the Notice of Preparation is published, or if no Notice of Preparation is published, at the time environmental analysis is commenced, as well as what would be reasonably expected to occur in the foreseeable future if the project were not approved, based on current plans and consistent with available infrastructure and community services. In this instance, the No Project Alternative would be no change from the current management conditions, other than as noted below, with the dams remaining in place. However, while it is relatively certain that the current management conditions – continued operation of the Klamath Hydroelectric Project under the current terms of annual licenses issued by FERC – would continue for the short term, that condition is not feasible in the long term. Federal agencies have imposed fish passage requirements, ramping requirements, and other significant changes to the Lower Klamath Project dam complexes and operations in the context of the PacifiCorp Klamath Hydroelectric Project relicensing (FERC Project No. 2082). These requirements were challenged and upheld under a trial-type administrative hearing (Section 241 of the Energy Policy Act of 2005). Additionally, any relicensing procedure would have to comply with conditions to meet water quality standards in California and in Oregon, and it is not clear that this would be possible with all (or perhaps any) of the Lower Klamath Project dams and reservoirs in place. ~~There is significant uncertainty about the long-term results if the KRRC's Proposed Project does not proceed. It is recognized that future consultations with the NMFS and the USFWS on the USBR's operation of the Klamath Irrigation Project, adaptive management of existing projects, and planned restoration activities can significantly alter conditions in the Klamath Basin, but the extent that these and other future basin activities would modify conditions is speculative. In light of this uncertainty,~~ As it would be misleading to analyze a long-term scenario for a temporary condition that would not persist, the No Project Alternative analysis focuses on the reasonably foreseeable period of 1–5 years), as described in Section 4.2.1.1 *[No Project Alternative] Alternative Description*.

4.2 No Project Alternative

4.2.1 Introduction

Volume I Section 4.2.1.1 Alternatives – No Project Alternative – Introduction – Alternative Description, paragraph 2 on page 4-15

In this instance, in the short term, the No Project Alternative would be no change from the current management conditions, other than as noted below with regard to ~~2017~~ flow requirements and cessation of certain KHSA measures related to water quality and habitat.

Volume I Section 4.2.1.1 Alternatives – No Project Alternative – Introduction – Alternative Description – Foreseeable Short-term Operations, paragraph 2 on page 4-16:

In the No Project Alternative analysis, the ~~existing~~ environmental conditions associated with the Lower Klamath Project and its operations under 2013 BiOp Flows would ~~continue except as~~ be modified by:

- Court-ordered flushing and emergency dilution flows downstream of Iron Gate Dam, which ~~became~~ were required ~~after~~ between February 2017 (U.S. District Court 2017) and March 2019 (NMFS 2019, USFWS 2019).

Additionally, because the 2019 BiOp Flows are now the current operational flow requirement for the Klamath River (USFWS 2019, NMFS 2019), this analysis also considers the newly defined environmental conditions associated with the Lower Klamath Project and its existing operations under 2019 BiOp Flows, as these flows would continue under the No Project Alternative.

Volume I Section 4.2.1.1 Alternatives – No Project Alternative – Introduction – Alternative Description – Foreseeable Short-term Operations, paragraph 3 on page 4-16:

Please see Section 4.2.1.1 *[Alternative Description] Summary of Available Hydrology Information for the No Project Alternative* for a discussion of the effects of ~~this~~ these additions on the analysis of the No Project Alternative).

Volume I Section 4.2.1.1 Alternatives – No Project Alternative – Introduction – Alternative Description – Foreseeable Short-term Operations, paragraph 4 on page 4-16:

There are various restoration efforts underway in the Klamath Basin to improve water quality, as discussed in Section 3.24 *Cumulative Effects*. However, the effects of these efforts, including efforts aimed at meeting Klamath River total maximum daily loads (TMDLs) are not analyzed for the reasonably foreseeable period under the No Project Alternative because the basin response to the

restoration ~~measures~~ efforts to meet the ~~total maximum daily loads (~~TMDLs~~)~~ during the short-term is too speculative

Volume I Section 4.2.1.1 Alternatives – No Project Alternative – Introduction – Alternative Description – Summary of Available Hydrology Information for the No Project Alternative, paragraph 1 on page 4-17:

Summary of Available Hydrology Information for the No Project Alternative

Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project* describes information regarding the EIR's analysis of the 2013 Biological Opinion (BiOp) flow requirements and the 2019 BiOp flow requirements. In addition, the 2010 BiOp Flows are briefly summarized below. The relevancy of the 2010 BiOp Flows to the Lower Klamath Project EIR is narrowly focused on the analysis of potential suspended sediment effects on fish under the existing condition/No Project Alternative (see also Appendix E), since no other analysis in this EIR uses USBR (2012) model output for the existing condition/No Project Alternative.

2010 BiOp Flows

The 2010 BiOp operations criteria were designed, in order of priority, to (1) meet or exceed minimum flows downstream of Iron Gate Dam; (2) meet or exceed the minimum Upper Klamath Lake elevations; (3) sustain water diversions to meet contractual agreements between USBR and water users, including the National Wildlife Refuges; and (4) meet the Upper Klamath Lake refill targets. A set of operational rules and an Interactive Management process was established to manage the distribution of stored water and the flows. Target flows at Iron Gate Dam were comprised of a base flow based on the 95 percent exceedance probability described in the 2010 BiOp and an augmentation flow based on water supply conditions in the basin. During fall and winter months, the water supply conditions were based only on the storage in Upper Klamath Lake, while the water supply conditions during spring and summer months were calculated from a combination of the storage volume, forecasted April through September inflow, and the target end-of-September Upper Klamath Lake carryover storage. Equations were developed for each month of half-month timestep to determine the augmentation flow that would best achieve the target flows at Iron Gate Dam that match the flow exceedance probability detailed in the 2010 BiOp. In addition to the target flows at Iron Gate Dam, the 2010 BiOp Flows incorporated a fall and winter flow variability program to enhance flow variability between September 1 and March 1 to mimic the natural hydrologic response downstream of Iron Gate Dam due to precipitation. The fall and winter flow variability program included:

- Developing a flow variability team comprised of technical staff from USBR, NMFS, NOAA Weather Surface (NWS), USFWS, USGS, CDFG, the Karuk, Hoopa Valley, and Yurok Tribes, and PacifiCorp.
- Releasing flow from Iron Gate Dam between September 1 and March 1 based on the recommendations of the flow variability team, unless USBR, in coordination with PacifiCorp, determined (1) operation constraints

prohibit implementation; or (2) the implementation of the recommendation will result in a risk to human safety or property. The maximum volume of releases to enhance flow variability downstream of Iron Gate Dam is 18,600 acre-feet.

2013 BiOp Flows and 2017 Court-ordered Flushing and Emergency Dilution Flows

In addition to the 2013 BiOp Flows, ~~and until the reinitiated formal consultation is complete,~~ the USBR ~~is~~ was also required by a 2017 court order to manage Ceratanova Shasta (C. Shasta) infection among coho salmon in the Klamath River with additional winter-spring surface flushing flows and deep flushing flows, as well as emergency dilution flows (U.S. District Court 2017 a–c). The ~~F~~flushing flows ~~are~~ were designed to dislodge and flush out polychaete worms that host C. Shasta in the Klamath River. Emergency dilution flows were developed to reduce C. Shasta infections in coho salmon if certain disease thresholds in the Klamath River ~~are~~ were exceeded. The details of the flushing flow and emergency dilution flow requirements are outlined in Measures to Reduce Ceratanova Shasta Infection of Klamath River Salmonids: A Guidance Document and US District Court Filing 111 (U.S. District Court 2017). The flushing flow and emergency dilution flow requirements included:

- Releasing surface flushing flows every year from Iron Gate Dam of at least 6,030 cfs for a 72-hour period during the winter period (November 1–April 30) sufficient to move surface sediments.
- Releasing deep flushing flows at least every other year (beginning in 2017) with the Klamath River flow measured at Iron Gate Dam averaging at least 11,250 cubic feet per second (cfs) over a single 24-hour period between February 15 and May 31, unless USBR determines that such flows are limited and/or precluded by inherent hydrologic, infrastructure, and/or public safety constraints.
- Releasing emergency dilution flows of downstream of Iron Gate Dam between April 1 to June 15 or when 80% of juvenile Chinook Salmon outmigration has occurred if either: (1) spore concentrations exceed five spores (non-specified genotype) per liter for the preceding sample based on quantitative polymerase chain reaction (qPCR) from water filtration samples at any sampling station, or (2) the prevalence of inflection (POI) of all captured juvenile Chinook salmon (both wild and hatchery) exceeds 20 percent in aggregate for the preceding week at the Kinsman Rotary Screw Trap. Emergency dilution flows are 3,000 cfs measured at Iron Gate Dam until spore or POI at Kinsman Trap decreases if flows at Iron Gate Dam are below 3,000 cfs when disease thresholds are met or exceeded. Emergency flows at Iron Gate Dam are maintained at 3,000 cfs or increased from 3,000 cfs to 4,000 cfs if disease levels remain above disease thresholds after flows at Iron Gate Dam have been 3,000 cfs for at least seven days. The volume of emergency dilution releases is capped at 50,000 acre-feet (AF).

The requirements of the flushing and emergency dilution releases ~~are~~ were in addition to the 2013 BiOp flow requirements during the period February 2017 – March 2019~~, which must still be met by USBR~~. Water released during flushing and emergency dilution flows ~~are~~ was not part of the Environmental Water Account detailed in the 2013 BiOp. The exact timing of the releases of flushing flows ~~is~~ was left to the discretion of USBR, provided they occurred within the specified timeframes for the releases. Provisions for adaptive management of the flushing and emergency dilution flows existed, provided consensus for an amended flow plan ~~is~~ was reached among the applicable agencies and submitted to the U.S. District Court for the Northern District of California San Francisco Division.

The additional surface and deep flushing flows, along with the emergency dilution flows to manage C. Shasta, ~~are~~were within the range of historical Klamath River flows evaluated in the 2013 BiOp studies. For example, while infrequent (i.e., less than 1 percent of the time at Iron Gate Dam), daily average flows in the Klamath River exceeded the deep flushing flow requirement of 11,250 cfs during some storm events in the period of analysis. Additionally, the duration of a deep flushing flow event ~~is~~ was short (i.e., 24 hours plus the time to ramp down the flushing flow) and ~~is~~ was designed to occur every other year (beginning in 2017), such that the overall period that deep flushing flows influenced Klamath River hydrology ~~is~~ was limited.

The flow-related analyses for the No Project Alternative in this EIR acknowledge the re-initiation of consultation on the 2013 BiOp Flows by considering the 2017 court-ordered flushing and emergency dilution flow requirements downstream of Iron Gate Dam as interim flow requirements until completion of formal consultation.

2019 BiOp Flows

After the issuance of the Lower Klamath Project Draft EIR on December 27, 2018, the applicable biological opinion and the operational flow requirements for the Klamath River changed in March 2019, when the new biological opinions were issued by NMFS (2019) and USFWS (2019). The 2019 BiOp Flows are now the current operational flow requirement for the Klamath River and thus they represent hydrology moving forward under the No Project Alternative. The 2019 BiOp flow requirements include:

- Releasing approximately 50,000 acre-feet from Iron Gate Dam in a manner that best meets coho salmon needs (e.g., disease mitigation, habitat) in below average to dry years.
- Releasing an "opportunistic" surface flushing flow from Iron Gate Dam of at least 6,030 cfs for a 72-hour period during the spring period (March 1–April 15) in average to wet years, if hydrologic conditions allow.
- Releasing an additional volume of 20,000 acre-feet for enhanced May/June flows in years in which the April 1 Environmental Water Account (EWA) is

greater than 400,000 acre-feet (407,000 acre-feet in years 2020, 2022, and 2024) and less than 576,000 acre-feet.

Comparison of Klamath River Flows under the 2010 BiOp Operational Criteria and the 2013 BiOp and 2019 BiOp Operational Criteria

Modeled Klamath River flows under the 2010 BiOp, 2013 BiOp, and 2019 BiOp operations criteria are similar (i.e., less than 90 cfs different) when examined on an average annual basis, with flows downstream of Iron Gate Dam averaging approximately 1,984 cfs, 1,896 cfs, and 1,898 cfs, respectively, during the 1980 to 2011 comparison period when modeled 2010 BiOp, 2013 BiOp, and 2019 BiOp Flows are available. The average annual 2010 BiOp, 2013 BiOp, and 2019 BiOp Flows downstream of Keno Dam from 1980 to 2011 are also similar (i.e., less than 60 cfs different), averaging approximately 1,456 cfs, 1,401 cfs, and 1,403 cfs, respectively. Average monthly 2013 BiOp and 2019 BiOp Flows range from approximately 35 percent less than 2010 BiOp Flows to approximately 12 percent greater than 2010 BiOp Flows over the entire 1980 to 2011 comparison period (Table 3.1- and 4.2-1-B). The 2010 BiOp Flows incorporated higher spring flows during average and wetter water years than the 2019 BiOp Flows, so the difference between average monthly 2019 BiOp Flows and average monthly 2010 BiOp Flows during mid to late spring (i.e., May and June) is greater than 10 percent.

Table 4.2-1-A. Average Monthly 2010 BiOp, 2013 BiOp, and 2019 BiOp Flows at Keno Dam From 1980 to 2011.

Month	Average Monthly Flow Downstream of Keno Dam			Differences (2013 BiOp vs. 2010 BiOp Flows)		Differences (2019 BiOp vs. 2010 BiOp Flows)	
	2010 BiOp Operations Criteria	2013 BiOp Operations Criteria	2019 BiOp Operations Criteria				
	(cfs)	(cfs)	(cfs)	(cfs)	(percent)	(cfs)	(percent)
Oct	938	885	828	-54	-6.1	-111	-13.4
Nov	1154	966	960	-189	-19.5	-195	-20.3
Dec	1530	1204	1133	-326	-27.1	-397	-35.1
Jan	1712	1409	1573	-303	-21.5	-139	-8.8
Feb	2167	1768	2011	-399	-22.6	-156	-7.8
Mar	2690	2548	2847	-142	-5.6	157	5.5
Apr	2297	2394	2386	97	4.1	89	3.7
May	1952	1952	1779	0	0.0	-172	-9.7
Jun	1440	1374	1139	-66	-4.8	-301	-26.5
Jul	730	772	716	42	5.4	-14	-2.0
Aug	692	749	733	57	7.6	41	5.6
Sep	725	825	776	100	12.1	51	6.6

Data source: USBR 2010, 2019a, 2019b.

Table 4.2-1-B. Average Monthly 2010 BiOp, 2013 BiOp, and 2019 BiOp Flows at Iron Gate Dam From 1980 to 2011.

Month	Average Monthly Flow Downstream of Iron Gate Dam			Differences	(2013 BiOp vs. 2010 BiOp Flows)	Differences	(2019 BiOp vs. 2010 BiOp Flows)
	2010 BiOp Operations Criteria	2013 BiOp Operations Criteria	2019 BiOp Operations Criteria				
	(cfs)	(cfs)	(cfs)	(cfs)	(percent)	(cfs)	(percent)
Oct	1302	1260	1179	-42	-3.4	-123	-10.5
Nov	1561	1367	1348	-194	-14.2	-214	-15.9
Dec	2105	1699	1655	-405	-23.9	-450	-27.2
Jan	2380	2021	2168	-359	-17.8	-212	-9.8
Feb	2907	2446	2698	-461	-18.9	-209	-7.7
Mar	3490	3290	3599	-199	-6.1	109	3.0
Apr	3072	3072	3086	0	0.0	14	0.4
May	2591	2524	2348	-67	-2.7	-242	-10.3
Jun	1918	1804	1557	-114	-6.3	-361	-23.2
Jul	1133	1095	1050	-38	-3.5	-83	-7.9
Aug	1045	1054	1042	9	0.8	-3	-0.3
Sep	1076	1163	1102	86	7.4	25	2.3

Data source: USBR 2010, 2019a, 2019b.

To maintain consistency with comparative analyses conducted for KBRA Flows and 2013 and 2019 BiOp Flows in Section 3.1.6 Summary of Available Hydrology Information for the Proposed Project, variations in the average monthly flows between years are also shown using paired heteroscedastic t-tests of the average monthly 2013 BiOp versus 2010 BiOp Flows and the average monthly 2019 BiOp versus 2010 BiOp Flows for the 31-year comparison period between 1980 and 2011 (Table 4.2-1-C). Probability values (p-values) less than 0.05 indicating a significant difference and p-values and less than 0.01 indicating a highly significant difference (Table 4.2-1-C). 2010 BiOp Flows are significantly or highly significantly different from either 2013 BiOp Flows or 2019 BiOp Flows (or both) in nine of twelve months. While Tables 4.2-1-A through 4.2-1-C summarize modeled average monthly flows and the significance of the differences between 2010 BiOp Flows and the flows under the 2013 BiOp and 2019 BiOp operations criteria, the monthly flow exceedance plots in Figure and Figure present a more in-depth comparison of the range of possible flows by month and their probability of occurring under the three operations scenarios.

Table 4.2-1-C. Comparison of Average Monthly 2010 BiOp, 2013 BiOp, and 2019 BiOp Flows From 1980 to 2011 Using Paired Heteroscedastic T-tests.

Month	Keno Dam		Iron Gate Dam	
	p-value 2010 BiOp vs. 2013 BiOp Flows	p-value 2010 BiOp vs. 2019 BiOp Flows	p-value 2010 BiOp vs. 2013 BiOp Flows	p-value 2010 BiOp vs. 2019 BiOp Flows
Oct	0.340	0.024 a	0.420	0.010 a
Nov	0.044a	0.039 a	0.036 a	0.021 a
Dec	0.170	0.035 a	0.081	0.022 a
Jan	0.470	0.730	0.510	0.770
Feb	0.110	0.640	0.047 a	0.940
Mar	0.580	0.150	0.440	0.260
Apr	0.870	0.960	0.620	0.780
May	0.890	0.051	0.690	0.024 a
Jun	0.320	8.9E-04 b	0.170	1.5E-04 b
Jul	0.340	0.120	0.021 a	5.9E-05 b
Aug	4.4E-04b	0.140	0.680	0.360
Sep	3.6E-10 b	2.5E-06 b	1.7E-06 b	0.093

Data source: USBR 2010, 2019a, 2019b.

[a] significant difference ($p<0.05$)

[b] highly significant difference ($p<0.01$)

Figure and Figure present monthly flow exceedance probabilities for modeled 2010 BiOp, 2013 BiOp, and 2019 BiOp Flows downstream of Keno and Iron Gate dams, respectively, for the 31-year period of overlapping flow projections from 1980 to 2011, where this period encompasses water year types ranging from

very dry to very wet. Flows with a 1 to 99 percent probability of occurring at Keno or Iron Gate dam are shown in the monthly flow exceedance curves; these curves do not display the upper maximum flows (i.e., exceedance probability less than 1 percent) or lower minimum flows (i.e., exceedance probability greater than 99 percent) that may occur under 2010 BiOp, 2013 BiOp, or 2019 BiOp operations criteria. The monthly flow exceedance plots show the range of flows expected in different water year types, with wet years characterized by flows with a 10 percent exceedance probability, median years characterized by flows with a 50 percent exceedance probability, and dry years characterized by flows with a 90 percent exceedance probability.

Monthly exceedance probability curves are often similar for 2010 BiOp, 2013 BiOp, and 2019 BiOp Flows at Keno and Iron Gate dams and the overall range of 2010 BiOp and 2019 BiOp Flows are similar. Monthly exceedance probability curves for 2010 BiOp and 2013 BiOp Flows are most similar during winter to mid-spring (i.e., January through May) with relatively small flow variations between the curves, except during the wettest water years (i.e., exceedance probability of one percent) in January and February when 2010 BiOp Flows are less than 2013 BiOp Flows. The similarity in the monthly exceedance probability curves indicate that modeled 2010 BiOp Flows would generally characterize the frequency, timing, and magnitude of 2013 BiOp Flows during winter to mid-spring, except during the wettest water years for 2013 BiOp Flows. Maximum 2010 BiOp Flows during the wettest water year types (i.e., exceedance probability of one percent) are less than maximum 2013 BiOp Flows during this time, so modeled 2010 BiOp Flows would not characterize peak 2013 BiOp Flows during the wettest water year types. Monthly exceedance probability curves for 2010 BiOp and 2019 BiOp Flows also are most similar during winter to mid-spring (i.e., January through May) with relatively small flow variations between the curves. Modeled 2010 BiOp Flows would generally characterize the frequency, timing, and magnitude of 2019 BiOp Flows during winter to mid-spring across all water year types though because 2010 BiOp Flows represent the range of 2019 BiOp Flows greater than 99.9 percent of the time. Extremely infrequent peak 2019 BiOp Flows (i.e., occurring less than 0.1 percent of the time between 1980 to 2011) would not be represented by 2010 BiOp Flows, so outputs of hydrologic models using the 2010 BiOp Flows may underrepresent the outputs of hydrologic models using the 2019 BiOp Flows during extremely wet water years. As elevated suspended sediment transport is associated with peak flows, which tend to occur in winter to mid-spring months, the aforementioned differences are discussed in the analysis of potential suspended sediment effects on fish under the existing conditions/No Project Alternative in Appendix E.

While the overall trends in 2010 BiOp, 2013 BiOp, and 2019 BiOp Flows are similar during late spring through fall months, 2010 BiOp Flows frequently have a smaller range than 2013 BiOp or 2019 BiOp Flows, especially during later summer and early winter (i.e., August through December). The magnitude of the difference between the range of 2010 BiOp and 2013 BiOp or 2019 BiOp Flows

varies between months and water year types, but it tends to be the greatest during wet (exceedance probability less than 10 percent) or dry (exceedance probability greater than 90 percent) water years. As such, modeled 2010 BiOp Flows may under or overpredict the flow conditions occurring under 2013 BiOp or 2019 BiOp Flows during late spring through early winter (i.e., June through December), depending on the water year type. As elevated suspended sediment transport is associated with peak flows, which do not tend to occur in late summer through early winter, the aforementioned differences are not relevant to the analysis of potential suspended sediment effects on fish under the existing conditions/No Project Alternative and are not discussed further.

As tributary flows enter the Klamath River in the Middle and Lower Klamath River, the proportion of the total flow in the river from Iron Gate Dam releases generally declines with distance downstream of Iron Gate Dam and the influence of 2010 BiOp, 2013 BiOp, and 2019 BiOp Flows on Klamath River flows diminishes. While differences between Klamath River flows under 2010 BiOp, 2013 BiOp, and 2019 BiOp ~~F~~flows would continue to exist downstream of Iron Gate Dam even as tributary inflows make up a larger proportion of the total Klamath River flow, the outputs of hydrologic models using 2010 BiOp Flows would better characterize Klamath River conditions under 2013 BiOp or 2019 BiOp Flows with distance downstream of Iron Gate Dam as the relative magnitude of differences between 2010 BiOp, 2013 BiOp, and 2019 BiOp Flows decreases compared to the total magnitude of the Klamath River flow.

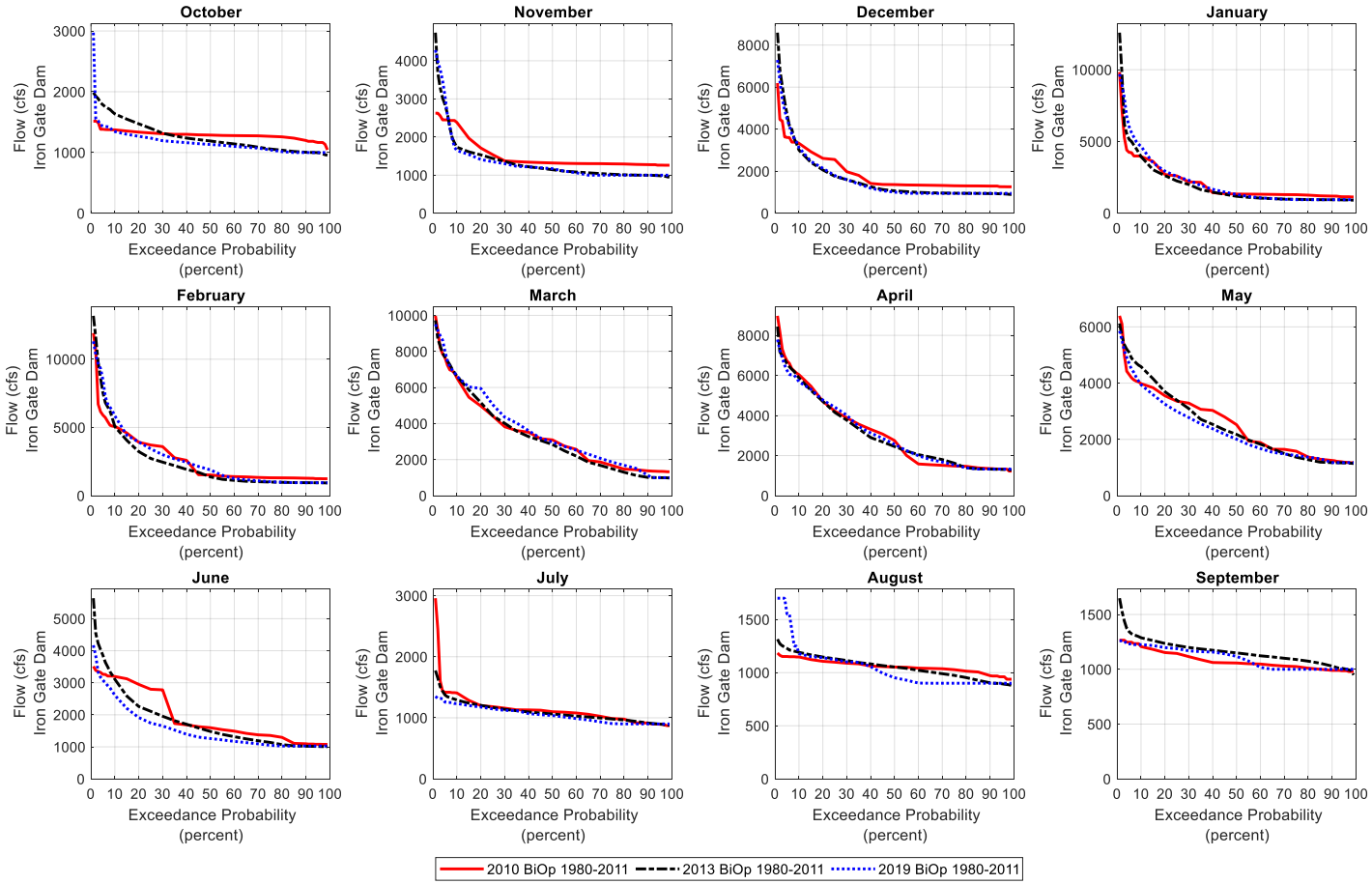

Figure 4.2-1. Monthly Flow Exceedance Curves at Iron Gate Dam for the 2010 Biological Opinion Flows (2010 BiOp), 2013 Biological Opinion Flows (2013 BiOp), and 2019 Biological Opinion Flows (2019 BiOp) Based on the Modeled Flows from 1980 to 2011. Data Source: USBR 2010, 2019a, 2019b. Note: The Scale of the Y-Axis (Flow in cfs) Varies Significantly Between Months. Wet, Median, and Dry Water Year Types Are Characterized by Flows at the 10, 50, 90 Percent Exceedance, Respectively.

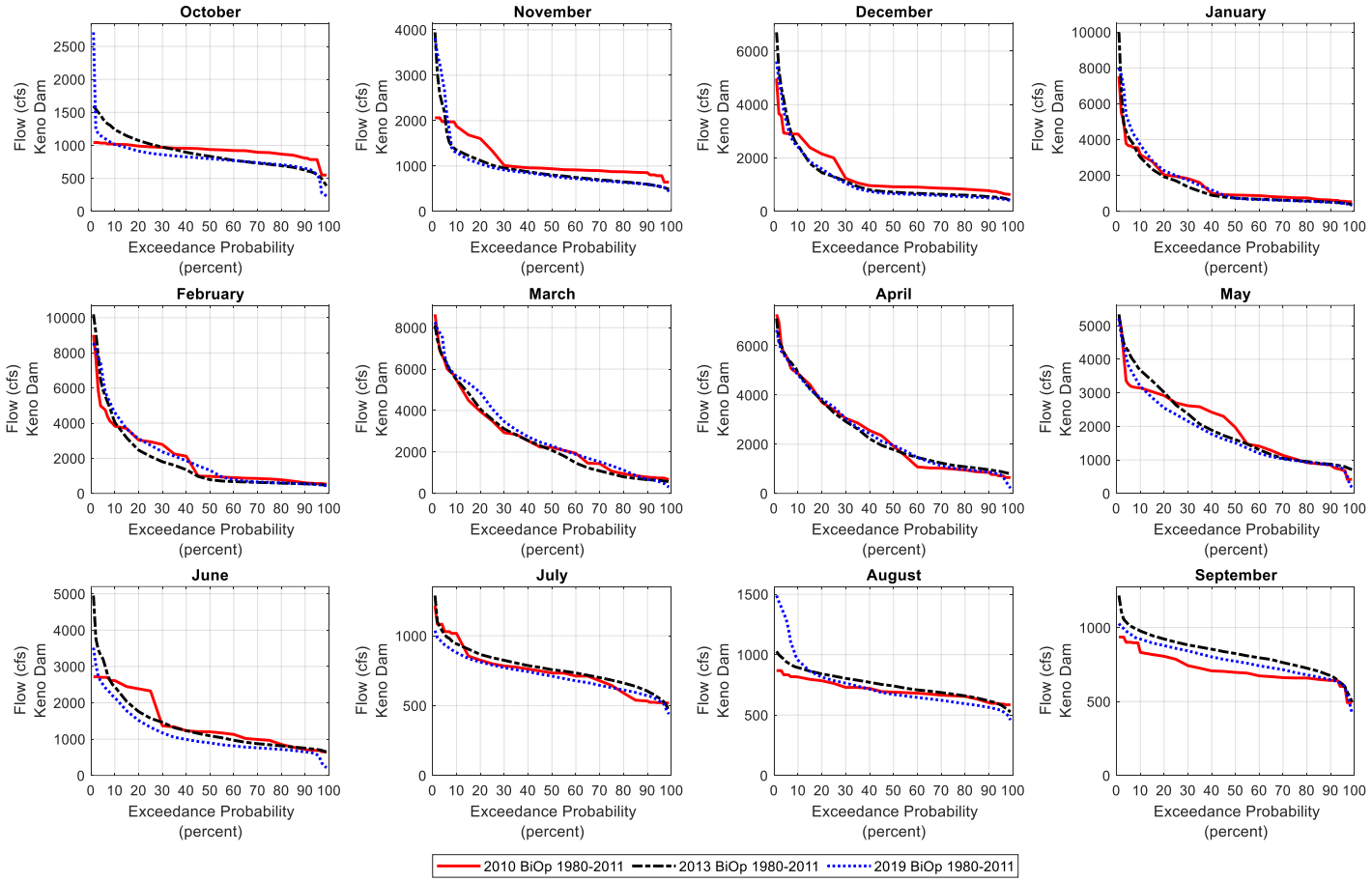

Figure 4.2-2. Monthly Flow Exceedance Curves at Keno Dam for the 2010 Biological Opinion Flows (2010 BiOp), 2013 Biological Opinion Flows (2013 BiOp), and 2019 Biological Opinion Flows (2019 BiOp) Based on the Modeled Flows from 1980 to 2011. Data Source: USBR 2010, 2019a, 2019b. Note: The Scale of the Y-Axis (Flow in cfs) Varies Significantly Between Months. Wet, Median, and Dry Water Year Types Are Characterized by Flows at the 10, 50, 90 Percent Exceedance, Respectively.

Summary
In summary, river flow-related environmental impacts under the EIR No Project Alternative are evaluated by synthesizing the ~~existing 2013 BiOp hydrology including the winter-spring surface and deep flushing flows as well as emergency dilution flow requirements,~~ existing conditions hydrology, the No Project Alternative hydrology analysis presented in the 2012 KHSA EIS/EIR (which is modeled using 2010 BiOp Flows), and the technical studies that supported the 2012 KHSA EIS/EIR. Both the 2013 BiOp hydrology (including the winter-spring surface and deep flushing flows as well as emergency dilution flow requirements) and the newly defined existing 2019 BiOp hydrology (including the surface flushing flows and potential for release of 20,000 to 50,000 acre-feet depending on the water year type) are considered. Additional analysis is undertaken when necessary to evaluate how variations between 2010 BiOp Flows and 2013 BiOp or 2019 BiOp Flows would alter the outputs of hydrologic modeling using the 2010 BiOp Flows, including evaluating how ~~the~~ flushing and dilution flows under 2013 BiOp or 2019 BiOp Flows would impact conditions in the Klamath Basin.

Volume I Section 4.2.1.1 Alternatives – No Project Alternative – Introduction – Alternative Description – KHSA Interim Measures, Table 4.2-1 KHSA Interim Measures Relevant to California Under the No Project Alternative Compared with Existing Conditions and the Proposed Project row 1 (Interim Measure) column 6 (Proposed Project) on page 4-19:

~~Would continue separate from the Proposed Project[2]~~ Would not continue and cease to exist when the KHSA is fully implemented.

4.2.2 Water Quality

Volume I Section 4.2.2 Alternatives – No Project Alternative – Water Quality – Water Temperature – Potential Impact 4.2.2-1 Seasonal alterations in water temperature due to continued impoundment of water in the reservoirs, paragraph 2 on page 4-25 through paragraph 1 on page 4-26:

Water temperature existing conditions would continue to occur under the No Project Alternative in the Hydroelectric Reach from J.C. Boyle Reservoir to Copco No. 1 Reservoir (see Section 3.2.2.2 *Water Temperature*) since the bypass operations at the J.C. Boyle Dam (RM 229.8) and peaking power generation at the J.C. Boyle Powerhouse (RM 225.2) would continue. In the J.C. Boyle Bypass Reach from J.C. Boyle Dam (RM 229.8) to the J.C. Boyle Powerhouse (RM 225.2), reservoir discharges would continue to be diverted around this reach (see also Section 2.3.1 *J.C. Boyle Dam Development*) and cold groundwater springs that enter the river in this reach would continue to dominate the remaining flows. Thus, water temperature in the J.C. Boyle Bypass Reach would continue to be primarily influenced by the temperature of the groundwater springs (approximately 11 to 12°C [51.8 to 53.6°F]), with less daily water temperature variations and cooler water temperatures during summer and warmer water temperatures during winter than would occur without bypass

operations. Downstream of the J.C. Boyle Bypass Reach, water temperature existing conditions in the J.C. Boyle Peaking Reach would also continue to occur under the No Project Alternative since hydropower peaking operations from the J.C. Boyle Powerhouse would continue and flow diverted around the J.C. Boyle Bypass Reach would rejoin the Klamath River through the J.C. Boyle Powerhouse (see Figure 2.3-1). 2004/2005 KRWQM results indicate the range of daily water temperature variations and the daily maximum water temperature in the J.C. Boyle Peaking Reach would continue to be greater than natural daily water temperature conditions similar to existing conditions as cold groundwater dominated flows from the J.C. Boyle Bypass Reach combine with bypassed warmer reservoir flows for hydropower operations downstream of the J.C. Boyle Powerhouse (PacifiCorp 2004a). In the ~~Hydroelectric Reach~~ J.C. Boyle Peaking Reach from the Oregon-California state line to the upstream end of Copco No. 1 Reservoir, TMDL model and 2004/2005 KRWQM results indicate that daily hydropower peaking operations would continue to potentially cause artificially high daily maximum water temperatures during late spring to mid-summer (i.e., June through August according to the TMDL model and May through July according to the 2004/2005 KRWQM) and late fall (i.e., October to November according to the TMDL model and November to December according to the 2004/2005 KRWQM) and daily variability in water temperatures that occur under existing conditions (North Coast Regional Board 2010; PacifiCorp 2004a, 2008, 2014). In the remainder of the Hydroelectric Reach (i.e., Copco No. 1 and Iron Gate reservoirs) water temperatures would be the same as those described under the existing condition (see Section 3.2.2.2 *Water Temperature*), where spring, summer, and fall water temperatures would continue to be influenced by the thermal mass of Copco No. 1 and Iron Gate reservoirs, and the seasonal stratification patterns of the two reservoirs. It is unclear what, if any, steps could reduce the impact of the reservoirs on the thermal regime within the Hydroelectric Reach between Copco No. 1 Reservoir and Iron Gate Dam and comply with the Thermal Plan's ban on elevated temperature discharges into COLD interstate waters (Table 3.2-4). Improvements from existing conditions under the Proposed Project described in Potential Impact 3.2-1 would not occur under the No Project Alternative.

Middle and Lower Klamath River and Klamath River Estuary

The continued impoundment of water in Copco No. 1 and Iron Gate reservoirs under the No Project Alternative would maintain existing ~~adverse~~ conditions. Releases from Iron Gate Reservoir under the No Project Alternative would continue to maintain cooler water temperatures in the Klamath River downstream of Iron Gate Dam from mid-January to April and to maintain variably cooler or warmer water from April through early August than would occur under the Proposed Project (see Potential Impact 3.2-1). Additionally, continued impoundment would continue to maintain adverse late summer/fall water temperatures in the Hydroelectric Reach downstream of Copco No. 1 Reservoir and in the Middle Klamath River downstream of Iron Gate Dam (see Section 3.2.2.2 *Water Temperature*) that result in the exceedance of the water quality

standards set forth in the Thermal Plan. Existing water temperature conditions are adverse because water temperature discharges from Copco No. 1 and Iron Gate reservoirs in late summer/fall regularly exceed the Thermal Plan water quality standard prohibiting the discharge of elevated water temperature into COLD interstate waters. A powerhouse intake barrier/thermal curtain installed by PacifiCorp under IM 11 in Iron Gate Reservoir during 2015 to isolate surface waters that have high concentrations of blue-green algae (cyanobacteria) and limit downstream release of the blue-green algae has also been reported by PacifiCorp to provide a secondary benefit of isolating surface waters and drawing deeper cooler water for release to the Klamath River downstream of Iron Gate Dam (PacifiCorp 2018). Results from the intake barrier/thermal curtain indicate that modest 1 to 2°C (1.8 to 3.6°F) water temperature improvement is possible (PacifiCorp 2017), although data do not indicate that this measure could achieve compliance with the Thermal Plan or to meet the Klamath River TMDLs temperature requirement in the Middle Klamath River (North Coast Regional Board 2010). Additionally, water temperature improvements downstream of Iron Gate Dam from operation of the intake barrier/thermal curtain would be potentially limited by the need to access water with higher dissolved oxygen concentrations to comply with dissolved oxygen standards, with the curtain completely rolled up during portions of 2017 to maximize dissolved oxygen concentrations for aquatic life (PacifiCorp 2018). Temperature effects of the dams do not extend downstream of the Salmon River confluence (see Section 3.2.2.2 *Water Temperature*).

Implementation of the 2017 court-ordered flushing and emergency dilution flows downstream of Iron Gate Dam would not significantly alter the existing conditions for water temperature downstream of Iron Gate Dam in the Middle and Lower Klamath River, the Klamath River Estuary, and the Pacific Ocean nearshore environment, but the additional flushing and emergency dilution releases would potentially result in a temporarily more prominent seasonal shift in water temperature downstream of Iron Gate Dam during the releases. Water temperature existing conditions downstream of Copco No. 1 and Iron Gate dams are generally warmer than expected under natural conditions during late-summer and fall and cooler than expected under natural conditions during spring and early summer (see Section 3.2.2.2 *Water Temperature*). These existing conditions could be accentuated by the additional flushing and emergency dilution releases since these flows would potentially occur from November 1 to June 15 (see Section 4.2.1.1 *Alternative Description – Summary of Available Hydrology Information for the No Project Alternative*). However, these conditions would be accentuated only if releases occurred outside of winter and only for a brief time with surface flushing flows occurring for only 72-hours once every year, deep flushing flows occurring for only 24 hours once every other year, and emergency dilutions only occurring in some years if specific disease conditions are met in the Klamath River.

Similarly, the 2019 BiOp Flows downstream of Iron Gate Dam would not significantly alter the existing conditions for water temperature downstream of Iron Gate Dam in the Middle and Lower Klamath River, the Klamath River Estuary, and the Pacific Ocean nearshore environment, but the flow regime would potentially result in a temporarily more prominent seasonal shift in spring to early summer water temperature downstream of Iron Gate Dam during the surface flushing releases. In the 2019 BiOp, "opportunistic" surface flushing flows are specified during wetter water years, but during drier water years, when conditions in the Klamath River Basin may prevent the release of surface flushing flows, approximately 50,000 acre-feet of water is available for a surface flushing flow or for use in a manner that best meets coho salmon needs. In wet to average water years, the 2019 BiOp "opportunistic" surface flushing flows would be release as 6,030 cfs for a 72-hour period between March 1 and April 15. In below average to dry water years, NMFS may request alternative distributions (i.e., releases) of the 50,000 acre-feet of water between March 1 and April 15, but the 2019 BiOp specifies that a surface flushing flow would be attempted between March 1 and April 15 if the necessary Klamath River and Upper Klamath Lake conditions are met. In the event that by April 15 a surface flushing flow (or other use of the 50,000 acre-feet) has not been released, the 50,000 acre-feet would be released as a required surface flushing flow event that approximates, to the maximum extent practicable, a surface flushing flow of 6,030 cfs for 72 hours (NMFS 2019; USFWS 2019). As such, it is possible that the 50,000 acre-feet would be used and the flow in the Klamath River would be elevated after April 15 during below average to wet water years. There is also potential for release of 20,000 acre-feet in May/June depending on the water year type. Implementation of the 2019 BiOp surface flushing flows downstream of Iron Gate Dam according to the above requirements would not significantly alter the existing conditions for water temperature downstream of Iron Gate Dam in the Middle and Lower Klamath River, the Klamath River Estuary, and the Pacific Ocean nearshore environment, but the additional flushing releases would potentially result in a temporarily more prominent seasonal shift in water temperature downstream of Iron Gate Dam during the releases. Water temperature existing conditions downstream of Copco No. 1 and Iron Gate dams are generally cooler than expected under natural conditions during spring and early summer (see Section 3.2.2.2 *Water Temperature*). These existing conditions could be accentuated by the additional surface flushing releases since these flows would occur between March and June depending on water year type, (see Section 4.2.1.1 *Alternative Description – Summary of Available Hydrology Information for the No Project Alternative*). However, these conditions would occur only for a brief time (i.e., 72-hours) each year.

As such, the temporary accentuation of the existing fall or spring shifts in water temperature in the Middle Klamath River downstream of Iron Gate Dam during 2017 court-ordered flushing and emergency dilution releases or 2019 BiOp flushing flow releases would result in a less than significant change to existing water temperature conditions. Therefore, there would be no change in water

temperature existing conditions in the Middle and Lower Klamath River reaches downstream from the confluence with the Salmon River, including the Klamath River Estuary and the Pacific Ocean nearshore environment under the No Project Alternative.

Overall, there would be no change from existing conditions for water temperature in the Hydroelectric Reach, the Middle and Lower Klamath River, the Klamath River Estuary, or the Pacific Ocean nearshore environment in the reasonably foreseeable short-term (0−5 years) under the No Project Alternative and the existing, adverse water temperature conditions would continue to occur due to increases in late summer/fall water temperatures downstream of Copco No. 1 and Iron Gate dams that cause an exceedance of water quality standards as set forth in the Thermal Plan.

Significance
No significant impact

Volume I Section 4.2.2 Alternatives – No Project Alternative – Water Quality – Water Temperature – Potential Impact 4.2.2-3 Increases in suspended material due to implementation of 2017 court-ordered flushing and emergency dilution flows downstream of Iron Gate Dam, paragraph 3 on page 4-27:

Potential Impact 4.2.2-3 Increases in suspended material due to implementation of 2017 court-ordered flushing and emergency dilution flows or 2019 BiOp surface flushing flows downstream of Iron Gate Dam. Implementation of the 2017 court-ordered flushing and emergency dilution flows and the 2019 BiOp surface flushing flows downstream of Iron Gate Dam would mobilize more sand, silt, and clay sized sediment downstream of Iron Gate Dam than under the existing conditions when the releases occur since the flushing releases are designed to mobilize such sediments. There would be an increase in suspended sediment concentrations (SSCs) under flushing flows compared to existing conditions, but the increase in SSCs downstream of Iron Gate Dam would have a limited duration much less the two-weeks that would result in a significant impact. Flushing flows under the 2017 court-ordered flushing and emergency dilution flows would only occur for 72-hours (surface flushing) or 24-hours (deep flushing), so increases in SSCs due to flushing flows are unlikely to increase SSCs above 100 milligrams per liter (mg/L) for an entire two-week period (i.e., the suspended sediment threshold of significance; see Section 3.2.3.1 *Thresholds of Significance – Suspended Sediments*). While emergency dilution releases would potentially occur for a longer period, emergency dilution flows (3,000 to 4,000 cfs) are unlikely to increase SSCs since they are below the thresholds recognized to cause transport of suspended sediment in the Klamath River downstream of Iron Gate Dam (see USBR 2012). Similarly, surface flushing flows under the 2019 BiOp would only occur for 72-hours, so increases in SSCs due to flushing flows are unlikely to increase SSCs above the suspended sediment threshold of significance. Thus, increases in SSCs due to

implementation of the flushing and emergency dilution releases would have a less than significant impact on suspended sediment concentrations under the No Project Alternative.

Significance
No significant impact

Volume I Section 4.2.2 Alternatives – No Project Alternative – Water Quality – Nutrients – Potential Impact 4.2.2-4 Annual interception and retention of nutrients and seasonal release of nutrients due to continued impoundment of waters in the reservoirs – Hydroelectric Reach, paragraph 6 on page 4-28:

The No Project Alternative would continue to result in the same relatively small annual decreases in total phosphorus (TP) and total nitrogen (TN) through the Hydroelectric Reach as occurs under existing conditions, due to settling of particulate matter and retention of associated nutrients originating from upstream reaches, including Upper Klamath Lake (in Oregon), in J.C. Boyle, Copco No. 1, and Iron Gate reservoirs, and dilution by the coldwater springs located downstream of J.C. Boyle Reservoir. On an annual basis, the combined total phosphorus retention in Copco No. 1 and Iron Gate reservoirs is approximately 9 to 13 percent of the total phosphorus inflow and the combined total nitrogen retention in Copco No. 1 and Iron Gate reservoirs is approximately 12 to 13 percent of the total nitrogen inflow based on data from May 2005 to May 2007 (see Section 3.2.2.4 *Nutrients* for additional details).

On a seasonal basis, nutrient concentrations typically decrease in the downstream direction from Copco No. 1 Reservoir to downstream of Iron Gate Dam during spring/summer. Nutrients generally increase in the downstream direction from Copco No. 1 Reservoir to downstream of Iron Gate Dam during mid-summer/fall due to a combination of anoxic conditions in the reservoirs releasing nutrients from reservoir sediments (i.e., internal nutrient loading), the hydraulic residence time of the reservoirs resulting in a temporal shift in the transport of upstream nutrients through the reservoirs, and reservoir turnover during fall (Asarian et al. 2009). Internal loading of nutrients on a seasonal basis is common in reservoirs that thermally stratify and become anoxic for several weeks to months during summer and fall. In Copco No. 1 and Iron Gate reservoirs, the total combined TP retention under existing conditions was approximately negative 8 percent during May through September (i.e., the main reservoir phytoplankton growing season), with the negative combined TP retention during this period indicating a net export of TP. While the reservoirs retain TP during the earlier part of the May through September time period, TP exports associated with internal nutrient loading during the later part of the time period are greater than the earlier TP retention and result in a net export of TP over the entire May through September period (Asarian et al. 2009). The total combined TN retention in Copco No. 1 and Iron Gate reservoirs under existing conditions was approximately 23 percent during May to September (i.e., the main

reservoir phytoplankton growing season). The higher TN retention during summer months was attributed to settling of organic matter and algal material, denitrification, and/or ammonia volatilization (Asarian et al. 2009, 2010). While TN retention was seasonally higher in Copco No. 1 and Iron Gate reservoirs during the main phytoplankton growing season, the ammonia concentration downstream of Iron Gate Reservoir increased beginning in September from approximately 0.01 to 0.05 mg/L until peaking in October and November at approximately 0.1 to 0.2 mg/L due to the anoxic conditions in the lower section Iron Gate Reservoir (Asarian et al. 2009, 2010) (see Appendix C for more detail). Copco No. 1 and Iron Gate reservoirs would remain in place under the No Project Alternative, so seasonal ~~Seasonal~~ increases in TP, and to a lesser degree TN, in the Hydroelectric Reach would continue to occur under this alternative due to the release (export) of dissolved forms of phosphorus (ortho-phosphorus) and nitrogen (ammonium) from reservoir sediments during summer and fall, when reservoir bottom waters are anoxic (i.e., through the process of internal nutrient loading, see Figure 3.2-2).

Volume I Section 4.2.2 Alternatives – No Project Alternative – Water Quality – Nutrients – Potential Impact 4.2.2-4 Annual interception and retention of nutrients and seasonal release of nutrients due to continued impoundment of waters in the reservoirs – Middle and Lower Klamath River and Klamath River Estuary, paragraph 2 on page 4-29:

There would be no change from existing conditions for nutrients due to implementation of the 2017 court-ordered flushing and emergency dilution flows or the 2019 BiOp surface flushing flows downstream of Iron Gate Dam under the No Project Alternative since suspended sediments transported by these releases would be primarily mineral (inorganic) sediments occurring in the Klamath River under existing conditions.

Volume I Section 4.2.2 Alternatives – No Project Alternative – Water Quality – Dissolved oxygen – Potential Impact 4.2.2-5 Seasonal low dissolved oxygen concentrations due to continued impoundment of water in the reservoirs, paragraph 3 on page 4-30 through paragraph 1 on page 4-31:

Dissolved oxygen concentrations due to implementation of the 2017 court-ordered flushing and emergency dilution flows and the 2019 BiOp surface flushing flows downstream of Iron Gate Dam would be similar to existing conditions, but dissolved oxygen would likely increase immediately downstream of Iron Gate Dam in the Middle Klamath River during releases due to increased turbulent mixing and aeration under the higher flushing flows. However, the 2017 court-ordered flushing and emergency dilution flows these conditions would be present for only a brief time between November 1 to May 31 since surface flushing flows occur for only 72-hours once every year and deep flushing flows occur for only 24-hours once every other year. Under the 2019 BiOp surface flushing flows these conditions would be present for only a brief time between

March 1 to April 15 since surface flushing flows occur for only 72-hours once every year. The temporary, brief increases in dissolved oxygen due to flushing flows also generally would occur before reservoirs stratify, so flushing releases would not alter the low dissolved oxygen downstream of Iron Gate Dam that occur under existing conditions during summer/late fall months. Dissolved oxygen concentrations in the Middle Klamath River under emergency dilution releases (3,000 to 4,000 cfs) would be similar to existing conditions since the increase in flow and associated mixing and aeration would be relatively small compared to existing conditions.

Increases in sediment transport due to flushing flows under this alternative would dislodge periphyton from the riverbed and decrease periphyton abundance downstream of Iron Gate Dam in the Middle Klamath River immediately after releases (see also Potential Impact 4.2.4-1). The relationship between flushing and emergency dilution releases, streambed scour and changes in periphyton abundance from the releases, and daily variations in summertime dissolved oxygen due to photosynthesis by periphyton is not fully understood, but seasonal periphyton abundance variations due to seasonal flow changes are a natural process in river systems and occur under existing conditions in the Klamath River. Periphyton naturally re-grow following high winter flows under existing conditions, so periphyton are anticipated to re-grow similarly after flushing flows. While the frequency of flushing flows (i.e., annually for surface flushing and every other year for deep flushing) and the rate of periphyton re-growth may result in a reduction in periphyton abundance downstream of Iron Gate Dam, these reductions in periphyton abundance are expected to have a less than significant impact on daily variations in summertime dissolved oxygen in the Klamath River and dissolved oxygen would be similar to existing conditions. Thus, there would be no significant impact on dissolved oxygen concentrations in the Middle and Lower Klamath River, the Klamath River Estuary, and the Pacific Ocean nearshore environment under the No Project Alternative due to 2017 court-ordered flushing and emergency dilution flows or 2019 BiOp surface flushing flows.

Significance
No significant impact

Volume I Section 4.2.2 Alternatives – No Project Alternative – Water Quality – pH – Potential Impact 4.2.2-6 Seasonal high pH and daily pH fluctuations due to continued impoundment of water in the reservoirs – Hydroelectric Reach, paragraph 1 through paragraph 3 on page 4-32:

The Klamath River is a naturally weakly buffered system (i.e., has typically low alkalinity less than 100 mg/L as calcium carbonate [$CaCO_3$]; PacifiCorp [2004a], Karuk Tribe of California [2010]), so it is susceptible to photosynthesis-driven daily and seasonal swings in pH. The No Project Alternative would result in no change from the existing, adverse condition with respect to pH values that

exceed the Basin Plan instantaneous maximum pH objective of 8.5 standard units (s.u.) and large daily fluctuations in the Hydroelectric Reach in Copco No. 1 and Iron Gate reservoirs during summertime periods of intense algal blooms that produce photosynthesis-driven variations in pH (see Section 3.2.2.6 *pH*).

As discussed above, the No Project Alternative would continue to result in the same pH values that exceed the Basin Plan instantaneous maximum pH objective of 8.5 s.u and large daily fluctuations in the Hydroelectric Reach in Copco No. 1 and Iron Gate reservoirs during summertime periods of intense algal blooms (see Section 3.2.2.6 pH). The Middle and Lower Klamath River and Klamath River Estuary are also a weakly buffered system, so daily and seasonal swings in pH would potentially occur due to photosynthesis and respiration by phytoplankton, periphyton, and macrophytes. In the Middle and Lower Klamath River and Klamath River Estuary, pH exhibits large (0.5–1.5 pH units) daily fluctuations under existing conditions during periods of high photosynthesis and pH values also regularly exceed Basin Plan instantaneous maximum pH objective of 8.5 s.u. during late-summer and early-fall months (August–September), with the most extreme pH exceedances typically occurring from Iron Gate Dam to approximately Seiad Valley (see Section 3.2.2.6 pH).

The pH in the Middle Klamath River likely would be similar to existing, adverse conditions with the 2017 court-ordered flushing and emergency dilution flows and the 2019 BiOp surface flushing flows under the No Project Alternative since periphyton along the riverbed contributing to pH conditions would re-grow after reductions following releases and continue to alter pH in the river during summertime periods of high photosynthesis.

Volume I Section 4.2.2 Alternatives – No Project Alternative – Water Quality – Chlorophyll-a and Algal Toxins – Potential Impact 4.2.2-7 Seasonal increases in chlorophyll-a and algal toxins due to continued impoundment of water in the reservoirs – Hydroelectric Reach, paragraph 5 on page 4-33:

Further downstream in the Hydroelectric Reach, adverse, large, seasonal phytoplankton blooms, including blue-green algae, would continue to occur in Copco No. 1 and Iron Gate reservoirs under the No Project Alternative similar to existing conditions, resulting in chlorophyll-*a* concentrations exceeding the TMDL target of 10 ug/L during the May to October growth season, and periodically high levels of algal toxins (concentrations greater than 0.8 and/or 4 ug/L microcystin[181]) (see also Section 3.2.2.7 *Chlorophyll-a and Algal Toxins*). In 2015, PacifiCorp installed a powerhouse intake barrier/thermal curtain in Iron Gate Reservoir under IM 11 to isolate surface waters that have high concentrations of blue-green algae (cyanobacteria) and potentially limit the release of Iron Gate Reservoir water containing extensive summer and fall blue-green algae blooms downstream to the Middle and Lower Klamath River. Available data (PacifiCorp 2016, 2017) do not indicate that the curtain could improve algal-derived (organic) suspended material in the reservoirs such that

they would no longer cause an exceedance of water quality standards (Table 3.2-4) or achieve the Klamath TMDLs phytoplankton chlorophyll-*a* target of 10 ug/L for Copco No. 1 and Iron Gate reservoirs during the May to October growth season (North Coast Regional Board 2010). The influence of the intake barrier/thermal curtain on chlorophyll-*a* and algal toxin conditions in the Middle and Lower Klamath River downstream of Iron Gate Dam are discussed below. Overall, the No Project Alternative would result in no change from existing, adverse conditions and would continue to cause exceedances of water quality standards in the Hydroelectric Reach.

Volume I Section 4.2.2 Alternatives – No Project Alternative – Water Quality – Chlorophyll-a and Algal Toxins – Potential Impact 4.2.2-7 Seasonal increases in chlorophyll-a and algal toxins due to continued impoundment of water in the reservoirs – Middle and Lower Klamath River and Klamath River Estuary, paragraphs 1 and 2 on page 4-34:

Downstream of Iron Gate Dam, chlorophyll-*a* and algal toxin trends generally would be similar to existing conditions under the No Project Alternative, with releases of chlorophyll-*a* and algal toxins (i.e., microcystin) in the Lower Klamath Project reservoirs to the Middle and Lower Klamath River, and eventually the Klamath River Estuary. Longitudinal and temporal variations in microcystin concentrations from upstream of Copco No. 1 Reservoir to Turwar indicate that Iron Gate Reservoir is the principal source of *Microcystis aeruginosa* cells to the Middle and Lower Klamath River (Otten et al. 2015) (see also Section 3.2.2.7 *Chlorophyll-a and Algal Toxins*). As discussed above, PacifiCorp installed a powerhouse intake barrier/thermal curtain in Iron Gate Reservoir under IM 11 during 2015. The primary purpose of the curtain is to isolate surface waters that have high concentrations of blue-green algae (cyanobacteria) such that extensive summer and fall blooms are not readily released downstream to the Middle and Lower Klamath River. The curtain also provides a potential secondary benefit of isolating warmer, less dense near-surface waters while withdrawing cooler, denser, and deeper waters from the reservoir for release to the Klamath River downstream (see further discussion in Section 4.4.2 *Water Quality*, Potential Impact 4.2.2-1) (PacifiCorp 2018). Water quality measurements during 2015 and 2016 when the intake barrier/thermal curtain was in use indicate that the curtain reduces entrainment of blue-green algae into the Iron Gate Powerhouse intake and subsequent release downstream into the Klamath River (PacifiCorp 2016, 2017). However, water quality monitoring data from 2017 and 2018 downstream of Iron Gate Dam show multiple exceedances of the Klamath TMDLs phytoplankton chlorophyll-a target (i.e., 10 ug/L) and the microcystin thresholds of significance (i.e., 4 ug/L) and multiple microcystin posting limits (e.g., 6 ug/L for CCHAB Warning TEIR I; Table 3.2-10) (Watercourse Engineering, Inc. 2018, 2019). An analysis of the intake barrier/thermal curtain performance during 2017 or 2018 has not been published and PacifiCorp continues to test and refine the intake barrier/thermal curtain design and operations, but available data do not indicate that this measure would

prevent releases from Iron Gate Dam that would exceed water quality standards (Table 3.2-4) or consistently achieve the Klamath TMDLs phytoplankton chlorophyll-*a* target of 10 ug/L for Copco No. 1 and Iron Gate reservoirs during the May to October growth season (North Coast Regional Board 2010). Additionally, potential reductions in the entrainment of blue-green algae, chlorophyll-a concentrations, and microcystin concentrations downstream of Iron Gate Dam from operation of the intake barrier/thermal curtain would be potentially limited by the need to access water with higher dissolved oxygen concentrations to comply with dissolved oxygen standards, with the curtain completely rolled up during portions of 2017 to maximize dissolved oxygen concentrations for aquatic life (PacifiCorp 2018). Since t~~T~~here would be no change to the habitat conditions that promote growth of *Microcystis aeruginosa* in Iron Gate Reservoir under existing conditions (see also Section 3.4.2.3 *Hydroelectric Reach*) and water quality monitoring data downstream of Iron Gate Dam still show exceedances of chlorophyll-*a* and microcystin water quality standards after installation of the curtain in 2015, the export of *Microcystis aeruginosa* cells and associated increases in chlorophyll-*a* and microcystin in the Middle Klamath River from Iron Gate Reservoir would continue to occur under the No Project Alternative similar to existing conditions.

The 2017 court-ordered flushing and emergency dilution flows and the 2019 BiOp flushing flows would result in no change from existing conditions for chlorophyll-*a* or algal toxins downstream of Iron Gate Dam, since releases would not alter conditions in Copco No. 1 or Iron Gate reservoirs that produce high chlorophyll-*a* concentrations and periodically high levels of algal toxins under existing conditions, and the court-ordered flushing and emergency dilution flows would primarily occur during winter and spring when chlorophyll-*a* and algal toxin concentrations in Iron Gate Reservoir would be low (see also Section 3.2.2.7 *Chlorophyll-a and Algal Toxins*). The 2017 court-ordered flushing and emergency dilution flows downstream of Iron Gate Dam would end by June 15, and the 2019 BiOp surface flushing flows would end by April 15, while monitoring data from the past five years (i.e., 2013 to 2018) indicates the abundance of blue-green algae and algal toxin concentrations (i.e., microcystin) in Iron Gate Reservoir increases above 0.8 ug/L or 4 ug/L after late June to early July (E&S Environmental Chemistry, Inc. 2013, 2014, 2015, 2016, 2018a, 2018b). Assuming blue-green algae cell counts and algal toxin concentrations from the past five years are representative of likely conditions in the reasonably foreseeable short-term (0−5 years), releases would end before elevated levels of chlorophyll-*a* or algal toxin concentrations occur in Iron Gate Reservoir, and there would be no changes from existing conditions for chlorophyll-a or algal toxin concentrations in the Middle and Lower Klamath River or the Klamath River Estuary. Overall, the No Project Alternative would result in no change from existing, adverse conditions and would continue to cause an exceedance of water quality standards in the Middle and Lower Klamath River and Klamath River Estuary. Thus, there would be no significant impact to chlorophyll-*a* and algal toxins due to 2017 court-ordered flushing and emergency dilution releases and the 2019 BiOp surface

flow releases in the reasonably foreseeable short-term (0−5 years) under the No Project Alternative in the Middle and Lower Klamath River and the Klamath River Estuary.

Significance
No significant impact

Volume I Section 4.2.2 Alternatives – No Project Alternative – Water Quality – Inorganic and Organic Contaminants – Potential Impact 4.2.2-8 Human and freshwater aquatic species' exposure to inorganic and organic contaminants due to continued impoundment of water in the reservoirs, paragraph 6 on page 4-35:

Implementation of the 2017 court-ordered flushing and emergency dilution flows and the 2019 BiOp surface flushing flows downstream of Iron Gate Dam would have no effect on exposure pathways for inorganic and organic contaminants because the flow changes would not alter the Lower Klamath Project reservoir sediment deposits nor would they alter physical, chemical, or biological conditions within the river or reservoir reaches that would change the potential for exposure to inorganic or organic contaminants compared with existing conditions.

4.2.3 Aquatic Resources

Volume I Section 4.2.3.1 Alternatives – No Project Alternative – Aquatic Resources – Key Ecological Attributes – Water Quality, paragraphs 1 through 4 on page 4-38:

Ongoing efforts to improve water quality conditions in this reach are underway through the TMDL process and considerable efforts to improve habitat are also underway (Hamilton et al. 2011). Once fully implemented, these efforts could reduce existing water quality degradation that contribute to reduced health and increased mortality rates for aquatic resources (described below) to some extent, but this process would be slower and more challenging than with the dams removed (Section 4.2.1 *Introduction*). In the interim, water quality conditions that may reduce survival of fish and other aquatic resources, including seasonally low dissolved oxygen concentrations and elevated pH with high diurnal variability that may be deleterious to aquatic resources (see also Section 3.2.2.5 *Water Quality – Environmental Setting – Dissolved Oxygen* and Section 3.2.2.6 *Water Quality – Environmental Setting –* pH), would persist downstream from Iron Gate Dam.

~~Modeling conducted for development of the California Klamath River TMDL indicates that under the No Project Alternative, dissolved oxygen concentrations immediately downstream from Iron Gate Dam would not meet the North Coast Basin Plan water quality objective of 85 percent saturation during August–September and the 90 percent saturation objective from October–November (Section 3.2.2.5 Dissolved Oxygen, Figure 3.2-20). Further downstream, near the confluence with the Shasta River, dissolved oxygen concentrations under the No~~

~~Project Alternative would not meet the 90 percent saturation objective from October–November (Section 3.2.2.5 Dissolved Oxygen, Figure 3.2-21). In the Klamath River at Seiad Valley, concentrations would be mostly in compliance, with the exception of modeled values in November that would not meet the 90 percent saturation objective (Section 3.2.2.5 Dissolved Oxygen, Figure 3.2-21). By the Salmon River (RM 66) confluence, with full attainment of TMDL allocations, predicted dissolved oxygen concentrations would remain at or above the 85 percent saturation objective (as well as the 90 percent saturation objective, where applicable), meeting the Water Quality Control Plan for the North Coast Region (California Basin Plan) requirements.~~

~~Under the No Project Alternative, continued high rates of algal photosynthesis in the reservoirs would result in high pH values in the Lower Klamath River downstream from Iron Gate Dam. Under the No Project Alternative, pH would continue to be elevated with high diurnal variability during summer and early fall months.~~

~~The overall anticipated effect on dissolved oxygen in the Lower Klamath River under the No Project Alternative would be an increasing trend toward compliance with water quality objectives and support of designated beneficial uses, but with possible continued seasonally low dissolved oxygen downstream from Iron Gate Dam. The seasonally low dissolved oxygen levels in this reach would not consistently meet California Basin Plan and Hoopa Valley Tribe water quality objectives. The No Project Alternative would continue to periodically result in dissolved oxygen levels that may be deleterious to aquatic resources downstream from Iron Gate Dam, but adverse effects would be similar to or less than under existing conditions.~~

Volume I Section 4.2.3.1 Alternatives – No Project Alternative – Aquatic Resources – Key Ecological Attributes – Water Temperature, paragraph 5 on page 4-38:

~~Under the No Project Alternative, the effects of ongoing and future upstream water quality improvements under the TMDLs would improve water temperatures downstream of Keno Dam, as described in Section 3.2.2.2 Water Temperature.~~ In general, the No Project Alternative would not affect the current ongoing changes to water temperature caused by the reservoirs and by dam operations, as described in Section 3.2.2.2 *Water Temperature*. The river's thermal regime downstream from the reservoirs would continue to be out of phase with the natural temperature regime (Hamilton et al. 2011).

Volume I Section 4.2.3.1 Alternatives – No Project Alternative – Aquatic Resources – Key Ecological Attributes – Water Temperature – Middle and Lower Klamath River, paragraph 1 on page 4-39:

Bartholow et al. (2005) and PacifiCorp (2004a~~b~~) showed that the reservoirs delay seasonal thermal signatures by an average of 18 days on an annual basis downstream of Iron Gate Dam (RM 193.1), with longer durations during the fall low-flow period (3 to 4 weeks) and shorter in the high-flow spring and early summer (2 to 3 weeks). The delay in the seasonal thermal signature is still evident upstream of the Shasta River (RM 179.5), greatly diminished by Seiad Valley (RM 132.7), and generally absent by the Salmon River (RM 66.3).

Volume I Section 4.2.3.1 Alternatives – No Project Alternative – Aquatic Resources – Key Ecological Attributes – Fish Disease and Parasites, paragraph 2 on page 4-40:

As described in Section 3.3.2.3 *Habitat Attributes Expected to be Affected by the Proposed Project [Fish Disease and Parasites]*, ~~T~~ the ongoing presence of the dams under the No Project Alternative would continue to contribute to the static flows, immobile substrate, seasonally warm water temperatures, and planktonic food sources in the mainstem Klamath River that are favorable for polychaetes and for *C. shasta* and *P. minibicornis* (Hetrick et al. 2009). Salmon carcasses would continue to concentrate downstream from Iron Gate Dam, where the polychaete hosts are abundant, facilitating the cross infection between the fish and the polychaetes. Under the No Project Alternative, mortality associated with *C. shasta* and *P. minibicornis* would be expected to worsen or remain similar to existing conditions. These conditions would continue to adversely affect salmon outmigrating from tributaries downstream from Iron Gate Dam, including those from the Shasta and Scott rivers. The highest rates of infection would likely continue to occur in the reach from Shasta River to Seiad Valley (Stocking and Bartholomew 2007, Bartholomew and Foott 2010). However, additional winter-spring surface flushing flows and ~~deep flushing~~ emergency dilution flow requirements outlined in Measures to Reduce Ceratanova Shasta Infection of Klamath River Salmonids: A Guidance Document and U.S. District Court Filing 111 (U.S. District Court 2017a–c; described in Section 4.2.3) and the newly defined existing 2019 BiOp Flows (including the surface flushing flows and potential for enhancement releases of 20,000 to 50,000 acre-feet depending on the water year type) is predicted to help reduce juvenile salmon disease below Iron Gate Dam. As described in Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*, ~~2017~~ court-ordered flushing flows were required ~~in~~ between February 2017 and ~~2018~~ March 2019, with the intent of reducing disease in the Lower Klamath River by mobilizing bedload sediments. In addition, 2017 court ordered emergency dilution flows were required in 2018. As described in Section 3.1.6, the 2017 court-ordered flows include a requirement to ensure that certain high flows are reached each winter, and also include an emergency dilution requirement if juvenile fish disease reaches high levels in the infection nidus. The emergency dilution flows were used in 2018. While the flushing flows have not been occurring over a long enough time to allow collection of enough data on the efficacy of the flushing flows, the necessity to use the emergency dilution flows in 2018 and 2019 suggests that the ~~addition~~

~~of the~~ flushing flows ~~is~~ are insufficient on ~~its~~ their own to resolve the issue of fish disease downstream of Iron Gate Dam. Therefore, the No Project Alternative would result in continued substantial deleterious effects on salmon because of fish disease and parasites.

Volume I Section 4.2.3.1 Alternatives – No Project Alternative – Aquatic Resources – Key Ecological Attributes – Fish Disease and Parasites – Potential Impact 4.2.3-4 Effects on Chinook and coho salmon Essential Fish Habitat (EFH) quality due to continued operations of the Lower Klamath Project, paragraph 6 on page 4-42:

Potential Impact 4.2.3-4 Effects on Chinook and coho salmon Essential Fish Habitat (EFH) quality due to continued operations of the Lower Klamath Project.

EFH in the Klamath River for Chinook and coho salmon includes the water quality and quantity necessary for successful adult migration and holding, spawning, egg-to-fry survival, fry rearing, smolt migration, and estuarine rearing of juvenile coho and Chinook salmon. Under the No Project Alternative, EFH for Chinook and coho salmon would be expected to remain similar to current conditions. Access to habitat would be limited to current levels and there would be no change from existing adverse conditions for water temperature in the Middle and Lower Klamath River, the Klamath River Estuary. ~~Conditions under the No Project Alternative would continue to contribute to elevated concentrations of disease parasites and would provide the conditions required for the cross infection of fish and polychaetes (Hetrick et al. 2009, Hamilton et al. 2011). These interacting factors could decrease the viability of Chinook and coho salmon populations in the future (Hetrick et al. 2009, Hamilton et al. 2011).~~ Under the No Project Alternative, there would be no change from existing adverse conditions for Chinook and coho salmon EFH in the reasonably foreseeable short-term (0−5 years).

Volume I Section 4.2.3.2 Alternatives – No Project Alternative – Aquatic Resources – Aquatic Resource Potential Impacts, Impacts, and Mitigation – Potential Impact 4.2.3-7 Effects on the fall-run Chinook salmon population due to continued operations of the Lower Klamath Project, paragraph 1 on page 4-44:

This includes around 76 miles of potential habitat within the Lower Klamath Project, based on approximately 54 miles of potential anadromous fish (steelhead) habitat in the Project Reach (NMFS 2006~~a~~, DOI 2007)[102], reduced in consideration of the more limited distribution of Chinook salmon relative to steelhead (DOI 2007), and including over 22 miles inundated by Klamath Hydroelectric Project reservoirs (Cunanan 2009).

[102] This also takes into consideration slight differences in the NMFS (2006) definition of the Project Reach from what is used in this report.

Volume I Section 4.2.3.2 Alternatives – No Project Alternative – Aquatic Resources – Aquatic Resource Potential Impacts, Impacts, and Mitigation – Potential Impact 4.2.3-7 Effects on the fall-run Chinook salmon population due to continued operations of the Lower Klamath Project, paragraph 1 on page 4-44:

Additional factors related to the Lower Klamath Project would continue to exacerbate the risk of disease downstream from Iron Gate Dam, including increased water temperatures and ~~dampened~~ reduced natural flow and thermal variability, reduced dissolved oxygen concentrations, loss of sediment transport through the reach due to capture of sediment by the dams, and reservoirs contributing plankton to the filter-feeding polychaete hosts of the myxozoan parasites (as discussed above in Section 4.2.3.1 *[No Project Alternative] Key Ecological Attributes – Aquatic Resources- Fish Disease and Parasites*).

Volume I Section 4.2.3.2 Alternatives – No Project Alternative – Aquatic Resources – Aquatic Resource Potential Impacts, Impacts, and Mitigation – Potential Impact 4.2.3-8 Effects on the spring-run Chinook salmon population due to continued operations of the Lower Klamath Project, paragraph 2 on page 4-47:

This includes around 76 miles of potential habitat within the Lower Klamath Project, based on approximately 54 miles of potential anadromous fish (steelhead) habitat in the Project Reach (NMFS 2006~~a~~, DOI 2007)[103], reduced in consideration of the more limited distribution of Chinook salmon relative to steelhead (DOI 2007), and including over 22 miles inundated by Klamath Hydroelectric Project reservoirs (Cunanan 2009).

Volume I Section 4.2.3.2 Alternatives – No Project Alternative – Aquatic Resources – Aquatic Resource Potential Impacts, Impacts, and Mitigation – Potential Impact 4.2.3-9 Effects on the coho salmon populations due to continued operations of the Lower Klamath Project, paragraph 4 on page 4-48:

Under the No Project Alternative, Iron Gate Dam would continue to block access by coho salmon to historical habitat which used to extend upstream at least as far as Spencer Creek (Hamilton et al. 2005), including an estimated 76 miles of potential habitat within the Lower Klamath Project, based on approximately 54 miles of potential anadromous fish (steelhead) habitat in the Project Reach (NMFS 2006~~a~~, DOI 2007),[104] reduced in consideration of the more limited distribution of coho salmon relative to steelhead (DOI 2007), and including over 22 miles inundated by Klamath Hydroelectric Project reservoirs (Cunanan 2009), and habitat within the bypass reaches.

[103] This also takes into consideration slight differences in the NMFS (2006) definition of the Project Reach from what is used in this report.
[104] This also takes into consideration slight differences in the NMFS (2006) definition of the Project Reach from what is used in this report.

Volume I Section 4.2.3.2 Alternatives – No Project Alternative – Aquatic Resources – Aquatic Resource Potential Impacts, Impacts, and Mitigation – Potential Impact 4.2.3-10 Effects on the steelhead population due to continued operations of the Lower Klamath Project, paragraph 1 on page 4-51:

In addition, there are around 80 miles of potential habitat for steelhead within the Klamath Hydroelectric Project that are currently inaccessible, comprising approximately 58 miles of anadromous habitat with the Project reach (NMFS 2006~~a~~, DOI 2007), that includes over 22 miles inundated by Klamath Hydroelectric Project reservoirs (Cunanan 2009) and habitat within the bypass reaches.

Volume I Section 4.2.3.2 Alternatives – No Project Alternative – Aquatic Resources – Aquatic Resource Potential Impacts, Impacts, and Mitigation – Potential Impact 4.2.3-11 Effects on the Pacific lamprey population due to continued operations of the Lower Klamath Project, paragraph 1 on page 4-53:

Although the exact upstream extent of suitable habitat for Pacific lamprey prior to the completion of the Lower Klamath Project dams and associated facilities is unknown, it is believed that Pacific lamprey would have migrated at least as far as Spencer Creek (Hamilton et al. 2005), including an estimated 80 miles of potential habitat within the Lower Klamath Project, based on approximately 58 miles of potential anadromous fish (steelhead) habitat in the Project Reach (NMFS 2006~~a~~, DOI 2007),[105] and including over 22 miles inundated by Klamath Hydroelectric Project reservoirs (Cunanan 2009), and habitat within the bypass reaches.

Volume I Section 4.2.3.2 Alternatives – No Project Alternative – Aquatic Resources – Aquatic Resource Potential Impacts, Impacts, and Mitigation – Potential Impact 4.2.3-14 Effects on the redband trout population due to continued operations of the Lower Klamath Project, paragraphs 5 and 6 on page 4-55:

Resident trout upstream of Iron Gate Dam are considered to be redband trout. Before construction of the Lower Klamath Project dams and associated facilities, redband trout in the area belonged to one population, with no migration barriers isolating populations from one another (NMFS 2006~~a~~). Under the No Project Alternative, genetic exchange and movement by redband trout between reaches would continue to be limited by the partially functional J.C. Boyle fish ladder (NMFS 2006-~~a~~) and lack of fish ladders at the Copco No. 1 and 2 Dams, as would access to productive spawning habitat in Spencer Creek in the J.C. Boyle Bypass and Peaking Reaches (NMFS 2006-~~a~~). The fragmentation of this

[105] This also takes into consideration slight differences in the NMFS (2006) definition of the Project Reach from what is used in this report.

population into several smaller, isolated subpopulations renders each more vulnerable to extinction due to stochastic events (wildfire, landslides, disease outbreaks, etc.) and limits genetic exchange among subpopulations.

Under the No Project Alternative, habitat connectivity for redband trout in the Klamath River would continue to be compromised by structural features of the Lower Klamath Project dams and associated facilities developments as well as by project operations. Fish downstream from J.C. Boyle Dam would continue to be hindered or obstructed from migrating to spawning grounds in Spencer Creek by the ineffective fish ladder at J.C. Boyle Dam, which poses a partial passage barrier (Hamilton et al. 2011). Spencer Creek is a highly productive spawning and rearing habitat for rainbow/redband trout (Hamilton et al. 2011). The stock of rainbow/redband trout in the bypass and peaking reaches below J.C. Boyle Dam is currently restricted from Spencer Creek and other suitable habitat upstream of the J.C. Boyle Dam (NMFS 2006~~a~~). Migration over the Copco No. 1 and 2 dams is in the downstream direction only, as there is no fishway. These conditions would remain unchanged under the No Project Alternative and the redband trout population would continue to suffer the effects of restricted habitat connectivity.

Volume I Section 4.2.3.2 Alternatives – No Project Alternative – Aquatic Resources – Aquatic Resource Potential Impacts, Impacts, and Mitigation – Potential Impact 4.2.3-14 Effects on the redband trout population due to continued operations of the Lower Klamath Project, paragraph 7 on page 4-55:

Under existing conditions, the lack of fully functioning fish screens at Iron Gate, Copco No. 1, and Copco No. 2 dams results in potential entrainment and ~~loss~~ mortality of juvenile redband trout ~~and reduces recruitment of redband trout to downstream reaches~~ (DOI 2007). All Lower Klamath Project hydropower facilities use Francis turbines. A 1987 report prepared by the Electric Power Research Institute (EPRI 1987) concluded that fish mortality from entrainment at hydroelectric projects using Francis turbines averaged 24 percent. ~~It is estimated that "several tens of thousands of resident fish" are annually entrained at "each of the Projects" facilities (NMFS 2006a), and it is likely that these~~ Risk of entrainment and mortality ~~rates~~ for redband trout would continue under the No Project Alternative.

Volume I Section 4.2.3.2 Alternatives – No Project Alternative – Aquatic Resources – Aquatic Resource Potential Impacts, Impacts, and Mitigation – Potential Impact 4.2.3-14 Effects on the redband trout population due to continued operations of the Lower Klamath Project, paragraphs 1 and 2 on page 4-56:

The health and productivity of redband trout in the J.C. Boyle Peaking Reach and J.C. Boyle Bypass Reach would continue to be affected under the No Project Alternative. Obstruction of sediment transport at J.C. Boyle Dam has altered substrates and channel features in the peaking and bypass reaches (FERC

2007). High flows have mobilized and removed sediment from storage sites and transported it downstream, reducing habitat quality for redband trout as well as for the macroinvertebrates they feed on (NMFS 2006~~a~~). These effects would continue under the No Project Alternative. In the J.C. Boyle Peaking Reach, redband trout numbers would continue to be subject to large fluctuations in flows that would: (1) cause fluctuations in water temperature and pH, (2) strand fish, (3) displace fish downstream, (4) reduce fry habitat along channel margins, (5) reduce access to suitable gravels where they are affected by flow fluctuations, and (6) reduce macroinvertebrate food production by reducing the area of the channel suitable for their survival (City of Klamath Falls 1986, Addley et al. 2005, as cited in Hamilton et al. 2011). All of these conditions are expected to continue to limit redband trout health and productivity ~~could result in substantial declines in redband trout abundance~~ in ~~this~~ these reaches.

Under the No Project Alternative, diversion of water ~~at Copco No. 2~~ for hydropower generation would continue to alter flows downstream, as occurs under existing conditions. Reduced flows in the 1.4-mile-long Copco No. 2 Bypass Reach would continue to prevent redband trout from using what would otherwise be habitat suitable for spawning and rearing. Productivity of redband trout in the bypass and peaking reaches downstream of J.C. Boyle Dam would continue to be suppressed by Lower Klamath Project effects that limit spawning and rearing habitat in these reaches (Hamilton et al. 2011). Under existing conditions, spawning of redband trout downstream of J.C. Boyle Dam appears limited to an area just downstream from the emergency canal spillway (Hamilton et al. 2011). Patches of gravel that might otherwise be suitable for spawning are rendered inaccessible to redband trout by reductions in instream flows (NMFS 2006~~a~~, Hamilton et al. 2011). These conditions would continue under the No Project Alternative.

Volume I Section 4.2.3.2 Alternatives – No Project Alternative – Aquatic Resources – Aquatic Resource Potential Impacts, Impacts, and Mitigation – Potential Impact 4.2.3-14 Effects on the redband trout population due to continued operations of the Lower Klamath Project, paragraph 3 on page 4-56:

Although redband trout in the Upper Klamath Basin support a robust sport fishery, Lower Klamath Project features and operations currently limit habitat connectivity and genetic exchange, reduce habitat quality, and reduce productivity. ~~Reduced redband trout abundance and distribution upstream of Iron Gate Dam attributable to Lower Klamath Project features and operations would continue under the No Project Alternative.~~ Habitat connectivity and suitability are substantially reduced in the Hydroelectric Reach due in part to Lower Klamath Project facilities isolating population units by limiting migration and reducing habitat suitability. Apparent phenotypic changes in redband trout in these reaches would likely be maintained or continue under the No Project Alternative, such as declines in size (Jacobs et al. 2007, as cited in Hamilton et al. 2011). ~~and condition factor (ODFW 2003, as cited in Hamilton et al. 2011).~~ The effect of

the No Project Alternative would be no change from existing conditions for redband trout in the reasonably foreseeable short-term (0−5 years).

Volume I Section 4.2.3.2 Alternatives – No Project Alternative – Aquatic Resources – Aquatic Resource Potential Impacts, Impacts, and Mitigation – Potential Impact 4.2.3-20 Effects on fish species from alterations to benthic macroinvertebrates due to continued operations of the Lower Klamath Project, paragraph 2 on page 4-58:

Under existing conditions, J.C. Boyle peaking operations kill, through stranding, large numbers of young fish and aquatic invertebrates that are the primary prey food for resident trout (NMFS 2006~~a~~). Current peaking operations reduce the production of sessile organisms, like macroinvertebrates, by 10 to 25 percent (Administrative Law Judge (2006). Fluctuations in the peaking reach are considered to be a contributing factor to the lower macroinvertebrate drift rates (NMFS 2006~~a~~).

4.2.5 Terrestrial Resources

Volume I Section 4.2.5.3 Alternatives – No Project Alternative – Terrestrial Resources – Special-status Species – Potential Impact 4.2.5-1 Effects of 2017 court-ordered flushing and emergency dilution flows released from Iron Gate Dam on foothill yellow-legged frog and western pond turtle breeding, paragraph 4 on page 4-64 through paragraph 2 on page 4-66:

Potential Impact 4.2.5-1 Effects of 2017 court-ordered flushing and emergency dilution flows <u>and 2019 BiOp flows</u> released from Iron Gate Dam on foothill yellow-legged frog and western pond turtle breeding.
To manage the fish parasite *C. shasta*, mandatory surface flushing flows in the winter-spring, deep flushing flows, and emergency dilution flows would occur in the ~~-~~short-term (0−5 years) in the Middle Klamath River downstream of Iron Gate Dam under the No Project Alternative (see Section 4.2.1.1 *[No Project Alternative] Alternative Description – Summary of Available Hydrology Information for the No Project Alternative*).

<u>As part of the 2017 court-ordered modification to the 2013 BiOp Flows, the 2017 court-ordered</u> ~~The~~ winter-spring surface flushing flow of 6,030 cfs is designed to occur for a 72-hour period between November 1 and April 30 (U.S. District Court 2017). This flow would be sufficient to move surface sediments (i.e., sand and potentially pea-sized gravel). The beginning of the foothill yellow-legged frog breeding season (typically April 22 through early July) overlaps with ~~this~~ <u>the 2017 court-ordered</u> flushing flow for about one week (April 22 through April 30). Mean daily flows in April are generally 2,000–3,000 cfs (Figure 3.6-4, Section 3.6.2.2 *Basin Hydrology*). Foothill yellow-legged frogs are known to time their egg-laying with the flow pattern of a given year, initiating egg-laying on the descending limb of the spring hydrograph (i.e., when flows are trending down) (Seltenrich and Pool 2002). If the <u>2017 court-ordered</u> winter-spring surface flushing flows were

to occur early in the foothill yellow-legged frog breeding season, individuals may delay breeding (Gonsolin 2010 and GANDA 2008); otherwise there is a potential for eggs to be scoured, if present, during the 2017 court-ordered winter-spring surface flushing flows.

The 2017 court-ordered deep flushing flows are designed to occur in one 24-hour period at least every other year (i.e., biennially) (U.S. District Court 2017). This one-day flow would ~~will~~ consist of an average flow of 11,250 cfs and occur any time between February 15 and May 31. Mean daily flows observed between April and May at Iron Gate Dam are typically between about ~~2,500~~ 1,500–3,500 (Figure 3.6-4 Section 3.6.2.2 *Basin Hydrology*). This deep flushing flow may scour or damage eggs attached to submerged rocks and pebbles during the one-month period that egg-laying overlaps with the 2017 court-ordered deep flushing flows (April 22–May 31). Tadpoles, which hatch between 5–37 days following egg-laying, could be present in May and could be displaced by the deep flushing flows, which would likely result in injury or mortality because the species is not adapted to high flows.

Both the 2017 court-ordered annual surface flushing and biennial deep flushing flows are implemented through flow augmentation when the required flows are not met naturally (i.e., in the case of a dry water year). The flows are timed, where possible, to occur during high precipitation events, in order to reduce the impact on water supplies. This means that any foothill yellow-legged frogs in the area would already be exposed to high flows, though supplementation would make these flows higher. Because the flows are designed to cause bed mobilization, the supplementation would be more likely to cause an impact than the precipitation event alone.

The 2017 court-ordered emergency dilution flows of 3,000–4,000 cfs are designed to occur between April 1 and June 15 if certain disease thresholds are present in the river (U.S. District Court 2017). Existing flows are typically at or above 3,000 cfs for approximately 40~~50~~ percent of April, 30~~25~~ percent of May, and 10~~5~~ percent of June (Figure 3.1-1; Section 3.1.6.2 *Comparison of Klamath River Flows under 2013 Biological Opinion and KBRA*). The 2017 court-ordered emergency dilution flows may scour or damage any eggs that are present between April 22 and June 15, when the flows overlap with the typical foothill yellow-legged frog breeding season. Additionally, direct impacts may result from stranding of eggs if breeding occurs along the river edge during the emergency dilution flows, and the subsequent receding flows reduce the wetted channel and dewatered egg masses. Tadpoles, which hatch between 5 and 37 days following egg-laying, could also be displaced by the emergency dilution flows.

In the 2019 BiOp, “opportunistic” surface flushing flows are specified during wetter water years, but approximately 50,000 acre-feet of water is available for a “forced” surface flushing flow or use in a manner that best meets coho salmon needs during drier water years since conditions in the Klamath River Basin may

prevent the release of surface flushing flows. In wet to average water years, the 2019 BiOp specifies "opportunistic" surface flushing flows of 6,030 cfs for a 72-hour period between March 1 and April 15 would be released. In below average to dry water years, the 2019 BiOp specifies that 50,000 acre-feet of water would be available to be released in a manner that best meets coho salmon needs between March 1 and April 15 since conditions during these water year types may not be sufficient to "force" a surface flushing flow in the Klamath River between March 1 and April 15 (e.g., insufficient hydraulic head at Link River Dam to produce 6,030 cfs for 72 hours at Iron Gate Dam). In these water year types, NMFS may request alternative distributions (i.e., releases) of the 50,000 acre-feet of water between March 1 and April 15, but the 2019 BiOp specifies that a "forced" surface flushing flow would be attempted between March 1 and April 15 if the necessary Klamath River and Upper Klamath Lake conditions are met, in the absence a request by NMFS for an alternative distribution. In the event that by April 15 a surface flushing flow (or other use of the 50,000 acre-feet) has not been released, the 50,000 acre-feet would be released as a "forced" surface flushing flow event that approximates, to the maximum extent practicable, a surface flushing flow of 6,030 cfs for 72 hours (NMFS 2019; USFWS 2019). As such, it is possible that the 50,000 acre-feet would be used and the flow in the Klamath River would be elevated after April 15 during below average to wet water years. Effects from the 2019 BiOp "opportunistic" surface flushing flows on foothill yellow-legged frogs would be similar to or less than that identified above for the 2017 court-ordered surface flushing flows since the 2019 BiOp surface flushing flows would tend to end earlier in the year (i.e., April 15), further reducing the potential of overlap with foothill yellow-legged frog breeding season (typically begins April 22). The 2019 BiOp "opportunistic" surface flushing flows during wet to average water years would end by April 15, while the 2019 BiOp "forced" surface flushing flows during below normal to dry water years would only occur after April 15 if the 50,000 acre-feet of water is not used before April 15. However, if the "forced" flows are released into the foothill yellow-legged frog breeding season (typically beginning April 22), there is a potential for egg scour and tadpole displacement.

The 2019 BiOp specifies that deep flushing flows (i.e., 11,250 cfs for 24 hours) would be attempted during late winter or early spring when hydrologic conditions and public safety allow, but they would be unlikely to occur. Modeling of 2019 BiOp Flows indicates the hydrologic and public safety conditions for deep flushing flows would only occur in 4 out of 36 years (approximately 11 percent of years) (NMFS 2019; USFWS 2019). While the specific time periods when deep flushing flows would occur are not specified in the 2019 BiOp, it is assumed deep flushing flows would occur within of the time period specified by the 2017 court-ordered deep flushing flows (i.e., February 15 and May 31) since the purpose of deep flushing flows remains the same in the 2017 court order and the 2019 BiOp (i.e., increase streambed mobility to reduce risks to coho salmon associated with *C. shasta* infections) and deep flushing flows would only be able to occur in conjunction with a natural high flow event. The 2019 BiOp deep flushing flows

have the potential to occur through May, so impacts from the 2019 BiOp deep flushing flows on foothill yellow-legged frogs would be similar to that identified above for the 2017 court-ordered flows.

The 2019 BiOp also specifies that an additional 20,000 acre-feet may be released in May and June during some water year types when specific conditions listed in the 2019 BiOp are met. While the 20,000 acre-feet may be used in different ways to enhance flows downstream of Iron Gate Dam in May and June based on NMFS recommendations to benefit coho salmon, the default approach for using the 20,000 acre-feet would increase flows downstream of Iron Gate Dam by 195 cfs (i.e., 12,000 acre-feet) in May and 134 cfs (i.e., 8,000 acre-feet) in June (NMFS 2019). Mean daily flows observed between May and June at Iron Gate Dam are typically between about 800 to 2,500 cfs (see Section 3.6.2.2 *Flood Hydrology – Environmental Setting – Basin Hydrology*, Figure 3.6-4). In the event Klamath River flow at Iron Gate Dam increases 134 to 195 cfs, it is possible that tadpoles, if present, may be displaced and impacts similar to those identified for the 2017 court-ordered emergency dilution flows would occur.

Although survey data are limiting for characterizing the presence of foothill yellow-legged frog in the Klamath River (i.e., this species has not been documented since 1976), occurrences are known in tributaries and presumably individuals have the potential to be present in the mainstem river as well. Due to the listing status of the foothill yellow-legged frog (i.e., State Candidate Threatened), direct mortality or harm to an individual would result in a significant impact. Thus, if eggs, juvenile and/or adult foothill yellow-legged frogs are present in the Middle Klamath River immediately downstream of Iron Gate Dam, direct impacts from scouring and displacement due to the court-ordered flushing and dilution flows may occur. The likelihood of this occurring is not high, because of the lack of certainty that individuals are present in the upper Middle Klamath River and the timing of flow supplementation to occur with natural high flows. However, if present and affected, this would be a significant impact.

Due to the low likelihood of locating eggs during high flow events, mitigation typically employed to reduce impacts to this species (i.e., rescuing and relocating eggs) would be ineffective. Modification of the flows to avoid the potential presence of foothill yellow-legged frog is not feasible. The USBR, which is responsible for the court-ordered flow releases, is a federal agency with a mandate to maximize agricultural deliveries as possible. Therefore, it is not feasible for the agency to adjust its decision-making to accommodate a candidate state-listed and state species of special concern that it does not have a particular obligation to protect. Thus, this would be a significant and unavoidable impact.

Since western pond turtles' nest on land and usually above the floodplain, up to several hundred meters from water (Ashton et al. 1997), there would be no significant impacts to their nests due to the 2017 court-ordered flushing and emergency dilution flows and 2019 BiOp flows. While the flushing and dilution

flows may disperse juvenile and adult western pond turtles, this would be a less than significant impact because although this species is considered an aquatic species, they are known to spend a considerable portion of their lives in upland habitats and may move to upland habitats during high winter flows.

Significance

Significant and unavoidable for foothill yellow-legged frog breeding populations, if present, in the Middle Klamath River immediately downstream of Iron Gate Dam in the short term (0−5 years)

No significant impact for western pond turtle in the Middle Klamath River immediately downstream of Iron Gate Dam in the short term (0−5 years)

4.2.6 Flood Hydrology

Volume I Section 4.2.6 Alternatives – No Project Alternative – Flood Hydrology – Potential Impact 4.2.6.1 The FEMA100-year floodplain inundation extent downstream from Iron Gate Dam could change due to 2017 flow requirements, potentially exposing people and/or structures to a substantial risk of damage, loss, injury, or death involving flooding, paragraph 4 on page 4-66:

Under the No Project Alternative, the dams would remain in place and the Lower Klamath Project would continue to operate in the short term (0−5 years) under annual licenses issued by FERC. Between February 2017 and March 2019, the ~~The~~ 2013 BiOp requirements for the upstream USBR Klamath Irrigation Project and the 2017 court-ordered flushing and emergency dilution flows ~~would~~ determined how instream flows through the Lower Klamath Project and releases from Iron Gate Dam ~~are~~ were managed (NMFS and USFWS 2013, U.S. District Court 2017). The 2019 BiOp Flows are now the current operational flow requirement for the Klamath River (USFWS 2019, NMFS 2019).

The 100-year floodplain inundation extent in the Klamath River between RMs 193 and 174 (i.e., from Iron Gate Dam to Humbug Creek) was modeled by USBR (2012), including a “WithDams_100yr” scenario that assumes 2010 BiOp flows and Lower Klamath Project dams remain in place. Floodplain inundation maps illustrating the USBR (2012) model results are presented in Appendix K of this EIR. Because the overall magnitude of the 2010 BiOp flows is consistent with that of the 2013 BiOp Flows ~~flows~~ and the 2019 BiOp Flows, and the 2017 court-ordered flushing and emergency dilution flows and the 2019 BiOp flushing flows are within the range of historical Klamath River flows evaluated in 2013 BiOp studies (see also Section 4.2.1.1 *[No Project Alternative] Alternative Description – Summary of Available Hydrology Information for the No Project Alternative*), the 100-year floodplain inundation extent previously modeled by USBR (2012) also serves as the Lower Klamath Project EIR No Project Alternative 100-year floodplain inundation extent.

Volume I Section 4.2.6 Alternatives – No Project Alternative – Flood Hydrology – Potential Impact 4.2.6.2 The FEMA 100-year floodplain inundation extent downstream from J.C. Boyle Dam could change due to 2017 flow requirements between the California-Oregon state line and Copco No. 1 Reservoir, potentially exposing people and/or structures to a substantial risk of damage, loss, injury, or death involving flooding, paragraph 1 on page 4-68:

As described for the Proposed Project analysis of Potential Impact 3.6-4 (see Section 3.6.5.2), J.C. Boyle Reservoir provides ~~no~~ limited storage (i.e., 1,724 acre-feet of active storage capacity; see Table 3.6-4) and the dam typically operates in spill mode at flows above power canal ~~plant~~ capacity (i.e., approximately ~~6,000~~ 2,800 cfs; Table 2-1 in USBR 2012). Existing-conditions peak flows in the Hydroelectric Reach are not substantially attenuated as a result of J.C. Boyle Dam.

Volume I Section 4.2.6 Alternatives – No Project Alternative – Flood Hydrology – Potential Impact 3.6-6 Dam failure could flood areas downstream of the Lower Klamath Project, paragraph 3 on page 4-68:

The Lower Klamath Project dams collectively store over ~~169,000~~ 87,000 acre-feet of water when they are full (Table 2.3-1).

4.2.8 Water Supply/Water Rights

Volume I Section 4.2.8 Alternatives – No Project Alternative – Water Supply/Water Rights – Potential Impact 4.2.8-1 Water availability changes from coordinated operations under 2017 flow requirements, paragraph 1 on page 4-69

With Iron Gate Dam continuing to block fish passage, it is assumed that ~~the 2017~~ flushing and emergency dilution flow requirements will continue under the No Project Alternative in the short term. The 2017 flow requirements determined how instream flows through the Lower Klamath Project and releases from Iron Gate Dam ~~are~~ were managed between February 2017 and March 2019 (NMFS and USFWS 2013, U.S. District Court 2017; see Section *[No Project] Alternative Description – Summary of Available Hydrology Information for the No Project Alternative*). The 2017 flow requirements require use of more water than the 2013 flow requirements, in that the USBR must guarantee at Iron Gate Dam, annual flushing flows and bi-annual deep flushing flows. Additionally, USBR must maintain an additional 50,000 acre feet of water until approximately June 15 annually, as a reserve in case emergency dilution flows are needed. The amount of water required to maintain the flow requirements is not fixed, because the requirements work in tandem with available high flows. Thus, the amount of water that USBR must withhold from deliveries in order to ensure the flow minimums are met will vary each year. Additionally, in some years, the 50,000 acre-feet of water held in reserve for dilution flows will be available for delivery to the Klamath Irrigation Project later in the year, while in other years it will not.

While it is not possible to quantify the reduction in water available for Klamath Irrigation Project deliveries, it is reasonable to assume that there will be some level of reduced deliveries in most, if not all, years. In 2018, the amount of Klamath Irrigation Project Supply water required to meet 2017 flow requirements was 76,713 acre-feet. As noted in Potential Impact 3.8-2, the potential for the Lower Klamath Project dams to somewhat ameliorate reductions in water deliveries would be uncertain in light of stated operational changes. Despite this uncertainty, there would remain some potential for coordinated operations to reduce the amount of supply by up to 20,000 acre-feet in drought situations. Similarly, the 2019 BiOp requires releasing an "opportunistic" surface flushing flow from Iron Gate Dam during the spring period (March 1 to April 15) if hydrologic conditions allow in average to wet years, although deep flushing flows are only required when hydrologic conditions and public safety allow, including, but not limited to, Upper Klamath Lake storage to allow for sufficient Link River Dam release capacity, Upper Klamath Lake storage sufficient to protect sucker needs, substantial accretions, and Klamath River tributary discharge that does not result in public safety or property concerns. An additional volume of 20,000 acre-feet for enhanced May/June flows would occur in years in which the April 1 EWA is greater than 400,000 acre-feet (407,000 acre-feet in years 2020, 2022, and 2024) and less than 576,000 acre-feet. As discussed in Section 3.8 *Water Supply/Water Rights*, coordinated efforts for any of the above flow releases do not affect releases downstream of Iron Gate Dam, and therefore do not impact water rights downstream. The Lower Klamath Project is not required to operate in such a manner as to extend USBR deliveries.

The potential for coordinated operations under either the 2017 flushing and emergency dilution flow requirements or the 2019 BiOp flushing flow requirements ~~has~~ would have no significant impact as compared to the ~~exiting~~ existing condition.

Significance
No significant impact in the short term (0−5 years)

4.2.11 Geology, Soils, and Mineral Resources

Volume I Section 4.2.11 Alternatives – No Project Alternative – Geology, Soils, and Mineral Resources, paragraph 4 on page 4-70.

The continued interception of sand, gravel and coarser sediment supplied by sources upstream of Iron Gate Dam would continue to coarsen the channel bed and reduce the size and frequency of mobile coarse sediment deposits in the Hydroelectric Reach and in the Middle Klamath River from Iron Gate Dam to approximately the Scott River, limiting the amount and quality of spawning gravel deposits in these reaches (see also Appendix F). From February 2017 to March 2019 (i.e., at the time of the Draft EIR), 2017 court-ordered flushing and emergency dilution flow requirements (U.S. District Court 2017) were in effect. With operation of the 2017 court-ordered ~~While the~~ winter-spring surface flushing

flows and deep flushing flow requirements at Iron Gate Dam (Section 4.2.1.1 *[No Project Alternative] Alternative Description – Summary of Available Hydrology Information for the No Project Alternative)* ~~would increase~~ the mobility of existing surficial fine sediment deposits and infilled fine sediment from the armor layer would be increased, with potential for continued infrequent (i.e., decadal scale)~~slight~~ mobilization of the armor layer in some locations, while new sediment supply would not occur. ~~However, all p~~Previous flow requirements have now been superseded by the ~~Biological Opinion flows (~~2019 BiOp Flows~~)~~, which require surface flushing flows (6,030 cfs), without deep flushing or emergency dilution flow requirements (see Section 3.1.6.3 *Klamath River Flows under the 2019 BiOp Operations Criteria for the Klamath Irrigation Project*); therefore, the potential for sediment mobilization would be similar to historical conditions and there would be no new sediment supply. Overall, with implementation of either of the flow conditions, ~~maintenance~~ the condition of ~~static~~ channel features would ~~represent no~~not change substantially from existing adverse conditions for the Middle Klamath River between Iron Gate Dam and the confluence with the Scott River.

4.2.12 Historical Resources and Tribal Cultural Resources

Volume I Section 4.2.12 No Project Alternative – Historical Resources and Tribal Cultural Resource, paragraph 1 on page 4-71:

Additionally, there would be no impacts to Copco No. 1 Dam, Copco No. 2 Dam, and Iron Gate Dam, their associated hydroelectric facilities, and the Klamath River Hydroelectric Project District (Potential Impact 3.12-11), because the Lower Klamath Project would remain in place. Please refer to Tables 4.3-1, 4.3-3, and 4.3-5 for National Register eligibility recommendations for each of the features making up the Lower Klamath Project. Potential impacts to submerged historic-period archaeological resources (Potential Impacts 3.12-12 through 3.12-16) within the reservoir footprints and along the Klamath River would not occur. Overall, conditions for historical resources and tribal cultural resources would remain consistent with existing conditions, and there would be no significant impacts in the short-term period (0−5 years).

4.3 Partial Removal Alternative

4.3.5 Terrestrial Resources

4.3.5.3 Special-status Species

Volume I Section 4.3.5.3 Alternatives – Partial Removal Alternative – Terrestrial Resources – Special-status Species, paragraph 4 on page 4-86 through paragraph 1 on page 4-87:

Under the Partial Removal Alternative there would be less construction activity as compared to the Proposed Project as some structures would remain in place

(see Table 4.3-1 through Table 4.3-6); however, short-term construction-related noise would still be generated due to the removal of the large majority of the dam complexes, including the entirety of each dam, and sealing of remaining structures and installation of security fencing. Thus, retaining some structures under the Partial Removal Alternative would not reduce noise-related impacts on special-status bats or non-federally listed birds to a less than significant level. Although bats are known to use some of the structures that would be retained (i.e., Copco No. 1, Copco No. 2, and Iron Gate powerhouses, see Section 3.5.5.3 *Special-status Species and Rare Natural Communities*), the Partial Removal Alternative would seal openings in the structures that remain, which would prevent bats from accessing the inside of the structures.

The structures that currently support the largest of the known bat roosts (e.g., Copco No. 1 and Iron Gate diversion tunnels) would be removed under this alternative. Birds may be nesting on the exterior of the structures that would be retained and potentially affected by facility preservation. As such, short- and long-term construction-related potential impacts (Potential Impacts 3.5-9, 3.5-10, 3.5-11, 3.5-12, 3.5-13, 3.5-14, 3.5-15, and 3.5-28) on terrestrial resources would be the same as those described for the Proposed Project. The mitigation measures and recommended terrestrial measures also would be the same as those identified for the Proposed Project. Implementation of Mitigation Measures TER-2, TER-3, TER-6, and TER-7 would reduce construction-related impacts, including in-water work, on all special-status amphibian species, gray wolf, and bald and golden eagles to less than significant.

4.3.12 Historical and Tribal Cultural Resources

Volume I Section 4.3.12 Alternatives – Partial Removal Alternative – Historical and Tribal Cultural Resources, paragraph 1 on page 4-92:

The retention of the aforementioned structures under the Partial Removal Alternative would potentially avoid disturbance-related impacts to three known TCR's, and potentially additional unknown TCR's, that are located in the immediate vicinity of structures that would remain in place under this alternative. While avoidance of potential impacts to these three TCR's would mean fewer overall impacts to TCR's under this alternative as compared with the Proposed Project, relative to existing conditions this alternative generally would not result in different effects related to either historic-period archaeological resources or tribal cultural resources compared with those described for the Proposed Project. Therefore, potential impacts and beneficial effects on these resources and any associated mitigation measures under the Partial Removal Alternative would be the same as those described for the Proposed Project (Potential Impacts 3.12-1 through 3.12-10 and 3.12-12 through 3.12-16).

4.3.17 Public Services

Volume I Section 4.3.17 Alternatives – Partial Removal Alternative – Public Services, paragraph 2 on page 4-93:

Implementation of Mitigation Measure HZ-1 (Section 3.21 *Hazards and Hazardous Materials*) and Mitigation Measure TR-1 (Section 3.22 *Traffic and Transportation*) would reduce impacts for reasons described under the Proposed Project. ~~However, the KRRC is developing a Traffic Management Plan to identify mitigation and other protective measures that would be implemented to reduce impacts to public services. Overseeing development and implementation of a Traffic Management Plan does not fall within the scope of the State Water Board's water quality certification authority. While the State Water Board expects that the Traffic Management Plan will be finalized and implemented, at this time the plan is not finalized, and the State Water Board cannot require its implementation. Accordingly, while the State Water Board anticipates that implementation of HZ-1 and Recommended Measure TR-1 would reduce impacts to public services, because it cannot require implementation of Recommended Measure TR-1, it is analyzing the impacts under this alternative as significant and unavoidable.~~

4.3.19 Aesthetics

Volume I Section 4.3.19 Alternatives – Partial Removal Alternative – Aesthetics, paragraph 1 on page 4-95:

The retention of some structures under the Partial Removal Alternative (e.g., powerhouse elements, penstocks, some buildings, see Table 4.3-1 through Table 4.3-6) would mean that the long-term (permanent) visual character of the Lower Klamath Project area would continue to be affected by the remaining man-made features, including for key observation points C3, C4, C5, IG9, IG10, IG11, and IG12; Table 3.19-3 and Figure 3.19-2 in Volume III Attachment 1 Section 3.19.5 *Aesthetics – Potential Impacts and Mitigation*) (Potential Impact 3.19-5). The retention of some structures under the Partial Removal Alternative would not cause the VRM class to be degraded at a key observation point, would not adversely impact a scenic vista for those areas that were not assigned a VRM class, and would not result in a significant long-term (permanent) impact. ~~However, as the remaining features are already part of the existing conditions (i.e., environmental baseline), the aesthetic effect of removing the other large existing structures (e.g., dams, some buildings) the would be beneficial as compared with existing conditions, even though the benefits would be of a slightly lesser degree than those described for the Proposed Project (Potential Impact 3.19-5).~~ Long-term (permanent) ~~V~~visual impacts due to construction of new infrastructure and improvements to existing infrastructure would be less than significant for the reasons described for the Proposed Project (Potential Impact 3.19-5). In general, short-term construction-related impacts to visual resources under the Partial Removal Alternative would be slightly less than those described

for the Proposed Project and as such would be less than significant (Potential Impact 3.19-6).

4.4 Continued Operations with Fish Passage Alternative

4.4.1 Introduction

Volume I Section 4.4.1.1 Alternatives – Continued Operations with Fish Passage Alternative – Introduction – Alternative Description, paragraph 2, bullets 1 and 2, on page 4-99:

The following conditions under the Continued Operations with Fish Passage Alternative are modifications to the 2012 KHSA EIS/EIR *Fish Passage at Four Dams Alternative*:

- Flows specified in the NMFS and USFWS 2013 BiOp for the USBR Klamath Irrigation Project, which served as the operational flow requirement for the Klamath River at the time of the Notice of Preparation for the Lower Klamath Project EIR (i.e., December 22, 2016), combined ~~are currently being considered under reinitiated consultation (see also 3.1.6.1 *Klamath River Flows under the Klamath Irrigation Project's 2013 BiOp*);~~ ~~C~~court-ordered flushing and emergency dilution flows downstream of Iron Gate Dam, which ~~became~~ were required ~~after~~ between February 2017 and March 2019 (U.S. District Court 2017) (3.1.6 *Summary of Available Hydrology Information for the Proposed Project* ~~see also Section 4.2.1.3 *Summary of Available Hydrology Information for the No Project Alternative*~~);
- Flows specified in the NMFS and USFWS 2019 biological opinions for the USBR Klamath Irrigation Project (2019 BiOp), which are the current operational flow requirement for the Klamath River (see also 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*); and
- Design and implementation of a Reservoir Management Plan, as described in the 2014 water quality certification application for Klamath Hydroelectric Project operations.

Volume I Section 4.4.1.2 Alternatives – Continued Operations with Fish Passage Alternative – Introduction – Alternative Analysis Approach, paragraph 5 on page 4-101:

As for the Proposed Project, the potential impacts of the Continued Operations with Fish Passage Alternative are analyzed in comparison to existing conditions. Unless otherwise indicated, the significance criteria, area of analysis, environmental setting, and impact analysis approach, including consideration of existing local policies, for all environmental resource areas under the Continued Operations with Fish Passage Alternative are the same as those described for the Proposed Project (see Section 3.1 Introduction and individual resource area subsections in Section 3 *Environmental Setting, Potential Impacts, and Mitigation Measures*). The potential impacts for each environmental resource area are

analyzed both in the short term and the long term, and unless otherwise indicated, use the same definitions of short term and long term as described for each resource area analyzed for the Proposed Project.

There are various restoration efforts underway in the Klamath Basin to improve water quality, as discussed in Section 3.24 *Cumulative Effects*. However, the effects of these efforts, including efforts aimed at meeting Klamath River TMDLs, are not analyzed in the short term under the Continued Operations With Fish Passage Alternative because the basin response to the restoration efforts to meet the total maximum daily loads (TMDLs) during the short term is too speculative.

4.4.2 Water Quality

Volume I Section 4.4.2.1 Alternatives – Continued Operations with Fish Passage Alternative – Water Quality – Water Temperature, paragraph 1 on page 4-102:

Short-term and long-term potential impacts to water temperature due to implementation of the 2017 court-ordered flushing and emergency dilution flows or the 2019 BiOp surface flushing flows under this alternative would be similar to the potential short-term impacts to water temperature described for the No Project Alternative (Section 4.2.2, Potential Impact 4.2.2-1).

Volume I Section 4.4.2.1 Alternatives – Continued Operations with Fish Passage Alternative – Water Quality – Water Temperature, paragraph 3 on page 4-102:

The 2007 FERC EIS found that PacifiCorp's proposal for relicensing of the Klamath Hydroelectric Project failed to address the project's water quality impairments within and downstream of the Hydroelectric Reach (FERC 2007). Studies indicated that water released from Iron Gate Dam is 1.8 to 4.5°F (approximately 1 to 2.5°C) cooler in the spring and approximately 4 to 18°F (approximately 2 to 10°C) warmer in the summer and fall as compared to modeled conditions without J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate dams (PacifiCorp 2004a, 2005, 2008, 2014; Dunsmoor and Huntington 2006; North Coast Regional Board 2010). In 2010, the Klamath River TMDLs ~~later~~ assigned water temperature and dissolved oxygen dual (i.e., co-occurring) load allocations to Copco No. 1 and Iron Gate reservoirs for the stratification period (May through October) to ensure compliance with the dissolved oxygen and water temperature targets (i.e., dissolved oxygen consistent with 85 percent saturation or better through September, and 90 percent or better in October [see also Table 3.2-5], and a zero water temperature increase above natural water temperatures~~, where natural baseline summer mean water temperature is approximately 18.7°C~~) within the reservoirs and to ensure support of cold freshwater habitat (COLD), which is a designated beneficial use.

Volume I Section 4.4.2.1 Alternatives – Continued Operations with Fish Passage Alternative – Water Quality – Water Temperature, paragraph 3 on page 4-102:

The 2007 FERC EIS found that PacifiCorp's proposal for relicensing of the Klamath Hydroelectric Project failed to address the project's water quality impairments within and downstream of the Hydroelectric Reach (FERC 2007). Studies indicated that water released from Iron Gate Dam is 1.8 to 4.5°F (approximately 1 to 2.5°C) cooler in the spring and approximately 4 to 18°F (approximately 2 to 10°C) warmer in the summer and fall as compared to modeled conditions without J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate dams (PacifiCorp 2004a, 2005, 2008, 2014; Dunsmoor and Huntington 2006; North Coast Regional Board 2010). In 2010, the Klamath River TMDLs ~~later~~ assigned water temperature and dissolved oxygen dual (i.e., co-occurring) load allocations to Copco No. 1 and Iron Gate reservoirs for the stratification period (May through October) to ensure compliance with the dissolved oxygen and water temperature targets (i.e., dissolved oxygen consistent with 85 percent saturation or better through September, and 90 percent or better in October [see also Table 3.2-5], and a zero water temperature increase above natural water temperatures~~, where natural baseline summer mean water temperature is approximately 18.7°C~~) within the reservoirs and to ensure support of cold freshwater habitat (COLD), which is a designated beneficial use.

Volume I Section 4.4.2.1 Alternatives – Continued Operations with Fish Passage Alternative – Water Quality – Water Temperature, paragraph 3 on page 4-102:

Results from testing of a powerhouse intake barrier/thermal curtain in Iron Gate Reservoir under IM 11 indicate that a ~~modest~~ 1 to 2°C (1.8 to 3.6°F) water temperature improvement is possible using this technique, considered to be a modest improvement since data indicate that this improvement would still not achieve compliance with the Thermal Plan or meet the Klamath River TMDLs temperature requirement in the Middle Klamath River (North Coast Regional Board 2010); Section 4.4.2 *Water Quality*, Potential Impact 4.2.2-1 below discusses these results.

Volume I Section 4.4.2.1 Continued Operations with Fish Passage Alternative – Water Quality – Water Temperature Potential Impact 4.2.2-1, paragraphs 3 and 4 on page 4-103:

Under the Continued Operations with Fish Passage Alternative, J.C. Boyle Reservoir would remain in place, but ~~increased~~ changes in minimum flows in the J.C. Boyle Bypass Reach and ~~limitation of~~ limits on peaking operations ~~at J.C. Boyle Powerhouse~~ within the J.C. Boyle Peaking Reach would ~~decrease the large daily water temperature range that occurs under existing conditions when warmer reservoir water is diverted around the Bypass Reach to produce power (Section 3.2.2.2 Water Temperature)~~ alter water temperature conditions in the Hydroelectric Reach from J.C. Boyle Dam to Copco No. 1 Reservoir. Minimum flows in the J.C. Boyle Bypass Reach in Oregon would increase to meet the requirement that at least 40 percent of the J.C. Boyle Reservoir inflow be

released through the J.C. Boyle Bypass Reach, so flow from the cold groundwater springs (a relatively constant approximately 11 to 12°C [51.8 to 53.6°F]) entering the Klamath River in this reach would comprise relatively less of the total flow. The range of daily water temperatures and the maximum daily water temperature in the J.C. Boyle Bypass Reach in Oregon would increase compared to existing conditions under the Continued Operations with Fish Passage Alternative due to more warmer reservoir water being released through the J.C. Boyle Bypass Reach and reducing the relative influence of the groundwater springs on water temperatures in this reach. Warmer water temperatures would occur during summer and early fall, while cooler water temperatures would occur in late fall and winter (i.e., November to April) in the J.C. Boyle Bypass Reach under this alternative compared to existing conditions. Areas adjacent to the cold groundwater springs in the J.C. Boyle Bypass Reach would continue to ~~serve as~~ potentially provide thermal refugia for aquatic species because the flow from the springs themselves would not be affected by the Continued Operations with Fish Passage Alternative, but the total thermal refugia area for aquatic species in the J.C. Boyle Bypass Reach would likely decrease as the percentage of flow in the river from the cold groundwater springs decreases and the percentage of flow from the warmer reservoir increases. Data and/or models results are not currently available to quantify the potential changes in the thermal refugia area under the Continued Operations with Fish Passage Alternative compared to existing conditions. See Section 4.4.3.3 *[Aquatic Resources] Water Quality* for more details about changes in thermal refugia for aquatic resources.

Under the Continued Operations with Fish Passage Alternative, downstream of the J.C. Boyle Bypass Reach, ~~The primary decrease in daily and seasonal flow fluctuations relative to existing conditions would occur in the J.C. Boyle Bypass Reach in Oregon because flow fluctuations in the downstream J.C. Boyle Peaking Reach in California (i.e., from the Oregon-California state line to Copco No. 1 Reservoir) are attenuated with distance downstream due to tributary inputs and accretion flows. With the limitation of peaking operations under this alternative,~~ the temperature effects ~~downstream from~~ in the J.C. Boyle Peaking Reach are generally similar to those described by removal of the facility, as described in Proposed Project (Potential Impact 3.2-1 *Hydroelectric Reach*). There would be a decrease in the range of daily water temperatures and the maximum daily water temperature compared to existing conditions under the Continued Operations with Fish Passage Alternative primarily due to reductions in hydropower peaking flows that discharge warmer reservoir water diverted around the J.C. Boyle Bypass Reach and into the J.C. Boyle Peaking Reach (see Section 3.2.2.2 *Water Temperature*). Decreases in peaking flow fluctuations relative to existing conditions would primarily occur in the upper portion of the J.C. Boyle Peaking Reach in Oregon and diminish in the downstream direction since peaking flow fluctuations attenuate with distance downstream due to tributary inputs and accretion flows.

In the lower portion of the J.C. Boyle Peaking Reach (i.e., near Shovel Creek upstream of Copco No. 1 Reservoir) from the Oregon-California state line to Copco No. 1 Reservoir, decreases in the peaking flow fluctuations under the Continued Operations with Fish Passage Alternative and associated water temperature changes from this decrease would be relatively less than would occur at the beginning of the J.C. Boyle Peaking Reach immediately downstream of the J.C. Boyle Powerhouse. Maximum water temperatures at the Oregon-California state line during summer and early fall would be slightly lower and temperatures would be less artificially variable relative to existing conditions due to higher overall flows and lower frequency of peaking operations at the J.C. Boyle Powerhouse (i.e., ~~weekly~~ one day per week peaking under this alternative as compared to daily peaking under existing conditions). According to the KRWQM (PacifiCorp 2004a), annual and summer peak maximum water temperatures in the lower portion of the J.C. Boyle Peaking Reach would be reduced under this alterative compared to existing conditions, but daily Klamath River water temperatures in this reach would potentially increase or decrease by approximately 2ºC or less due to the influence of local meteorological conditions in the absence of peaking flows. Overall, the ~~The~~ decrease in maximum daily water temperatures and temperature variability in the J.C. Boyle Peaking Reach would be less than described under the Proposed Project, because there would still be peaking operations occurring one day per week in conjunction with recreational flows (see Section 4.4.1 *[Continued Operations with Fish Passage Alternative] Introduction*). Relative to existing conditions, the slight decreases in long-term maximum summer/fall water temperatures and less artificial diel temperature variation in the J.C. Boyle Peaking Reach would return the river to a more natural thermal regime, although the degree of benefit would be slightly lower than under the Proposed Project (Potential Impact 3.2-1). ~~Elimination of~~ Reductions in the artificial temperature signal caused by peaking operations under existing conditions would better conform with the California Thermal Plan's prohibition on elevated temperature discharges (Table 3.2-4) and would be beneficial.

Volume I Section 4.4.2.1 Alternatives – Continued Operations with Fish Passage Alternative – Water Quality – Water Temperature – Potential Impact 4.2.2-1 Seasonal alterations in water temperature due to continued impoundment of water in the reservoirs, paragraph 3 on page 4-103 through paragraph 1 on page 4-104:

Under the Continued Operations with Fish Passage Alternative, J.C. Boyle Reservoir would remain in place, but changes in minimum flows in the J.C. Boyle Bypass Reach and limits on peaking operations within the J.C. Boyle Peaking Reach would alter water temperature conditions in the Hydroelectric Reach from J.C. Boyle Dam to Copco No. 1 Reservoir. Minimum flows in the J.C. Boyle Bypass Reach in Oregon would increase to meet the requirement that at least 40 percent of the J.C. Boyle Reservoir inflow be released through the J.C. Boyle Bypass Reach, so flow from the cold groundwater springs (a relatively constant

approximately 11 to 12°C [51.8 to 53.6°F]) entering the Klamath River in this reach would comprise relatively less of the total flow. The range of daily water temperatures and the maximum daily water temperature in the J.C. Boyle Bypass Reach in Oregon would increase compared to existing conditions under the Continued Operations with Fish Passage Alternative due to more warmer reservoir water being released through the J.C. Boyle Bypass Reach and reducing the relative influence of the groundwater springs on water temperatures in this reach. Warmer water temperatures would occur during summer and early fall, while cooler water temperatures would occur in late fall and winter (i.e., November to April) in the J.C. Boyle Bypass Reach under this alternative compared to existing conditions. Areas adjacent to the cold groundwater springs in the J.C. Boyle Bypass Reach would continue to potentially provide thermal refugia for aquatic species because the flow from the springs themselves would not be affected by the Continued Operations with Fish Passage Alternative, but the total thermal refugia area for aquatic species in the J.C. Boyle Bypass Reach would likely decrease as the percentage of flow in the river from the cold groundwater springs decreases and the percentage of flow from the warmer reservoir increases. Data and/or models results are not currently available to quantify the potential changes in the thermal refugia area under the Continued Operations with Fish Passage Alternative compared to existing conditions. See Section 4.4.3.3 *[Aquatic Resources] Water Quality* for more details about changes in thermal refugia for aquatic resources.

Under the Continued Operations with Fish Passage Alternative, downstream of the J.C. Boyle Bypass Reach, the temperature effects in the J.C. Boyle Peaking Reach are generally similar to those described by removal of the facility, as described in Proposed Project (Potential Impact 3.2-1 *Hydroelectric Reach*). There would be a decrease in the range of daily water temperatures and the maximum daily water temperature compared to existing conditions under the Continued Operations with Fish Passage Alternative primarily due to reductions in hydropower peaking flows that discharge warmer reservoir water diverted around the J.C. Boyle Bypass Reach and into the J.C. Boyle Peaking Reach (see Section 3.2.2.2 *Water Temperature*). Decreases in peaking flow fluctuations relative to existing conditions would primarily occur in the upper portion of the J.C. Boyle Peaking Reach in Oregon and diminish in the downstream direction since peaking flow fluctuations attenuate with distance downstream due to tributary inputs and accretion flows.

In the lower portion of the J.C. Boyle Peaking Reach (i.e., near Shovel Creek upstream of Copco No. 1 Reservoir) from the Oregon-California state line to Copco No. 1 Reservoir, decreases in the peaking flow fluctuations under the Continued Operations with Fish Passage Alternative and associated water temperature changes from this decrease would be relatively less than would occur at the beginning of the J.C. Boyle Peaking Reach immediately downstream of the J.C. Boyle Powerhouse. Maximum water temperatures at the Oregon-California state line during summer and early fall would be slightly lower and

temperatures would be less artificially variable relative to existing conditions due to higher overall flows and lower frequency of peaking operations at the J.C. Boyle Powerhouse (i.e., one day per week peaking under this alternative as compared to daily peaking under existing conditions). According to the KRWQM (PacifiCorp 2004a), annual and summer peak maximum water temperatures in the lower portion of the J.C. Boyle Peaking Reach would be reduced under this alterative compared to existing conditions, but daily Klamath River water temperatures in this reach would potentially increase or decrease by approximately 2ºC or less due to the influence of local meteorological conditions in the absence of peaking flows.

Overall, the decrease in maximum daily water temperatures and temperature variability in the J.C. Boyle Peaking Reach would be less than described under the Proposed Project, because there would still be peaking operations occurring one day per week in conjunction with recreational flows (see Section 4.4.1 *[Continued Operations with Fish Passage Alternative] Introduction*). Relative to existing conditions, the slight decreases in long-term maximum summer/fall water temperatures and less artificial diel temperature variation in the J.C. Boyle Peaking Reach would return the river to a more natural thermal regime, although the degree of benefit would be slightly lower than under the Proposed Project (Potential Impact 3.2-1). Reductions in the artificial temperature signal caused by peaking operations under existing conditions would better conform with the California Thermal Plan's prohibition on elevated temperature discharges (Table 3.2-4) and would be beneficial.

In the remainder of the Hydroelectric Reach (i.e., Copco No. 1 and Iron Gate reservoirs) water temperatures would be ~~the same as~~ similar to those described under the existing condition (see Section 3.2.2.2 *Water Temperature*), where spring, summer, and fall water temperatures would continue to be influenced by the thermal mass of Copco No. 1 and Iron Gate reservoirs, and the seasonal stratification patterns of the two reservoirs. While the specific flow conditions of the Continued Operations With Fish Passage Alterative were not modeled, a comparison between Steady Flow conditions (i.e., no peaking flows and no additional flow through the J.C. Boyle Bypass Reach) and existing conditions results from the 2004 version of the KRWQM would characterize the general variations and trends in water temperature under this alternative by highlighting how the elimination of peaking operations would alter water temperature in the Hydroelectric Reach. During the periods when flow is not steady under the Continued Operations With Fish Passage Alternative (e.g., peaking operations one day per week, as water supplies allow), water temperature conditions would be more similar to existing conditions than those modeled under Steady Flow conditions. Overall, the water temperature upstream, within, and downstream of Copco No. 1 Reservoir would be generally similar or the same under both modeled Steady Flow conditions and existing conditions, but there potentially would be approximately 2ºC or less differences in the water temperature during some periods (PacifiCorp 2004a). Increased flow in the J.C. Boyle Bypass

Reach under the Continued Operations With Fish Passage Alternative compared to modeled Steady Flow conditions would likely result in water temperature differences between this alternative and existing conditions more frequently approaching 2ºC, but periods of water temperature cooler than existing conditions still would frequently occur during summer. In general, water temperature trends under the Continued Operations With Fish Passage Alternative would be similar to those calculated between Steady Flow and existing conditions. The thermal structure of Copco No. 1 and Iron Gate reservoirs (i.e., onset of stratification date, fall turnover date, duration of stratification, maximum stratification date, maximum water temperature difference, and minimum reservoir bottom water temperature) were similar for modeled Steady Flow and existing conditions using the 2004 version of the KRWQM, with only small (10 days or less) changes in the fall turnover date, duration of stratification, or maximum stratification date in one of the two years modeled.

It is unclear what, if any, steps could reduce the impact of the reservoirs on the thermal regime within the Hydroelectric Reach between Copco No. 1 Reservoir and Iron Gate Dam and comply with the Thermal Plan's ban on elevated temperature discharges into COLD interstate waters (Table 3.2-4). Of the seven water quality improvement actions described in the Reservoir Management Plan[192], selective withdrawal and intake control is most focused on water temperature improvements. ~~With respect to this approach,~~ PacifiCorp has estimated that the maximum useable cool water volume in Copco No. 1 Reservoir in summer under existing conditions (approximately 3,100 acre-feet at less than 14°C and 4,800 acre-feet at less than 16°C) (PacifiCorp 2014b), which if selectively withdrawn from the reservoirs, would decrease water temperatures immediately downstream of Copco No. 1 Reservoir. However, the limited cool water volume in Copco No. 1 Reservoir under existing conditions would result in selective withdrawal exhausting the cool water volume in less than 2 days at 1,000 cfs (or slightly longer at a lower flow) and producing only a relatively brief decrease in water temperature downstream of Copco No. 1 Dam (PacifiCorp 2005; FERC 2007; PacifiCorp 2014b). Water temperature differences upstream of Copco No. 1 or Iron Gate reservoirs between modeled Steady Flow and existing conditions were analyzed for the potential to alter the usable cool water volume in the reservoirs. A comparison of Steady Flow and existing conditions results from the 2004 version of the KRWQM shows either minimum water temperatures ranging from approximately 1ºC colder to approximately 1ºC warmer or consistently cooler minimum water temperatures under Steady Flow conditions depending on the time period being considered (PacifiCorp 2004a) and this suggests the total usable cool water volume would likely remain similar or slightly increase compared to existing conditions if peaking flows are eliminated and Steady Flow conditions occur. However, the increased flow in the J.C. Boyle Bypass Reach under the Continued Operations With Fish Passage Alternative compared to modeled Steady Flow conditions would increase the water temperature in the J.C. Boyle Bypass Reach during the portion of the year

when the J.C. Boyle Reservoir water temperature is greater than the groundwater spring temperatures (i.e., approximately mid-spring through mid-fall) due to the relative proportion of flow from J.C. Boyle Reservoir releases increasing relative to the cooler groundwater spring flows. As a result of this, the cooling effect of flows from the J.C. Boyle Bypass Reach on the flows in the J.C. Boyle Peaking Reach would be diminished under Continued Operations With Fish Passage Alternative compared to modeled Steady Flow conditions. Additionally, the increased surface area of the river compared to the bypass canal would allow more solar radiation to be absorbed by flow through the river than the bypass canal, so the overall water temperature in the J.C. Boyle Peaking Reach would potentially be greater under the Continued Operations With Fish Passage Alternative with J.C. Boyle Reservoir releases of at least 40 percent of inflow to the reservoir through the J.C. Boyle Bypass Reach, groundwater springs flows into the J.C. Boyle Bypass Reach, and flow through the J.C. Boyle Powerhouse than under modeled Steady Flow conditions with minimum J.C. Boyle Reservoir releases to J.C. Boyle Bypass Reach (i.e., 100 cfs; consistently less than 40 percent of inflow to J.C. Boyle Reservoir), groundwater springs flows into the J.C. Boyle Bypass Reach, and steady flow through the J.C. Boyle Powerhouse. Due to the reduced cooling from J.C. Boyle Bypass Reach flows on water temperature in the J.C. Boyle Peaking Reach, the water temperature entering the Copco No. 1 Reservoir would potentially be slightly higher during mid-spring to mid-fall under this alternative compared to the modeled Steady Flow conditions, resulting in the total usable cool water volume being similar or potentially slightly less than existing conditions. Overall, modeling of the water temperature changes in the J.C. Boyle Bypass and Peaking reaches when hydropower peaking flows are eliminated (i.e., Steady Flow conditions) indicates there is potential for the useable cool water volume in Copco No. 1 Reservoir to slightly increase or remain the same, but the useable cool water volume in Copco No. 1 may be similar or slightly decrease under the flow conditions in the Continued Operations With Fish Passage Alternative. The magnitude of potential increases or decreases in useable cool water volume in Copco No. 1 was not quantified by previous modeling (PacifiCorp 2004a), so potential changes in useable cool water volume and the duration cool water would be available for selective withdrawal from Copco No. 1 Reservoir are unknown under the Continued Operations With Fish Passage Alternative. Thus, ~~It~~ it is currently unclear whether selective withdrawal from Copco No. 1 Reservoir alone would be sufficient to allow compliance with the Thermal Plan or to meet the Klamath TMDLs temperature requirement in the Hydroelectric Reach (see also below discussion in Middle and Lower Klamath River and Klamath River Estuary).

Volume I Section 4.4.2.1 Alternatives – Continued Operations with Fish Passage Alternative – Water Quality – Water Temperature – Potential Impact 4.2.2-1 Seasonal alterations in water temperature due to continued impoundment of water in the reservoirs – Hydroelectric Reach, paragraph 2 on page 4-105:

The anticipated increases in water temperatures due to climate change would occur over a timescale of decades and would act in opposition to improvements in water temperature in the Hydroelectric Reach at the Oregon-California state line expected from actions taken in furtherance of TMDL implementation throughout the Upper Klamath Basin, such as flow augmentation or storage, increased riparian shading, erosion control, and restoration of natural channel morphology ~~and decreased diversion from cold springs~~ (~~ODEQ 2010~~ ODEQ 2019). While full implementation of the Klamath TMDLs would alleviate the reservoir-induced thermal lag modeled by PacifiCorp (2004a, 2005, 2008, 2014), Dunsmoor and Huntington (2006), and North Coast Regional Board (2010), ~~is anticipated to~~ resulting in late summer/fall reductions in water temperature in the range of 2~~—~~ to 10ºC immediately downstream from Iron Gate Dam (~~North Coast Regional Board 2010)~~, there is currently no reasonable proposal to achieve the temperature allocations in the Klamath TMDLs with the Lower Klamath Project dams remaining in place ~~despite~~ since the modest improvements exhibited through implementation of the KHSA IMs ~~Reservoir Management Plan~~ during the past several years were not able to achieve Klamath River TMDL temperature allocations (PacifiCorp 2017, 2018), it has not been demonstrated that the current Reservoir Management Plan measures could achieve Klamath River TMDL temperature allocations, and there are no additional proposed operations and/or technologies to incorporate into a final Reservoir Management Plan that have been shown could achieve the Klamath River TMDL temperature allocations.

In summary, continued impoundment of water in Copco No. 1 and Iron Gate reservoirs under the Continued Operations with Fish Passage Alternative would maintain existing adverse late summer/fall water temperatures in the Hydroelectric Reach downstream of Copco No. 1 Reservoir (Section 3.2.2.2 *Water Temperature*). There is currently no reasonable proposal to achieve the temperature allocations in the Klamath TMDLs with the Lower Klamath Project dams remaining in place, despite the modest improvements achieved to date through implementation of ~~the~~ KHSA IMs that could be incorporated into a final Reservoir Management Plan.

Volume I Section 4.4.2.1 Alternatives – Continued Operations with Fish Passage Alternative – Water Quality – Water Temperature – Potential Impact 4.2.2-1 Seasonal alterations in water temperature due to continued impoundment of water in the reservoirs – Middle and Lower Klamath River and Klamath River Estuary, paragraph 1 on page 4-106:

As discussed above, short-term and long-term potential impacts on water temperature due to implementation of the 2017 court-ordered flushing and emergency dilution flows or the 2019 BiOp surface flushing flows under this alternative would be similar to the potential short-term impacts on water temperature under the No Project Alternative (Section 4.2.2, Potential Impact 4.2.2-1).

Volume I Section 4.4.2.1 Alternatives – Continued Operations with Fish Passage Alternative – Water Quality – Water Temperature – Potential Impact 4.2.2-1 Seasonal alterations in water temperature due to continued impoundment of water in the reservoirs – Middle and Lower Klamath River and Klamath River Estuary, paragraph 2 on page 4-106:

~~One of the purposes of the curtain is to isolate warmer, less dense near-surface waters while withdrawing cooler, denser, and deeper waters from the reservoir for release to the Klamath River downstream (PacifiCorp 2018). The other~~ While the primary purpose of the curtain is to isolate surface waters that have high concentrations of blue-green algae (cyanobacteria) such that extensive summer and fall blooms are not readily released downstream to the Middle and Lower Klamath River (see further discussion in Potential Impact 4.2.2-4), PacifiCorp reports that the curtain also provides a secondary benefit of isolating warmer, less dense near-surface waters while withdrawing cooler, denser, and deeper waters from the reservoir for release to the Klamath River downstream of the Iron Gate Dam (PacifiCorp 2018). Results from the intake barrier/thermal curtain indicate that a modest 1— to 2°C (1.8— to 3.6°F) water temperature improvement is possible (PacifiCorp 2017), although data do not indicate that this measure could achieve compliance with the Thermal Plan or to meet the Klamath River TMDLs temperature requirement in the Middle Klamath River (North Coast Regional Board 2010). Additionally, water temperature improvements from operation of the intake barrier/thermal curtain would be potentially limited by the need to access water with higher dissolved oxygen concentrations to comply with dissolved oxygen standards, with the curtain completely rolled up during portions of 2017 to maximize dissolved oxygen concentrations for aquatic life (PacifiCorp 2018).

Volume I Section 4.4.2.1 Alternatives – Continued Operations with Fish Passage Alternative – Water Quality – Water Temperature – Potential Impact 4.2.2-1 Seasonal alterations in water temperature due to continued impoundment of water in the reservoirs – Middle and Lower Klamath River and Klamath River Estuary, paragraph 2 on page 4-108:

There is currently no reasonable proposal to achieve the temperature allocations in the Klamath TMDLs with the Lower Klamath Project dams remaining in place, despite the modest improvements achieved to date through implementation of ~~the~~ KHSA IMs that could be incorporated into a final Reservoir Management Plan (see discussion in Section 4.4.2 *Water Quality*, Potential Impact 4.2.2-1 *Hydroelectric Reach*).

Volume I Section 4.4.2.2 Alternatives – Continued Operations with Fish Passage Alternative – Water Quality – Suspended Sediments, paragraph 4 on page 4-109:

The Continued Operations with Fish Passage Alternative also includes 2017 court-ordered flushing and emergency dilution flows or the 2019 BiOp surface flushing flows downstream of Iron Gate Dam that would increase SSCs compared to existing conditions during these releases.

Volume I Section 4.4.2.2 Alternatives – Continued Operations with Fish Passage Alternative – Water Quality – Suspended Sediments – Potential Impact 4.2.2-2 Seasonal increases in algal-derived (organic) suspended material due to continued impoundment of water in the reservoirs, paragraph 2 on page 4-110:

In 2015, PacifiCorp installed a powerhouse intake barrier/thermal curtain in Iron Gate Reservoir under IM 11. ~~One of the purposes~~ The primary purpose of the curtain is to isolate ~~warmer, less dense near-surface waters while withdrawing cooler, denser, and deeper waters from the reservoir for release to the Klamath River downstream (PacifiCorp 2018). The other purpose is to isolate~~ surface waters that have high concentrations of blue-green algae (cyanobacteria) such that extensive summer and fall blooms are not readily released downstream to the Middle and Lower Klamath River (see further discussion in Section 4.4.2 *Water Quality*, Potential Impact 4.2.2-1 and Potential Impact 4.2.2-7), but PacifiCorp reports that the curtain also provides a secondary benefit of isolating warmer, less dense near-surface waters and drawing deeper cooler, denser water for release to the Klamath River downstream of Iron Gate Dam (PacifiCorp 2018). ~~Results from the intake barrier/thermal curtain~~ Water quality measurements during 2015 and 2016 when the intake barrier/thermal curtain was in use indicate that the curtain reduces entrainment of blue-green algae into the Iron Gate Powerhouse intake and subsequent release downstream into the Klamath River (PacifiCorp 2016, 2017), but water quality monitoring data from 2017 and 2018 downstream of Iron Gate Dam show multiple exceedances of the Klamath TMDLs phytoplankton chlorophyll-a target (i.e., 10 ug/L) and multiple microcystin posting limits (e.g., 6 ug/L for CCHAB Warning TEIR I; Table 3.2-10) (Watercourse Engineering, Inc. 2018, 2019). An analysis of the intake barrier/thermal curtain performance during 2017 or 2018 has not been published and PacifiCorp continues to test and refine the intake barrier/thermal curtain design and operations, but the available data do not indicate that this measure could improve algal-derived (organic) suspended material in the reservoirs such that they would no longer cause an exceedance of water quality standards (Table 3.2-4) or achieve the Klamath TMDLs phytoplankton chlorophyll-a target of 10 ug/L for Copco No.1 and Iron Gate reservoirs during the May to October growth season (North Coast Regional Board 2010). Additionally, potential reductions in the entrainment of blue-green algae downstream of Iron Gate Dam from operation of the intake barrier/thermal curtain would be potentially limited by the need to access water with higher dissolved oxygen concentrations to comply with dissolved oxygen standards, with the curtain completely rolled up during portions of 2017 to maximize dissolved oxygen concentrations for aquatic life (PacifiCorp 2018).

Volume I Section 4.4.2.2 Alternatives – Continued Operations with Fish Passage Alternative – Water Quality – Suspended Sediments – Potential Impact 4.2.2-2 Seasonal increases in algal-derived (organic) suspended material due to continued impoundment of water in the reservoirs, paragraph 1 on page 4-111:

While episodic large fluxes of algal-derived (organic) suspended material from phytoplankton growth in the Upper Klamath Lake would still likely enter the Hydroelectric Reach from upstream during some years even with nutrient measures in Oregon's Upper Klamath River and Lost River TMDLs (ODEQ 2019), these ~~Nutrient~~ nutrient reduction measures ~~in Oregon's Upper Klamath River and Lost River TMDLs~~ could, over time, decrease algal-derived (organic) suspended material in Copco No.1 and Iron Gate reservoirs ~~and could, in the long term, be beneficial to water quality~~ due to decreased nutrient availability reducing phytoplankton growth in the reservoirs.

Volume I Section 4.4.2.2 Alternatives – Continued Operations with Fish Passage Alternative – Water Quality – Nutrients, Potential Impact 4.2.2-4 Annual interception and retention of nutrients and seasonal release of nutrients due to continued impoundment of waters in the reservoirs. paragraph 2 on page 4-114:

With respect to the potential impact of 2017 court-ordered flushing and emergency dilution flows or the 2019 BiOp surface flushing flows on nutrients downstream of Iron Gate Dam under the Continued Operations with Fish Passage Alternative, since suspended sediments transported by these releases would be primarily mineral (inorganic) sediments there would be no change from existing conditions for nutrients due to implementation of these flows.

Volume I Section 4.4.2.4 Alternatives – Continued Operations with Fish Passage Alternative – Water Quality – Dissolved Oxygen – Potential Impact 4.2.2-5 Seasonal low dissolved oxygen concentrations due to continued impoundment of water in the reservoirs – Hydroelectric Reach, paragraph 5 on page 4-115:

Since 2007, PacifiCorp has developed several iterations of a proposed Reservoir Management Plan that put forward solutions to addressing water quality impairments associated with J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate dams, including dissolved oxygen. Study results, including those under IM 11 (see Table 4.2-1), have indicated that ~~while~~ proposed reservoir management techniques can improve some of the project impacts to water quality (e.g., transport of nuisance and/or noxious blue-green algae downstream of Iron Gate Dam [Austin et al. 2016, PacifiCorp 2018]), but the various techniques have not resulted in water quality improvements at Copco No. 1 or Iron Gate reservoirs that create the TMDL compliance lens nor have they otherwise sufficiently improved Lower Klamath Project impacts to dissolved oxygen (see Section 3.2.2.5 *Dissolved Oxygen*). Results from operation of a turbine venting system at Iron Gate Dam indicate that dissolved oxygen improvement is possible using this technique, however, turbine venting alone is insufficient to prevent dissolved

oxygen percent saturation values below the Basin Plan minimum dissolved oxygen criteria. The current Reservoir Management Plan (PacifiCorp 2014) lists operations and technologies that feasibility studies have indicated would improve dissolved oxygen concentrations to meet Basin Plan minimum dissolved oxygen criteria, but PacifiCorp has stated that it is not prepared to proceed with oxygen diffuser systems in the reservoirs and that further studies are necessary to determine whether other cost-effective technologies would sufficiently improve dissolved oxygen conditions (PacifiCorp 2014). Similarly, it is possible that further iterations of a Reservoir Management Plan would potentially include a combination of operations and technologies that would meet Basin Plan minimum dissolved oxygen criteria in the reservoirs and in the Klamath River downstream of the reservoirs. However, neither multiple iterations of the Reservoir Management Plans, nor additional testing under KHSA IM11, have indicated that this is feasible, and there currently is no proposed, feasible set of operations and technologies to sufficiently improve dissolved oxygen concentrations to meet Basin Plan minimum dissolved oxygen criteria. Therefore, an assumption that a future iteration of the current Reservoir Management Plan would adequately address the issue would be speculative at this point. Potential Impact 4.2.2-5 below discusses the potential for operations and technologies to improve dissolved oxygen conditions in the Hydroelectric Reach and the Middle and Lower Klamath River ~~these results~~, along with consideration of flow changes under this alternative.

Volume I Section 4.4.2.4 Alternatives – Continued Operations with Fish Passage Alternative – Water Quality – Dissolved Oxygen – Potential Impact 4.2.2-5 Seasonal low dissolved oxygen concentrations due to continued impoundment of water in the reservoirs – Hydroelectric Reach, paragraph 2 on page 4-116:

In 2015, PacifiCorp installed a powerhouse intake barrier/thermal curtain in Iron Gate Reservoir under IM 11 with the primary purpose of isolating~~. One of the purposes of the curtain is to isolate warmer, less dense near-surface waters while withdrawing cooler, denser, and deeper waters from the reservoir for release to the Klamath River downstream (PacifiCorp 2018). The other purpose is to isolate~~ surface waters that have high concentrations of blue-green algae (cyanobacteria) such that extensive summer and fall blooms are not readily released downstream from upstream or within Iron Gate Reservoir to the Middle and Lower Klamath River (see further discussion in Section 4.4.2.2 *[Continued Operations with Fish Passage] Water Quality – Suspended Sediments*, Potential Impact 4.2.2-2). The curtain also provides a potential secondary benefit of isolating warmer, less dense near-surface waters while withdrawing cooler, denser, and deeper waters from the reservoir for release to the Klamath River downstream (see further discussion in Section 4.4.2.1 *[Continued Operations with Fish Passage] Water Quality – Water Temperature*, Potential Impact 4.2.2-1) (PacifiCorp 2018). Results from deployment of the intake barrier/thermal curtain in 2016 indicate that the presence of the curtain can reduce mixing of reservoir surface waters near the curtain such that moderate (5 to 6 mg/L) to low

(approximately 2 to 5 mg/L) dissolved oxygen concentrations occur at depths from 2 to 12 meters due to respiration of dense phytoplankton blooms (PacifiCorp 2017). The curtain was completely rolled up during portions of 2017 to maximize dissolved oxygen concentrations for aquatic life (PacifiCorp 2018), so operation of the intake barrier/thermal curtain under this alternative would be limited when it is necessary to access water with higher dissolved oxygen concentrations to comply with dissolved oxygen standards in the Klamath River. Overall, while results from the Reservoir Management Plan feasibility investigations of in-reservoir oxygenation and deployment of an intake barrier/thermal curtain suggest that improvement in dissolved oxygen is possible in the reservoirs (PacifiCorp 2017, 2018), these studies have not resulted in water quality improvements at Copco No. 1 or Iron Gate reservoirs that meet TMDL requirements for dissolved oxygen in the reservoirs, nor have they otherwise sufficiently improved Lower Klamath Project impacts to dissolved oxygen in the Middle Klamath River immediately downstream of Iron Gate Dam (see below discussion under Middle and Lower Klamath River and Klamath River Estuary).

Volume I Section 4.4.2.4 Alternatives – Continued Operations with Fish Passage Alternative – Water Quality – Dissolved Oxygen – Potential Impact 4.2.2-5 Seasonal low dissolved oxygen concentrations due to continued impoundment of water in the reservoirs – Middle and Lower Klamath River and Klamath River Estuary, paragraph 1 on page 4-118:

There is currently no reasonable proposal to achieve the Klamath TMDLs compliance lens for dissolved oxygen in Copco No. 1 and Iron Gate reservoirs or Basin Plan minimum dissolved oxygen criteria (minimum dissolved oxygen criteria of 85 percent saturation for the period April 1 through September 30, and below the minimum criterion of 90 percent saturation for the period October 1 to March 31, for the Klamath River from Oregon-California state line [RM 214.1] to the Scott River [RM 145.1]; Table 3.2-4) with the dams remaining in place, despite the modest improvements achieved to date through implementation of ~~the~~ KHSA IMs that could be incorporated into a final Reservoir Management Plan.

Volume I Section 4.4.2.4 Alternatives – Continued Operations with Fish Passage Alternative – Water Quality – Dissolved Oxygen – Potential Impact 4.2.2-5 Seasonal low dissolved oxygen concentrations due to continued impoundment of water in the reservoirs – Middle and Lower Klamath River and Klamath River Estuary, paragraph 2 on page 4-118:

Alterations in dissolved oxygen concentrations due to implementation of the 2017 court-ordered flushing and emergency dilution flows or the 2019 BiOp surface flushing flows downstream of Iron Gate Dam would result in no significant impacts for the reasons described under the No Project Alternative (Section 4.2.2, Potential Impact 4.2.2-5).

Volume I Section 4.4.2.4 Alternatives – Continued Operations with Fish Passage Alternative – Water Quality – Dissolved Oxygen – Potential Impact 4.2.2-5 Seasonal low dissolved oxygen concentrations due to continued impoundment of water in the reservoirs – Middle and Lower Klamath River and Klamath River Estuary, paragraph 1 on page 4-119:

In 2015, PacifiCorp installed a powerhouse intake barrier/thermal curtain in Iron Gate Reservoir under IM 11with the primary purpose of isolating~~. One of the purposes of the curtain is to isolate warmer, less dense near-surface waters while withdrawing cooler, denser, and deeper waters from the reservoir for release to the Klamath River downstream (PacifiCorp 2018). The other purpose is to isolate~~ surface waters that have high concentrations of blue-green algae (cyanobacteria) such that extensive summer and fall blooms are not readily released from upstream or within Iron Gate Reservoir downstream to the Middle and Lower Klamath River (see further discussion in Section 4.4.2.2 *[Continued Operations with Fish Passage] Water Quality – Suspended Sediments*, Potential Impact 4.2.2-2). The curtain also provides a potential secondary benefit of isolating warmer, less dense near-surface waters while withdrawing cooler, denser, and deeper waters from the reservoir for release to the Klamath River downstream (see further discussion in Section 4.4.2.1 *[Continued Operations with Fish Passage] Water Quality – Water Temperature*, Potential Impact 4.2.2-1) (PacifiCorp 2018). Results from deployment of the intake barrier/thermal curtain in 2016 indicate that the presence of the curtain can reduce mixing of reservoir surface waters near the curtain such that low dissolved oxygen concentrations are entrained in the powerhouse intake, and to date turbine venting does not sufficiently improve dissolved oxygen concentrations in the Middle Klamath River immediately downstream of Iron Gate Dam (PacifiCorp 2018). The curtain was completely rolled up during portions of 2017 to maximize dissolved oxygen concentrations for aquatic life (PacifiCorp 2018), so operation of the intake barrier/thermal curtain under this alternative would be limited when it is necessary to access water with higher dissolved oxygen concentrations to comply with dissolved oxygen standards in the Klamath River.

Volume I Section 4.4.2.4 Alternatives – Continued Operations with Fish Passage Alternative – Water Quality – Dissolved Oxygen – Potential Impact 4.2.2-5 Seasonal low dissolved oxygen concentrations due to continued impoundment of water in the reservoirs – Middle and Lower Klamath River and Klamath River Estuary, paragraph 1 on page 4-120:

There is currently no reasonable proposal to achieve the Klamath TMDLs compliance lens for dissolved oxygen in Copco No. 1 and Iron Gate reservoirs or Basin Plan minimum dissolved oxygen criteria (minimum dissolved oxygen criteria of 85 percent saturation for the period April 1 through September 30, and below the minimum criterion of 90 percent saturation for the period October 1 to March 31, for the Klamath River from Oregon-California state line [RM 214.1] to

the Scott River [RM 145.1]; Table 3.2-4) with the dams remaining in place, despite the modest improvements achieved to date through implementation of ~~the~~ KHSA IMs that could be incorporated into a final Reservoir Management Plan.

Volume I Section 4.4.2.5 [Continued Operations with Fish Passage] Water Quality – pH, paragraph 3 on page 4-120:

The Klamath River is a naturally weakly buffered system with alkalinity typically less than 100 mg/L as calcium carbonate [CaCO3] (PacifiCorp 2004a; Karuk Tribe of California 2010), so it is susceptible to daily and seasonal swings in pH due photosynthesis by phytoplankton, periphyton, and macrophytes. The Continued Operations with Fish Passage Alternative would result in no change from the existing adverse condition with respect to pH values that exceed the Basin Plan instantaneous maximum pH objective of 8.5 s.u and large daily fluctuations in the Hydroelectric Reach in Copco No. 1 and Iron Gate reservoirs during summertime periods of intense algal blooms (see Section 3.2.2.6 *pH*).

Volume I Section 4.4.2.5 Alternatives – Continued Operations with Fish Passage Alternative – Water Quality – pH – Potential Impact 4.22-6 Seasonal high pH and daily pH fluctuations due to continued impoundment of water in the reservoirs – Hydroelectric Reach, paragraph 2 on page 4-121:

Also as described in Section 4.4.2 *[Continued Operations with Fish Passage] Water Quality* Potential Impacts 4.2.2-2, 4.2.2-4, and 4.2.2-5, nutrient reduction measures in Oregon and California's TMDLs would, over time, be beneficial to pH. However, the measures necessary to achieve significant reductions are, at this point, unknown and reductions are likely to require decades to achieve. As there is currently no reasonable proposal to achieve TMDL targets and meet applicable water quality standards for water temperature, nutrients, and dissolved oxygen, elevated pH in the surface waters of Copco No. 1 and Iron Gate reservoirs during summer and fall months would continue to occur. Warmer water temperatures under climate change also would further exacerbate seasonal phytoplankton blooms in the Hydroelectric Reach, increasing pH variations and potentially resulting in more frequent exceedances of pH water quality standards in the Hydroelectric Reach in the long term compared to existing conditions. ~~and overall there is currently no reasonable proposal to achieve TMDL targets and meet applicable water quality standards for water temperature, nutrients and dissolved oxygen, which would also continue to result in elevated pH in the surface waters of Copco No. 1 and Iron Gate reservoirs during summer and fall months.~~ Overall, the Continued Operations with Fish Passage Alternative would result in no change from existing adverse conditions and would continue to cause an exceedance of pH water quality standards in the Hydroelectric Reach.

Volume I Section 4.4.2.5 Alternatives – Continued Operations with Fish Passage Alternative – Water Quality – pH – Potential Impact 4.22-6 Seasonal high pH and daily pH fluctuations due to continued impoundment of water in the reservoirs – Middle and Lower Klamath River and Klamath River Estuary, paragraph 3 on page 4-121:

Alterations in pH due to implementation of the 2017 court-ordered flushing and emergency dilution flows or the 2019 BiOp flushing flows downstream of Iron Gate Dam would result in no significant impacts for the reasons described under the No Project Alternative (Section 4.2.2, Potential Impact 4.2.2-6).

Volume I Section 4.4.2.6 Alternatives – Continued Operations with Fish Passage Alternative – Water Quality – Chlorophyll-a and Algal Toxins – Potential Impact 4.2.2-7 Seasonal increases in chlorophyll-a and algal toxins due to continued impoundment of water in the reservoirs – Hydroelectric Reach, paragraph 1 on page 4-123:

While seasonal phytoplankton (including blue-green algae) blooms originating from Upper Klamath Lake (in Oregon) can enter J.C. Boyle Reservoir, the short residence time of this reservoir generally does not support substantial additional growth of algae (Section 3.2.2.3 Suspended Sediments and Appendix C.2.1.1). Microcystin concentrations greater than California water quality objectives have been infrequently measured to increase in J.C. Boyle Reservoir adjacent to the shore (e.g., Topsy Campground) compared to microcystin concentrations in the Klamath River upstream of the reservoir (Watercourse Engineering, Inc, 2016, 2017, E&S Environmental Chemistry 2018a), so there is potentially some localized *Microcystis aeruginosa* growth and microcystin production within J.C. Boyle Reservoir. However, measurements of *Microcystis aeruginosa* cell density and microcystin concentrations in the downstream J.C. Boyle Bypass and Peaking reaches suggest there is limited downstream transport of *Microcystis aeruginosa* microcystin from J.C. Boyle Reservoir (see Section 3.2.2.7 *[Water Quality] Chlorophyll-a and Algal Toxins*, Section 3.4.2.3 *[Phytoplankton and Periphyton] Hydroelectric Reach*, and Appendix C, Section 3.2.2.6 *Algal toxins and Chlorophyll-a* for further discussion). Increased minimum flows in the J.C. Boyle Bypass Reach and limitations on ~~of~~ peaking operations at J.C. Boyle Powerhouse under this alternative would not be expected to significantly affect ~~this~~ conditions in J.C. Boyle Reservoir and there would be no significant impact of the Continued Operations with Fish Passage Alternative on chlorophyll-*a* and algal toxin concentrations in the Hydroelectric Reach from J.C. Boyle Reservoir to the upstream end of Copco No. 1 Reservoir.

Volume I Section 4.4.2.6 Alternatives – Continued Operations with Fish Passage Alternative – Water Quality – Chlorophyll-a and Algal Toxins – Potential Impact 4.2.2-7 Seasonal increases in chlorophyll-a and algal toxins due to continued impoundment of water in the reservoirs – Hydroelectric Reach, paragraph 2 on page 4-123:

Warmer water temperatures under climate change would further exacerbate seasonal phytoplankton blooms in the Hydroelectric Reach, which would then be transported downstream. Further, ~~, and overall~~ there is currently no reasonable proposal to achieve TMDL targets and meet applicable water quality standards for water temperature, nutrients and dissolved oxygen, which would also continue to result in elevated chlorophyll-*a* concentrations and periodically high algal toxin concentrations in the surface waters of Copco No. 1 and Iron Gate reservoirs during summer and fall months.

Volume I Section 4.4.2.6 Alternatives – Continued Operations with Fish Passage Alternative – Water Quality – Chlorophyll-a and Algal Toxins – Potential Impact 4.2.2-7 Seasonal increases in chlorophyll-a – Middle and Lower Klamath River and Klamath River Estuary, paragraph 1 on page 4-124:

Downstream of Iron Gate Dam, this alternative would continue to result in similar chlorophyll-a and algal toxin trends when large phytoplankton blooms are transported from Iron Gate Reservoir into the Middle and Lower Klamath River and Klamath River Estuary. In 2015, PacifiCorp installed a powerhouse intake barrier/thermal curtain in Iron Gate Reservoir under IM 11 with the primary purpose of isolating surface waters that have high concentrations of blue-green algae (cyanobacteria) and potentially limiting the release of Iron Gate Reservoir water containing extensive summer and fall blue-green algae blooms downstream to the Middle and Lower Klamath River. The curtain also provides a potential secondary benefit of isolating warmer, less dense near-surface waters while withdrawing cooler, denser, and deeper waters from the reservoir for release to the Klamath River downstream (see further discussion in Section 4.4.2.1 *[Continued Operations with Fish Passage] Water Quality – Water Temperature*, Potential Impact 4.2.2-1) (PacifiCorp 2018). Water quality measurements during 2015 and 2016 when the intake barrier/thermal curtain was in use indicate that the curtain reduces entrainment of blue-green algae into the Iron Gate Powerhouse intake and subsequent release downstream into the Klamath River (PacifiCorp 2016, 2017). However, water quality monitoring data from 2017 and 2018 downstream of Iron Gate Dam show multiple exceedances of the Klamath TMDLs phytoplankton chlorophyll-a target (i.e., 10 ug/L) and the microcystin thresholds of significance (i.e., 4 ug/L) and multiple microcystin posting limits (e.g., 6 ug/L for CCHAB Warning TEIR I; Table 3.2-10) (Watercourse Engineering, Inc. 2018, 2019). An analysis of the intake barrier/thermal curtain performance during 2017 or 2018 has not been published and PacifiCorp continues to test and refine the intake barrier/thermal curtain design and operations, but available data do not indicate that this measure would prevent releases from Iron Gate Dam that would exceed water quality standards (Table 3.2-4) or consistently achieve the Klamath TMDLs phytoplankton chlorophyll-*a* target of 10 ug/L for Copco No. 1 and Iron Gate reservoirs during the May to October growth season (North Coast Regional Board 2010). Additionally, potential reductions in the entrainment of blue-green algae,

chlorophyll-a concentrations, and microcystin concentrations downstream of Iron Gate Dam from operation of the intake barrier/thermal curtain would be potentially limited by the need to access water with higher dissolved oxygen concentrations to comply with dissolved oxygen standards, with the curtain completely rolled up during portions of 2017 to maximize dissolved oxygen concentrations for aquatic life (PacifiCorp 2018).

Volume I Section 4.4.2.6 Alternatives – Continued Operations with Fish Passage Alternative – Water Quality – Chlorophyll-a and Algal Toxins – Potential Impact 4.2.2-7 Seasonal increases in chlorophyll-a and algal toxins due to continued impoundment of water in the reservoirs – Middle and Lower Klamath River and Klamath River Estuary, paragraph 2 on page 4-124:

The improvement actions described in Section 4.4.2 *[Continued Operations with Fish Passage] Water Quality* Potential Impacts 4.2.2-2, 4.2.2-4, 4.2.2-5, and 4.2.2-6 do not indicate that this measure could reduce the extent of phytoplankton blooms in the upstream Lower Klamath Project reservoirs such that they would no longer cause exceedances of chlorophyll-*a* or algal toxin standards in the Middle and Lower Klamath River. A powerhouse intake barrier/thermal curtain was installed in Iron Gate Reservoir during 2015 under IM 11 to isolate surface waters that have high concentrations of blue-green algae (cyanobacteria) such that extensive summer and fall blooms are not readily released downstream to the Middle and Lower Klamath River (see further discussion in Section 4.4.2 *Water Quality* Potential Impact 4.2.2-1 and Potential Impact 4.2.2-2), with PacifiCorp reporting that the curtain also provides a secondary benefit of isolating warmer, less dense near-surface waters and drawing deeper cooler, denser water for release to the Klamath River downstream of Iron Gate Dam (PacifiCorp 2018). Water quality measurements during 2015 and 2016 when the intake barrier/thermal curtain was in use indicate that the curtain reduces entrainment of blue-green algae into the Iron Gate Powerhouse intake and subsequent release downstream into the Klamath River (PacifiCorp 2016, 2017), but water quality monitoring data from 2017 and 2018 downstream of Iron Gate Dam show multiple exceedances of the Klamath TMDLs phytoplankton chlorophyll-a target (i.e., 10 ug/L) and multiple microcystin posting limits (e.g., 6 ug/L for CCHAB Warning TEIR I; Table 3.2-10) (Watercourse Engineering, Inc. 2018, 2019). An analysis of the intake barrier/thermal curtain performance during 2017 or 2018 has not been published and PacifiCorp continues to test and refine the intake barrier/thermal curtain design and operations, but the available data do not indicate that this measure could reduce transport of chlorophyll-a or algal toxins (e.g., microcystin) from the reservoirs into the Klamath River downstream of Iron Gate Dam such that releases from Iron Gate Dam would not cause exceedances of water quality standards (Table 3.2-4) or achieve the Klamath TMDLs phytoplankton chlorophyll-a target of 10 ug/L for Copco No.1 and Iron Gate reservoirs during the May to October growth season (North Coast Regional Board 2010). Furthermore, potential reductions in the entrainment of blue-green algae,

chlorophyll-a, and algal toxins (e.g., microcystin) downstream of Iron Gate Dam from operation of the intake barrier/thermal curtain would be potentially limited by the need to access water with higher dissolved oxygen concentrations to comply with dissolved oxygen standards, with the curtain completely rolled up during portions of 2017 to maximize dissolved oxygen concentrations for aquatic life (PacifiCorp 2018). Alterations in chlorophyll-a and algal toxins due to implementation of the 2017 court-ordered flushing and emergency dilution flows or the 2019 BiOp flushing flows downstream of Iron Gate Dam would result in no significant impacts for the reasons described under the No Project Alternative (see Section 4.2.2, Potential Impact 4.2.2-7).

Volume I Section 4.4.2.7 Alternatives – Continued Operations with Fish Passage Alternative – Water Quality – Inorganic and Organic Contaminants, paragraph 34 on page 4-125:

Alterations in human and freshwater aquatic species' exposure to inorganic and organic contaminants due to implementation of the 2017 court-ordered flushing and emergency dilution flows or the 2019 BiOp flushing flows downstream of Iron Gate Dam would result in no significant impacts for the reasons described under the No Project Alternative (Section 4.2.2, Potential Impact 4.2.2-8).

4.4.3 Aquatic Resources

Volume I Section 4.4.3.2 Alternatives – Continued Operations with Fish Passage Alternative – Aquatic Resources – Bed Elevation and Grain Size Distribution, paragraph 2 on page 4-126:

Additionally, as described in Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*, in 2017, the United States District Court ordered USBR to change operations to meet court-ordered flushing flows below Iron Gate Dam. These flows are not modeled as part of existing conditions hydrology because they went into effect in February 2017 after the December 2016 Notice of Preparation was filed. These flows were intended to increase bedload mobilization during the years in which they occurred (2017, 2018). In March 2019, the court-required re-initiation of USBR consultation with NMFS and USFWS was completed and new biological opinions (BiOps) were issued by NMFS (2019) and USFWS (2019a). The 2019 BiOp flow requirements include annual surface flushing flows and the potential for dilution flows and/or enhanced spring flows should water be available and disease conditions support their use (see Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*). The flushing ~~These~~ flows increase bedload mobilization during the years in which they ~~are ordered by the court~~ occur.

Volume I Section 4.4.3.3 Alternatives – Continued Operations with Fish Passage Alternative – Aquatic Resources – Water Quality, paragraph 1 on page 4-127:

The combination of warm water temperatures in surface waters and low dissolved oxygen below approximately 10 meters would potentially limit upstream migration of a proportion of fall-run Chinook salmon through the Hydroelectric Reach, unless migrating fish are able to remain within a water depth shallow enough to provide suitable dissolved oxygen and deep enough to avoid unsuitable water temperatures. Migrating at night and use of thermal refugia from Fall Creek and other cool water tributaries, would increase the ability of fall-run Chinook salmon to migrate through reservoirs under this alternative. If the trap and haul fish passage option was implemented consistent with FERC (2007), these water quality migration impediments would be further avoided (as described in Section 4.4.3.7 *Fish Passage*).

Volume I Section 4.4.3.4 Alternatives – Continued Operations with Fish Passage Alternative – Aquatic Resources – Fish Disease and Parasites, paragraph 1 on page 4-129:

Additionally, as described in Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*, in 2017, the United States District Court ordered USBR to change operations to meet court-ordered flushing and dilution flows below Iron Gate Dam. These flows are not modeled as part of existing conditions hydrology because they went into effect in February 2017 after the December 2016 Notice of Preparation was filed. These flows ~~are aimed at~~ were intended to reduce~~ing~~ fish disease downstream of Iron Gate Dam in the years in which they occurred (2017, 2018). ~~This alternative assumes that these flows would continue to be required, because the addition of habitat alone is unlikely to eliminatethe current nidus downstream of Iron Gate Dam under the Continued Operations with Fish Passage Alternative.~~ In March 2019, the court-required re-initiation of USBR consultation with NMFS and USFWS was completed and new biological opinions (BiOps) were issued by NMFS (2019) and USFWS (2019a). The 2019 BiOp flow requirements include annual surface flushing flows and the potential for dilution flows and/or enhanced spring flows should water be available and disease conditions support their use (see Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project)*.

Therefore, under this alternative, fish disease would potentially be reduced by the addition of habitat and associated reduction in crowding below Iron Gate Dam, and the ~~continued operation of 2017~~ flushing flow requirements. While there has not been sufficient time to collect data characterizing the efficacy of the flushing flows since they were initiated in 2017, the necessity to use dilution flows in 2018 and 2019 suggests that flushing flows are insufficient on their own to resolve the fish disease nidus downstream of Iron Gate Dam. ~~The flushing flow and dilution requirements alone have not been successful in eliminating the disease nidus to date.~~ Thus, although the conditions leading to nidus downstream of Iron Gate Dam ~~will~~ would be ameliorated by reduced crowding, and by ~~flushing and dilution enhancement~~ flushing flows and the potential for dilution flows~~as required by the~~

~~2017 court order~~, the nidus is anticipated to continue to occur to some degree under the Continued Operations with Fish Passage Alternative.

Volume I Section 4.4.3.6 Alternatives – Continued Operations with Fish Passage Alternative – Aquatic Resources – Aquatic Habitat and Instream Flows, paragraph 3 on page 4-131:

These actions are also beneficial for coho salmon (particularly from the Upper Klamath River Population Unit). Implementation of the Coho Enhancement Fund under the ~~No Project Alternative~~ Continued Operations with Fish Passage Alternative would have no significant impact (no change from existing conditions) on redband trout, shortnose and Lost River suckers, green sturgeon, eulachon, and Southern Resident Killer Whales, since these species are not found in or near the river reaches associated with IM2 projects or actions.

Volume I Section 4.4.3.7 [Continued Operations with Fish Passage] Aquatic Resources – Fish Passage, paragraph 3 on page 4-131:

Therefore, trap and haul was predicted to have lower cumulative mortality than volitional ladders, since this option would avoid mortality associated with passage through the Lower Klamath Project reservoirs and riverine habitat that would be bypassed. ~~FERC (2007)~~Oosterhout (2005), as subsequently cited by FERC (2007), predicted that average cumulative mortality for adult Chinook salmon migrating upstream from Iron Gate Dam to upstream of J.C. Boyle Dam would be 21 percent for trap and haul (including delayed mortality of adults transported in trucks). The Oosterhout (2005) mortality prediction for juveniles migrating downstream from ~~Upper Klamath Lake~~J.C. Boyle Reservoir to downstream of Iron Gate Dam averaged 19 percent (Option 1C in Oosterhout 2005)~~to downstream of Iron Gate was 46 percent for trap and haul. However, the FERC analysis did not consider the impacts of the trap and haul operation itself, such as handling and trucking stress and mortality.~~ The recent review of Lusardi and Moyle (2017) note that adults trapped and hauled upstream can experience high ~~(> 20 percent)~~ pre-spawn mortality rates (which are incorporated into the predictions used here), and juvenile salmonids transported downstream are observed to experience delayed mortality, reduced growth rates, and increased predation. ~~Therefore, for purposes of comparing the impacts of the Continued Operations with Fish Passage alternative with the impacts of trap and haul, this analysis does not assume that mortality would be different from that estimated for volitional fishways reported by FERC (2007). In addition,~~

For this analysis, it is assumed that mortality ~~effects~~ from ~~of~~ passage through trap and haul facilities would be equivalent for other migratory species, which is a reasonable assumption for modern fishways designed to accommodate all species (including Pacific lamprey).

Volume I Section 4.4.3.7 [Continued Operations with Fish Passage] Aquatic Resources – Fish Passage – Potential Impact 4.2.3-1 Effects on coho salmon critical habitat quality and quantity due to continued operations of the Lower Klamath Project, paragraph 1 on page 4-134:

As under existing conditions, this thermal stress may continue to contribute to coho salmon being more susceptible to disease downstream of Iron Gate Dam to the confluence of the Salmon River.

Volume I Section 4.4.3.7 [Continued Operations with Fish Passage] Aquatic Resources – Fish Passage – Potential Impact 4.2.3-1 Effects on coho salmon critical habitat quality and quantity due to continued operations of the Lower Klamath Project, paragraph 3 on page 4-134:

Delay, injury, and mortality could occur for upstream migrating adults, and downstream migrating juveniles, as described in Section 4.4.3.7 *Fish Passage*~~,~~ ~~upstream migrating adult mortality within fishways is predicted to be approximately 28 percent, and 58 percent for downstream migrating juveniles (FERC 2007)~~. Increased production resulting from increased habitat access is anticipated to off-set losses from fish passage injury and mortality (FERC 2007). Since mortality estimates are cumulative assuming migration through all facilities past all dams and through all reservoirs, any upstream migrating adults that migrated past fewer facilities and reservoirs and spawned in Fall or Jenny creeks for example, would have much lower morality (e.g., 10 percent for adults, FERC 2007). The same is true for downstream migrating juveniles; the fewer facilities and reservoirs required during downstream migration, the lower the cumulative mortality. Trap and haul operations are also predicted to have lower cumulative mortality during passage than volitional fishways.

Volume I Section 4.4.3.7 [Continued Operations with Fish Passage] Aquatic Resources – Fish Passage – Potential Impact 4.2.3-7 Effects on the fall-run Chinook salmon population due to continued operations of the Lower Klamath Project – Upper Klamath River and Connected Waterbodies, paragraph 6 on page 4-136:

This would be a potential increase in access to 49 significant tributaries in the Upper Klamath Basin, comprising hundreds of miles of additional potentially productive habitat (DOI 2007), including access to groundwater discharge areas relatively resistant to effects of climate change (Hamilton et al. 2011).

Oosterhout (2005) estimated that fall-run Chinook salmon spawner abundance for the Continued Operations with Fish Passage Alternative with volitional fish passage would be around 29,754, or around 28,539 with trap and haul facilities (under a no harvest assumption). Either fish passage option produced about 12,000 fewer adults than modeling dam removal similar to the Proposed Project. However, under this alternative, Iron Gate Hatchery would continue to target

current annual production goals as described in Section 3.3.2.3 *Habitat Attributes Expected to be Affected by the Proposed Project – Fish Hatcheries*, resulting in a greater abundance of fall-run Chinook salmon production than predicted under the Proposed Project.

Volume I Section 4.4.3.7 [Continued Operations with Fish Passage] Aquatic Resources – Fish Passage – Potential Impact 4.2.3-7 Effects on the fall-run Chinook salmon population due to continued operations of the Lower Klamath Project – Upper Klamath River and Connected Waterbodies, paragraph 2 on page 4-137:

It is anticipated juveniles would migrate downstream with mortality from predation and poor water quality considered in the estimates of passage survival discussed in Section 4.4.3.7 *Fish Passage*. ~~As described in Section 4.4.3.7 *Fish Passage*, upstream migrating adult mortality within fishways is predicted to be approximately 28 percent, and 58 percent for downstream migrating juveniles (FERC 2007).~~ Increased production resulting from increased habitat access is anticipated to off-set losses from fish passage injury and mortality (FERC 2007). Since mortality estimates are cumulative assuming migration through all facilities past all dams and through all reservoirs, the fewer facilities and reservoirs required during downstream migration, the lower the cumulative mortality in the reach. Trap and haul operations are also predicted to have lower cumulative mortality during passage than volitional fishways.

Volume I Section 4.4.3.7 [Continued Operations with Fish Passage] Aquatic Resources – Fish Passage – Potential Impact 4.2.3-7 Effects on the fall-run Chinook salmon population due to continued operations on the Lower Klamath Project – Middle and Lower Klamath River, paragraph 3 on page 4-139:

Despite modest improvements in dissolved oxygen concentrations from implementation of actions contained within the current Reservoir Management Plan (i.e., turbine venting system at Iron Gate Dam; see discussion in Section 4.4.2.1 *[Continued Operations with Fish Passage] Water Temperature*, Potential Impact 4.2.2-1 and Appendix C – *Section C.4.2*), dissolved oxygen concentrations during August through October immediately downstream from Iron Gate Dam would continue to be low (less than 7 mg/l ~~85 percent saturation~~ during August through September and ~~90~~ less than 8 mg/l~~percent saturation~~ from October and November (see Figure 3.2-20 in Section 3.2.2.5 *Dissolved Oxygen*). Dissolved oxygen concentration in this range during typical fall water temperatures would mostly be a risk for incubating eggs and could cause moderate production impairment (Carter 2008).

Volume I Section 4.4.3.7 Alternatives – Continued Operations with Fish Passage Alternative – Aquatic Resources – Fish Passage – Potential Impact 4.2.3-8 Effects on the spring-run Chinook salmon population due to continued operations

of the Lower Klamath Project – Upper Klamath River — Hydroelectric Reach, paragraph 3 on page 4-141:

It is anticipated that adults will migrate upstream through inundated reservoir habitat, and that juveniles will migrate downstream with mortality from predation and poor water quality considered in the estimates of passage survival discussed in Section 4.4.3.7 *Fish Passage*. ~~As described in Section 4.4.3.7 *Fish Passage*, upstream migrating adult mortality within fishways is predicted to be approximately 28 percent, and 58 percent for downstream migrating juveniles (FERC 2007).~~

Volume I Section 4.4.3.7 Alternatives – Continued Operations with Fish Passage Alternative – Aquatic Resources – Fish Passage – Potential Impact 4.2.3-9 Effects on coho salmon populations due to continued operations of the Lower Klamath Project – Upper Klamath River — Hydroelectric Reach, paragraph 6 on page 4-145:

It is anticipated that adults will migrate upstream through inundated reservoir habitat, and that juveniles will migrate downstream with mortality from predation and poor water quality considered in the estimates of passage survival discussed in Section 4.4.3.7 *Fish Passage*. ~~As described in Section 4.4.3.7 *Fish Passage*, upstream migrating adult mortality within fishways is predicted to be around 28 percent, and 58 percent for downstream migrating juveniles (FERC 2007).~~ Since mortality estimates are cumulative assuming migration through all facilities past all dams and through all reservoirs, any upstream migrating adults that migrated past fewer facilities and reservoirs and spawned in Fall or Jenny creeks for example, would have much lower morality (e.g., 10 percent for adults, FERC 2007). The same is true for downstream migrating juveniles; the fewer facilities and reservoirs required during downstream migration, the lower the cumulative mortality (FERC 2007). <u>Trap and haul operations are also predicted to have lower cumulative mortality during passage than volitional fishways.</u>

Volume I Section 4.4.3.7 Alternatives – Continued Operations with Fish Passage Alternative – Aquatic Resources – Fish Passage – Potential Impact 4.2.3-10 Effects on the steelhead population due to continued operations of the Lower Klamath Project, paragraph 2 on page 4-150:

It is anticipated that adults will migrate upstream through inundated reservoir habitat, and that juveniles will migrate downstream with mortality from predation and poor water quality considered in the estimates of passage survival discussed in Section 4.4.3.7 *Fish Passage*. ~~As described in Section 4.4.3.7 *Fish Passage*, upstream migrating adult mortality within fishways is predicted to be around 28 percent, and 58 percent for downstream migrating juveniles (FERC 2007).~~ Increased production resulting from increased habitat access is anticipated to off-set losses from fish passage injury and mortality (FERC 2007). Since mortality estimates are cumulative assuming migration through all facilities past all dams

and through all reservoirs, any upstream migrating adults that migrated past fewer facilities and reservoirs and spawned in Fall or Jenny creeks for example, would have much lower morality (e.g., 10 percent for adults, FERC 2007). The same is true for downstream migrating juveniles; the fewer facilities and reservoirs required during downstream migration, the lower the cumulative mortality. Trap and haul operations are also predicted to have lower cumulative mortality during passage than volitional fishways.

Volume I Section 4.4.3.7 Alternatives – Continued Operations with Fish Passage Alternative – Aquatic Resources – Fish Passage – Potential Impact 4.2.3-11 Effects on the Pacific lamprey population due to continued operations of the Lower Klamath Project – Upper Klamath River — Hydroelectric Reach, paragraph 1 on page 4-153:

It is anticipated that adults will migrate upstream through inundated reservoir habitat, and that juveniles will migrate downstream with mortality from predation and poor water quality considered in the estimates of passage survival discussed in Section 4.4.3.7 *Fish Passage*. ~~As described in Section 4.4.3.7 *Fish Passage*, upstream migrating adult mortality within fishways is predicted to be around 28 percent, and 58 percent for downstream migrating juveniles (FERC 2007).~~ Since mortality estimates are cumulative assuming migration through all facilities past all dams and through all reservoirs, any upstream migrating adults that migrated past fewer facilities and reservoirs and spawned in Fall or Jenny creeks for example, would have much lower morality (e.g., 10 percent for adults, FERC 2007). The same is true for downstream migrants; the fewer facilities and reservoirs required during downstream migration, the lower the cumulative mortality. Trap and haul operations are also predicted to have lower cumulative mortality during passage than volitional fishways. Increased production resulting from increased habitat access is anticipated to off-set losses from fish passage injury and mortality (FERC 2007).

Volume I Section 4.4.3.7 Alternatives – Continued Operations with Fish Passage Alternative – Aquatic Resources – Fish Passage – Potential Impact 4.2.3-13 Effects on Lost River and shortnose sucker populations due to continued operations of the Lower Klamath Project, paragraph 8 on page 4-155:

~~Overall, i~~There are no available data to ~~t is speculative to~~ determine whether increased access to spawning habitat outweigh the ~~increased risk~~impacts to the population of hybridization, or vice-versa. Increased risk of hybridization negates any potential long-term benefits of habitat connectivity, but increased risk of hybridization is unlikely to pose a long-term significant impact, since hybridization is already occurring in the Upper Klamath Lake population even in the absence of upstream passage from Lower Klamath Project reservoirs.

Volume I Section 4.4.3.7 Alternatives – Continued Operations with Fish Passage Alternative – Aquatic Resources – Fish Passage – Potential Impact 4.2.3-14

Effects on the redband trout population due to continued operations of the Lower Klamath Project – Upper Klamath River and Connected Waterbodies, paragraph 3 on page 4-156:

New fish passage facilities would improve access to Spencer Creek, which provides important spawning habitat and temperature refugia for redband trout (DOI 2007, Buchanan et al. 2011b). New upstream fish passage would also improve connectivity of resident redband populations in the mainstem Klamath River to those in Lake Ewauna, the Link River, and Upper Klamath Lake (DOI 2007). If trap and haul as described by FERC (2007) were implemented, redband trout would not have access to expanded habitat because the upstream entrance to the trapping facility would be located downstream of Iron Gate Dam, downstream of the range for redband trout.

Volume I Section 4.4.3.7 Alternatives – Continued Operations with Fish Passage Alternative – Aquatic Resources – Fish Passage – Potential Impact 4.2.3-14 Effects on the redband trout population due to continued operations of the Lower Klamath Project – Summary, paragraph 3 on page 4-157:

The habitat improvements and increased connectivity would confer greater population-level benefits than the expected mortality within the fishways, resulting in overall benefits to redband trout in the long term. If passage were provided through trap and haul as described by FERC (2007), there would not be an increase in accessible habitat for redband trout since the upstream entrance to the trapping facility would be located downstream of Iron Gate Dam, downstream of the range for redband trout.

Volume I Section 4.4.3.7 Alternatives – Continued Operations with Fish Passage Alternative – Aquatic Resources – Fish Passage – Potential Impact 4.2.3-8 Effects on the spring-run Chinook salmon population due to continued operations of the Lower Klamath Project – Upper Klamath River — Hydroelectric Reach, paragraph 3 on page 4-141:

It is anticipated that adults will migrate upstream through inundated reservoir habitat, and that juveniles will migrate downstream with mortality from predation and poor water quality considered in the estimates of passage survival discussed in Section 4.4.3.7 *Fish Passage*. ~~As described in Section 4.4.3.7 *Fish Passage*, upstream migrating adult mortality within fishways is predicted to be approximately 28 percent, and 58 percent for downstream migrating juveniles (FERC 2007).~~ As mortality estimates are cumulative assuming migration through all facilities past all dams and through all reservoirs, any upstream migrating adults that migrated past fewer facilities and reservoirs and spawned in Fall or Jenny creeks for example, would have much lower morality (e.g., 10 percent for adults, FERC 2007). The same is true for downstream migrating juveniles; the fewer facilities and reservoirs required during downstream migration, the lower

the cumulative mortality. Trap and haul operations are also predicted to have lower cumulative mortality during passage than volitional fishways.

*Volume I Section 4.4.3.7 Alternatives – Continued Operations with Fish Passage Alternative – Aquatic Resources – Fish Passage – Potential Impact 4.2.3-9 Effects on coho salmon populations due to continued operations of the Lower Klamath Project – Upper Klamath River — Hydroelectric Reach**,** paragraph 6 on page 4-145:*

It is anticipated that adults will migrate upstream through inundated reservoir habitat, and that juveniles will migrate downstream with mortality from predation and poor water quality considered in the estimates of passage survival discussed in Section 4.4.3.7 *Fish Passage*. ~~As described in Section 4.4.3.7 *Fish Passage*, upstream migrating adult mortality within fishways is predicted to be around 28 percent, and 58 percent for downstream migrating juveniles (FERC 2007).~~ Since mortality estimates are cumulative assuming migration through all facilities past all dams and through all reservoirs, any upstream migrating adults that migrated past fewer facilities and reservoirs and spawned in Fall or Jenny creeks for example, would have much lower morality (e.g., 10 percent for adults, FERC 2007). The same is true for downstream migrating juveniles; the fewer facilities and reservoirs required during downstream migration, the lower the cumulative mortality. Trap and haul operations are also predicted to have lower cumulative mortality during passage than volitional fishways.

4.4.5 Terrestrial Resources

Volume I Section 4.4.5.1 Alternatives – Continued Operations with Fish Passage Alternative – Terrestrial Resources – Vegetation Communities – Mitigation Measure TER-5 – Identification, protection, and restoration of wetland and riparian habitats, paragraph 1 on page 4-166:

Mitigation Measure TER-5 − Identification, protection, and restoration of wetland and riparian habitats.
The KRRC shall conduct a wetland delineation within the limits of construction in accordance with the 1987 U.S. Army Corps of Engineers (USACE) Wetland Delineation Manual (USACE 1987) and applicable Regional Supplements (i.e., Western Mountains, Valleys, and Coast Region [USACE 2010] and Arid West [USACE 2008]). The results of the wetland delineation shall be incorporated into the Continued Operations with a Continued Operations with Fish Passage Alternative, the Two Dam and Three Dam designs to avoid and minimize direct impacts on wetlands to the maximum extent feasible, and wetland areas adjacent to the construction Limits of Work shall be fenced to prevent inadvertent entry. Where avoidance is not feasible the KRRC shall develop a restoration plan to re-vegetate all areas disturbed during construction with a ~~goal~~ requirement of no net loss of wetland or riparian habitat acreage or no net loss of overall ~~and~~ functions and values. The restoration plan shall include details on revegetation native seed mixes based on existing species that will be impacted and installation

techniques for container plants and seeds. Wetlands established in restored areas would be monitored for five years or until the performance criteria, as defined in the restoration plant that shall be developed, have been met.

Volume I Section 4.4.5.3 Alternatives – Continued Operations with Fish Passage Alternative – Terrestrial Resources – Special-status Species, paragraph 1 on page 4-168:

Compared to the existing condition, the substantial construction involved with constructing fish passage facilities would have the potential to significantly impact special-status wildlife species for the reasons described above and in Section 3.5.5 (Potential Impacts 3.5-10, 3.5-11, 3.5-12, 3.5-13, 3.5-14, and 3.5-28). Implementation of Mitigation Measures TER-2, ~~and~~ TER-3, TER-6, and TER-7 would reduce construction-related impacts, including in-water work, on all special-status amphibian species, gray wolf, and bald and golden eagles to less than significant. Implementation of Recommended Terrestrial Measures 3–~~12~~10 and 12 would reduce impacts on special-status birds and mammals to less than significant. Implementation of the TER-2 and TER-3 measures would be enforceable through inclusion in a water quality certification. Therefore, the TER-2 and TER-3 measures are feasible and Potential Impact 3.5-10 would result in no significant impacts on amphibian and reptile with mitigation from construction-related impacts and Potential Impact 3.5-28 impacts would be reduced for the reasons described in Section 3.5.5.3 *Terrestrial Resources Potential Impacts and Mitigation*. Implementation of Mitigation Measures TER-6 and TER-7 would be covered under the United States Fish and Wildlife Service (USFWS) Endangered Species Act permit authority and impacts on the gray wolf and bald and golden eagles from construction-related impacts (Potential Impacts 3.5-10 and 3.5-13). It is not clear, however, whether the hydroelectric project owner or operator would implement the Recommended Terrestrial Measures 3–10 and 12 (Potential Impacts 3.5-10, 3.5-11, 3.5-12, ~~3.5-13,~~ 3.5-14, and 3.5-28) through 'good citizen' agreements, as described in the Definite Plan, and it is unclear how these recommended terrestrial measures would be enforced in light of Federal Power Act preemption. Without an enforcement mechanism, these restoration activities cannot be deemed feasible for the purposes of CEQA. Therefore, this impact on special-status birds~~,~~ and mammals would be significant and unavoidable.

4.4.8 Water Supply/Water Rights

Volume I Section 4.4.8 Alternatives – Continued Operations with Fish Passage Alternative – Water Supply/Water Rights, paragraph 1 on page 4-170.

Flow increases in the J.C. Boyle and Copco No. 2 bypass reaches are related to minimum instream flows in the Hydroelectric Reach and would not impact water supply or water rights downstream of Iron Gate Dam. Similarly, there would be no changes to water supply/water rights related to the 2017 court-ordered flushing and emergency dilution flow requirements, or the 2019 BiOp flushing

flow requirements, which is discussed in detail in Potential Impact 4.2.8-1. Overall, the Continued Operations with Fish Passage Alternative would not affect water supply/water rights as compared with the existing condition.

4.4.11 Geology, Soils, and Mineral Resources

Volume I Section 4.4.11 Alternatives – Continued Operations with Fish Passage Alternative – Geology, Soils, and Mineral Resources, paragraph 2 on page 4-172.

Increases in minimum flows and decreases in peaking flows due to changes in J.C. Boyle Dam and Copco No. 2 Dam operations, plus the 2013 BiOp Flows with the 2017 court-ordered winter-spring surface flushing flows and deep flushing flow requirements at Iron Gate Dam (and emergency dilution flows, if needed), which ~~that~~ were in effect from February 2017 to March 2019 (i.e., at the time of the Draft EIR) (see also Section 4.2.1.1 *[No Project] Alternative Description – Summary of Available Hydrology Information for the No Project Alternative)*, would result in an overall increase in flows under this alternative compared to existing conditions. The 2019 BiOp Flows that are currently in effect require surface flushing flows (6,030 cfs), without deep flushing or emergency dilution flow requirements; therefore, although minimum flows would be increased with changes in dam operations under this alternative, peaking flows would be similar to historical conditions under the 2019 BiOp Flows. New sediment supply would not occur under this alternative, regardless of the flow regime. With the 2013 BiOp Flows and 2017 court-ordered flushing and emergency dilution flows, ~~While~~ the additional flows would increase the mobility of existing surficial fine sediment deposits and infilled fine sediment from the armor layer, with potential for ~~slight~~continued mobilization of the armor layer on an approximately decadal scale (i.e., with 10- to 12-year return period probability flows) in some locations. With the 2019 BiOp Flows, sediment mobilization would be similar to historical conditions. However, given that there would be no new sediment supply under either of the flow conditions, ~~maintenance of static~~the conditions of channel features under the Continued Operations with Fish Passage Alternative would ~~represent no~~not change substantially from~~s~~ existing adverse conditions for the Middle Klamath River between Iron Gate Dam and the confluence with the Scott River.

4.4.12 Historical and Tribal Cultural Resources

Volume I Section 4.4.12 Alternatives – Continued Operations with Fish Passage Alternative – Historical Resources and Tribal Cultural Resources, paragraph 2 on page 4-173.

Under the Continued Operations with Fish Passage Alternative, construction activities to install fish ladders would occur at all four Lower Klamath Project dam complexes. Construction activities would result from the development of structures to support these fish passage options; however, the overall area of

ground disturbance would be reduced as less structures would be removed. While construction-related impacts under this alternative would be less than those described for the Proposed Project, there would still be potential for construction-related impacts due to ground-disturbance, heavy equipment, and blasting such that Potential Impacts 3.12-1, 3.12-4, and 3.12-5 for tribal cultural resources and Potential Impacts 3.12-~~12~~11, 3.12-15, and 3.12-16 for historic-period archaeological resources, would occur in the manner described for the Proposed Project.

4.4.17 Public Services

Volume I Section 4.4.17 Alternatives – Continued Operations with Fish Passage Alternative – Public Services, paragraph 4 on page 4-174:

Implementation of Mitigation Measure HZ-1 (Section 3.21 *Hazards and Hazardous Materials*) and Mitigation Measure TR-1 (Section 3.22 *Traffic and Transportation*) would reduce this impact to less than significant for reasons described under the Proposed Project. Overseeing development and implementation of a Hazardous Materials Management Plan, as required under Mitigation Measure HZ-1 falls within the scope of the State Water Board's water quality certification authority. It is not clear, however, whether the hydroelectric project owner or operator would implement measures relating to traffic management (such as ~~Recommended~~ Mitigation Measure TR-1), emergency response, and construction-related fire management through 'good citizen' agreements, as described in the Definite Plan, and it is unclear how these measures would be enforced. Because the State Water Board cannot ensure implementation of these additional measures, it has determined that the construction-related impact on increased response times for emergency, fire, police, and medical services to be significant and unavoidable under this alternative.

4.4.19 Aesthetics

Volume I Section 4.4.19 Alternatives – Continued Operations with Fish Passage Alternative – Aesthetics, paragraph 1 on page 4-176:

Under the Continued Operations with Fish Passage Alternative, construction activities to install upstream and downstream fish ladders would occur at all four Lower Klamath Project dam complexes. This activity would take place within the Limits of Work for the Proposed Project. and would involve construction equipment, as well as use of staging areas and demolition areas. ~~However, since c~~Construction of new infrastructure to support fish passage would occur near and potentially directly adjacent to the existing infrastructure ~~(Potential Impact 3.19-5), the construction activities and the facilities themselves would not distract from a natural view relative to existing conditions in the short term or the long term and this alternative would result in a less than significant impact.~~ such that there would be no long-term (permanent) visual changes for key observation

points C3, C4, C5, IG9, IG10, IG11, and IG12; Table 3.19-3 and Figure 3.19-2 in Volume III Attachment 1 Section 3.19.5 *Aesthetics – Potential Impacts and Mitigation*) (Potential Impact 3.19-5). The construction of new infrastructure to support fish passage under the Continued Operations with Fish Passage Alternative would not cause the VRM class to be degraded at a key observation point, would not adversely impact a scenic vista for those areas that were not assigned a VRM class, and would not result in a significant long-term (permanent) impact.

4.4.22 Transportation and Traffic

Volume I Section 4.4.22 Alternatives – Continued Operations with Fish Passage Alternative – Transportation and Traffic, paragraph 1 on page 4-179:

Under the Continued Operations with Fish Passage Alternative, construction activities would occur to install upstream and downstream fish ladders at all four Lower Klamath Project dam complexes. These construction activities would include the type of short-term construction-related transportation and traffic impacts described for the Proposed Project (Potential Impacts 3.22.5-1 through 3.22.5-56). Although the level of construction under this alternative would be less than the level of construction necessary for removal of the Lower Klamath Project dam complexes under the Proposed Project, this alternative could still result in an increase in traffic on narrow rural roads from commuting workers, hauling of large equipment, and disposal of wastes, particularly for fishway construction at Iron Gate Dam and Copco No. 1 dams, which would last for 12 months and 9 months, respectively (Table 4.4-1). For reasons described for the Proposed Project (Section 3.22 *[Traffic and Transportation] Potential Impacts and Mitigation*), this would result in~~be a~~ significant short-term impacts compared with existing conditions for Potential Impacts 3.22.5-1 through 3.22.5-5. Implementation of measures such as those contained in the Traffic Management Plan and Emergency Management Plan proposed by the KRRC, as well as ~~Recommended~~ Mitigation Measure TR-1, would be expected to reduce short-term construction-related impacts to less than significant under this alternative. It is not clear, however, whether the hydroelectric project owner or operator would implement these measures through 'good citizen' agreements, as described in the Definite Plan, and it is unclear how these measures would be enforced. Without an enforcement mechanism, these measures cannot be deemed feasible for the purposes of CEQA. Therefore, this alternative would result in significant and unavoidable short-term construction-related traffic and transportation impacts.

4.5 Two Dam Removal Alternative

4.5.1 Introduction

Volume I Section 4.5.1.1 Alternatives – Two Dam Removal Alternative – Introduction – Alternative Description, bullet 1, and paragraph 2, on page 4-182:

The following conditions under the Two Dam Removal Alternative are a modification to the 2012 KHSA EIS/EIR *Fish Passage at J.C. Boyle and Copco 2, Remove Copco 1 and Iron Gate Alternative*:

- Flows specified in the NMFS and USFWS 2013 BiOp for the USBR Klamath Irrigation Project~~, which are currently being considered under reinitiated consultation~~ (see also 3.1.6.1 *Klamath River Flows under the Klamath Irrigation Project's 2013 BiOp* [as revised in Volume III Attachment 1 Section 3.1.6]).

As described in Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project* (as revised in Volume III Attachment 1 Section 3.1.6), 2017 court-ordered flushing and emergency dilution flows ~~are~~ were required to be released from Iron Gate Dam during the period February 2017 – March 2019 as part of re-initiation of consultation on the 2013 BiOp Flows, but they ~~are~~ were not modeled as part of existing conditions hydrology. The 2019 BiOp Flows are now the current operational flow requirement for the Klamath River (USFWS 2019, NMFS 2019) thus they would represent hydrology moving forward under the Two Dam Removal Alternative. ~~Potential new BiOp flow requirements under this alternative are speculative at this time, and it is not clear whether flushing and emergency dilution flow requirements would continue under the new BiOp during or after dam removal. However, the 2017 flow requirements are considered to be the most reasonable assumption for conditions until agency formal consultation is completed and a new BiOp is issued.~~ For analysis of potential impacts related to fish disease, the Two Dam Removal Alternative considers conditions with and without 2017 court-ordered flushing and emergency dilution flows and with the 2019 BiOp flushing flows (see also Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project* [(as revised in Volume III Attachment 1 Section 3.1.6]).

4.5.2 Water Quality

Volume I Section 4.5.2.1 Alternatives – Two Dam Removal Alternative – Water Quality – Water Temperature, paragraph 2 on page 4-187:

The Two Dam Removal Alternative would ~~not include~~ increase flow in the J.C. Boyle Bypass to meet the requirement that at least 40 percent of the J.C. Boyle Reservoir inflow be released through this reach and peaking power generation or whitewater recreation flows ~~from the J.C. Boyle Dam~~ in the J.C. Boyle Peaking Reach would be eliminated as the downstream dams would not be available to regulate the peaking flows. The increase in the J.C. Boyle Reservoir water being released through the J.C. Boyle Bypass Reach in Oregon would reduce the relative influence of the cold groundwater springs (a relatively constant approximately 11 to 12°C [51.8 to 53.6°F]) on water temperatures in this reach, such that the range of daily water temperatures and the maximum daily water temperature in the J.C. Boyle Bypass Reach in Oregon would increase under the

Two Dam Removal compared to existing conditions. Warmer water temperatures would occur during summer and early fall, while cooler water temperatures would occur in late fall and winter (i.e., November to April) in the J.C. Boyle Bypass Reach under this alternative compared to existing conditions. Areas adjacent to the cold groundwater springs in the J.C. Boyle Bypass Reach would continue to potentially provide thermal refugia for aquatic species because the flow from the springs themselves would not be affected by the Two Dam Removal Alternative, but the total thermal refugia area for aquatic species in the J.C. Boyle Bypass Reach would likely decrease as the percentage of flow in the river from the cold groundwater springs decreases and the percentage of flow from the warmer reservoir increases (see also Section 4.5.3.3 *[Two Dam Removal Alternative] Aquatic Resources – Water Temperature*). Data and/or models results are not currently available to quantify the potential changes in the thermal refugia area under the Two Dam Removal compared to existing conditions.

Elimination of the peaking and recreation flows from J.C. Boyle Dam would likely result in J.C. Boyle Reservoir operating in a run of the river manner ~~and increases~~(i.e., steady flow conditions). While the Two Dam Removal Alterative was not specifically modeled, a comparison between KRWQM steady flow conditions (i.e., no peaking flows) and existing conditions results (PacifiCorp 2004a) would characterize the general water temperature variations and trends in the J.C. Boyle Peaking Reach under the Two Dam Removal. Increases in the water temperature range associated with J.C. Boyle peaking operations under existing conditions would no longer occur under ~~both~~ the Two Dam Removal Alternative ~~and the Proposed Project~~ (see also Section 3.2.2.2 *Water Temperature*), resulting in a more natural daily water temperature variations within the J.C. Boyle Peaking Reach. The upper portion of the J.C. Boyle Peaking Reach (i.e., downstream of the J.C. Boyle Powerhouse) would typically have lower maximum water temperatures and higher minimum water temperatures under the Two Dam Removal Alternative than under existing conditions, but the potential impact of eliminating peaking operations would diminish in the downstream direction. The annual and summer peak maximum water temperatures in the lower portion of the J.C. Boyle Peaking Reach (i.e., near Shovel Creek upstream of Copco No. 1 Reservoir) would be reduced under this alterative compared to existing conditions, but the daily Klamath River water temperatures in this reach would occasionally increase or decrease by approximately 2°C or less compared to existing conditions due to the influence of local meteorological conditions in the absence of peaking flows (PacifiCorp 2004a). However, the maximum water temperature and daily water temperature range would be similar or slightly less under the Two Dam Removal Alternative compared to the Proposed Project based on 2004/2005 KRWQM modeling of steady flow conditions in the lower portion of the J.C. Boyle Peaking Reach. Overall, elimination of peaking flows would move the J.C. Boyle Peaking Reach towards a more natural thermal regime under the Two Dam Removal Alternative compared to existing conditions.

Volume I Section 4.5.2.1 Alternatives – Two Dam Removal Alternative – Water Quality – Water Temperature, paragraph 1 on page 4-189:

~~J.C. Boyle Reservoir would not alter water temperature in the J.C. Boyle Peaking Reach from the Oregon-California state line to Copco No. 1 Reservoir and J.C. Boyle Dam operations for peaking and recreation releases that cause increases in the water temperature range would be eliminated under both the Two Dam Removal Alternative and the Proposed Project.~~ Elimination of J.C. Boyle Dam peaking and recreation releases and more steady flow in this section of the Klamath River would result in water temperature in the J.C. Boyle Peaking Reach moving towards a more natural thermal regime under the Two Dam Removal Alternative compared to existing conditions. At the upper end of the J.C. Boyle Peaking Reach near the Oregon-California state line, the daily range of water temperatures would decrease, with lower maximum water temperatures and higher minimum water temperatures (PacifiCorp 2004a). In the lower portion of the J.C. Boyle Peaking Reach downstream of the Oregon-California state line, available modeling data indicates that annual and summer maximum water temperatures would decrease, but daily water temperatures would vary by approximately +/- 2ºC or less compared to existing conditions in the lower end of the J.C. Boyle Peaking Reach near Copco No. 1 Reservoir (PacifiCorp 2004a). Short-term and long-term alterations in water temperatures in the J.C. Boyle Peaking Reach from the Oregon-California state line to Copco No. 1 Reservoir under the Two Dam Removal Alternative would result in water temperature effects similar to those of the Proposed Project (i.e., slightly lower maximum water temperatures and less artificial diel temperature variation during summer and early fall, see also Potential Impact 3.2-1) ~~and~~ , but the magnitude of these water temperature changes potentially would be slightly less under the Two Dam Removal Alternative than under the Proposed Project. Overall, the short-term and long-term alterations would move the water temperature in the J.C. Boyle Peaking Reach towards a more natural thermal regime and this would be beneficial.

Volume I Section 4.5.2.2 Alternatives – Two Dam Removal Alternative – Water Quality – Suspended Sediments, paragraph 1 on page 4-191:

Sediments and suspended materials (inorganic and organic) would continue to be intercepted and retained behind J.C. Boyle Dam in the long term under the Two Dam Removal Alternative, albeit to a lesser degree compared with existing conditions because~~, since~~ while ~~that~~ J.C. Boyle dam would remain in place it would be operated in a run of the river manner albeit with a similarly short hydraulic residence time (i.e., on the order of one to three days) compared with existing conditions (1.1 days [FERC 2007]). ~~While t~~ The amount of sediment supplied to the Klamath River on an annual basis from the watershed upstream of J.C. Boyle Dam is a relatively small fraction of the total sediment (Stillwater Sciences 2010a) (see also Section 3.11.2.4 *Sediment Load*)~~.~~, While there would

be a long-term increase in mineral (inorganic) suspended material downstream of J.C. Boyle Dam under this alternative compared with existing conditions, it would be less than under the Proposed Project since J.C. Boyle Dam would continue to intercept sediment in calm areas along the channel margins and areas nearest the dam face. The majority of algal-derived (organic) suspended material from upstream sources (Upper Klamath Lake, Klamath Straights Drain, Lost River) is intercepted and retained by the Keno Impoundment/Lake Ewauna, but J.C. Boyle Dam does retain some algal-derived (organic) suspended material under existing conditions (see Appendix C, Section C.2.1 *Upper Klamath Basin* for more detail). ~~Thus, t~~ The long-term increases in algal-derived (organic) suspended material downstream of J.C. Boyle Dam under this alternative would be less than under the Proposed Project since the dam would continue to intercept and retain some degree of upstream algal-derived suspended material in calm areas along the channel margins and areas nearest the dam face.

Volume I Section 4.5.2.1 Alternatives – Two Dam Removal Alternative – Water Quality – Suspended Sediments, paragraph 3 on page 4-191:

However, under the Two Dam Removal Alternative, the overall long-term impact from changes in the interception of sediments due to retention of J.C. Boyle and Copco No. 2 dams and removal of Copco No. 1 and Iron Gate dams would be similar ~~under both the Two Dam Removal Alternative and~~ to the Proposed Project and thus would be a less than significant impact. ~~The long-term increases in mineral (inorganic) and algal-derived (organic) suspended material due to the lack of interception by the dams would be a less than significant impact under the Proposed Project as only a small amount of sediment and suspended material is delivered from upstream of J.C. Boyle Dam. Thus, a decrease in the amount of sediment transported downstream under the Two Dam Alternative due to the retention of J.C. Boyle and Copco No. 2 dams and removal of Copco No. 1 and Iron Gate dams would still be a less than significant impact.~~ The long-term increases in mineral (inorganic) and algal-derived (organic) suspended material due to the lack of interception by the dams would be a less than significant impact under the Proposed Project as ~~only~~ a relatively small amount of sediment and suspended material is delivered from upstream of J.C. Boyle Dam.

Volume I Section 4.5.2.4 Alternatives – Two Dam Removal Alternative – Water Quality – Dissolved Oxygen, paragraphs 3 and 4 on pages 4-197-198:

In the long term, since J.C. Boyle Dam would remain in place, continuing summertime interception and retention of sediments and suspended materials from upstream sources containing high biological oxygen demand (see also Section 3.2.2.5 *Dissolved Oxygen*) would still occur in J.C. Boyle Reservoir under the Two Dam Removal Alternative. J.C. Boyle Reservoir would be operated in a run-of-the-river manner (i.e., steady flow conditions) due to elimination of the peaking and recreation flows from J.C. Boyle Dam under this alternative, which

would increase mixing within J.C. Boyle Reservoir under this alternative compared to under existing conditions. ~~Accordingly,~~ While existing large summertime variations in dissolved oxygen in J.C. Boyle Reservoir, especially at depth, would still occur and could continue to influence dissolved oxygen concentrations in the California portion of the Hydroelectric Reach similar to ~~in the same manner as under~~ existing conditions (see also Section 3.2.2.5 *Dissolved Oxygen*), the magnitude of dissolved oxygen variations with depth in J.C. Boyle Reservoir and its downstream influence on dissolved oxygen would be less under the Two Dam Removal Alternative than under existing conditions. This assessment is based on 2004/2005 KRWQM modeling of dissolved oxygen conditions in the J.C. Boyle Reservoir, Bypass Reach, and Peaking Reach under steady flow conditions (i.e., no peaking flows and no additional flow through the J.C. Boyle Bypass Reach), which although not exactly the same as the specific flow conditions included in the Two Dam Removal Alternative (i.e., no peaking or recreation flows and at least 40 percent of reservoir inflow released downstream into the J.C. Boyle Bypass), are similar and would characterize the general dissolved oxygen trends expected under the Two Dam Removal Alternative. In J.C. Boyle Reservoir, dissolved oxygen concentrations would generally increase under steady flow conditions and result in fewer periods with dissolved oxygen concentrations less than 6 mg/L compared to existing conditions, but dissolved oxygen concentrations would still reach approximately 2 mg/L during portions of some years (PacifiCorp 2004a). In the J.C. Boyle Bypass Reach downstream of the J.C. Boyle Dam, dissolved oxygen would decrease below 85 percent saturation and 6.5 mg/L immediately downstream of the dam during summertime periods when dissolved oxygen is low in J.C. Boyle Reservoir under steady flow conditions, which is similar to existing conditions. However, the minimum dissolved oxygen concentrations immediately downstream of the dam typically would be higher under steady flow conditions than under existing conditions, due to generally higher dissolved oxygen concentrations in J.C. Boyle Reservoir (PacifiCorp 2004a). Under both steady flow and existing conditions, aeration and fast-moving water velocities in the J.C. Boyle Bypass Reach would increase dissolved oxygen to near or slightly greater than saturation levels by the J.C. Boyle Powerhouse. Higher flow releases under the Two Dam Removal Alternative (i.e., at least 40 percent inflow to J.C. Boyle Reservoir released into the J.C. Boyle Bypass Reach) compared to modeled steady flow conditions (i.e., no additional flow releases into the J.C. Boyle Bypass Reach) would potentially result in more rapid aeration, with dissolved oxygen increasing to near or slightly greater than saturation levels within a shorter distance downstream of J.C. Boyle Dam than under modeled steady flow or existing conditions.

In the J.C. Boyle Peaking Reach downstream of the J.C. Boyle Powerhouse, measurements and modeling of existing conditions indicate~~s these~~ summertime dissolved oxygen variations in J.C. Boyle Reservoir and peaking flow releases of diverted reservoir water increase the range of dissolved oxygen concentrations between the Oregon-California state line and the upstream end of Copco No. 1 Reservoir (North Coast Regional Board 2011), but aeration and fast water

velocities within the free-flowing reach result in dissolved oxygen concentrations near or slightly greater than saturation upstream of Copco No. 1 Reservoir (PacifiCorp 2004a; FERC 2007; Raymond 2008; Raymond 2009a). The Two Dam Removal Alternative would not include peaking power generation and release of flow for recreation within the J.C. Boyle Peaking Reach, but run-of-the-river operations and release of steady flow from the J.C. Boyle Powerhouse would likely result in the dissolved oxygen at the Oregon-California state line ~~would still likely have~~ having slightly greater daily variability than natural conditions during summertime periods of low dissolved oxygen in J.C. Boyle Reservoir (see also Potential Impact 3.2-10). 2004/2005 KRWQM results indicate that daily variability of dissolved oxygen would increase downstream of the J.C. Boyle Powerhouse under steady flow conditions compared to natural conditions, and dissolved oxygen would potentially fall below 85 percent saturation and 6.5 mg/L during summer, similar to existing conditions. However, the magnitude of the daily dissolved oxygen variability would be less under steady flow conditions than under existing conditions (PacifiCorp 2004a). Higher summertime dissolved oxygen in J.C. Boyle Reservoir under steady flow conditions compared to existing conditions reduces the daily dissolved oxygen variability by reducing the decrease in dissolved oxygen in the J.C. Boyle Peaking Reach, when diverted reservoir flow is released downstream of the powerhouse. As such, the daily variability of dissolved oxygen at the Oregon-California state line also would be reduced under the Two Dam Removal Alternative compared to existing conditions, but there may still be more daily variability of dissolved oxygen at the Oregon-California state line than would occur under natural conditions. While the degree of influence of peaking flows on daily variability in dissolved oxygen concentrations at the Oregon-California state line is not clearly defined by existing information, the daily variability is not currently adversely affecting beneficial uses. ~~However, dissolved oxygen concentrations immediately downstream of J.C. Boyle would potentially fall below 85 percent saturation and 6.5 mg/L during summer similar to existing conditions.~~ Thus, retaining J.C. Boyle Dam with no peaking or recreation flows under the Two Dam Removal Alternative would have only a small influence on dissolved oxygen concentrations downstream of the Oregon-California state line compared to existing conditions and there would be no significant impact.

4.5.3 Aquatic Resources

Volume I Section 4.5.3.3 Alternatives – Two Dam Removal Alternative – Aquatic Resources – Water Quality, paragraph 4 on page 4-205:

In the Hydroelectric Reach from the upstream end of Copco No. 1 Reservoir to Iron Gate Dam, removing Iron Gate~~,~~ and Copco No. 1~~, and Copco No. 2~~ reservoirs and converting the reservoir areas to a free-flowing river under this alternative would result in the same effects on water temperatures in the Middle Klamath River immediately downstream from Iron Gate Dam as described for the Proposed Project (i.e., long-term increases in spring water temperatures and

decreases in late summer/fall water temperatures) (see Section 3.3.5.3 *Water Quality*).

Volume I Section 4.5.3.4 Alternatives – Two Dam Removal Alternative – Aquatic Resources – Fish Disease and Parasites, paragraph 2 on page 4-206:

As described in Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project* (as revised in Volume III Attachment 1 Section 3.1.6), 2017 court-ordered flushing and emergency dilution flows ~~are~~ were required to be released from Iron Gate Dam during the period February 2017 – March 2019 as part of re-initiation of consultation on the 2013 BiOp Flows, but they ~~are~~ were not modeled as part of existing conditions hydrology. The 2019 BiOp Flows are now the current operational flow requirement for the Klamath River (USFWS 2019, NMFS 2019) thus they would represent hydrology moving forward under the Two Dam Removal Alternative. Under the Two Dam Removal Alternative, it is anticipated that the nidus would no longer form downstream of Iron Gate Dam, and the risk of a new nidus forming upstream is low, even in the absence of the 2017 flushing flow and emergency dilution requirements or the 2019 BiOp surface flushing flows (see also Section 3.3.5.5 *Fish Disease and Parasites*). Although the conditions leading to a reach that would exhibit the highest infectivity (nidus) for *C. shasta* and *P. minibicornis* downstream of Iron Gate Dam would be ameliorated once Copco No. 1 and Iron Gate dams are removed, some disease factors would continue under the Two Dam Removal Alternative, including eight years of additional Iron Gate Hatchery operations potentially resulting in continued (through post-dam removal year 10) congregations of mostly adult fall-run Chinook salmon in the reach from Iron Gate Dam to Seiad Valley (see also Section 3.3.5.6 *Fish Hatcheries*). Under the Two Dam Removal Alternative, if a nidus were to remain in the vicinity of Iron Gate Hatchery, or theoretically were to form within newly accessible upstream habitat such as the reach immediately downstream of Copco No. 2 or J.C. Boyle dam where future fish passage facility entrances would be located, flushing and emergency dilution flows as required by the 2017 court order, or the 2019 BiOp, may be required from a new upstream location to achieve the same ecological benefits (i.e., disruption of nidus).

Volume I Section 4.5.3.8 Alternatives – Two Dam Removal Alternative – Aquatic Resources – Fish Passage – Potential Impact 3.3-14 Effects on the redband trout population due to short-term sediment releases and long-term changes in habitat quality and quantity due to dam removal, paragraph 1 on page 4-221:

Under the Two Dam Removal Alternative, ~~Suspended~~ suspended and bedload sediment effects would differ from those described for the Proposed Project. Since redband trout are restricted to locations ~~distributed~~ upstream of Iron Gate Dam, ~~and therefore under the Proposed Project~~ the only impacts these individuals would experience from sediment releases under the Two Dam Removal Alternative would be limited to the Hydroelectric Reach between Iron

Gate Dam and Copco No. 2. ~~downstream of J.C. Boyle or downstream of Copco No.2). Therefore, despite the relatively small volume of sediment stored in J.C. Boyle Reservoir (and even less in Copco No. 2), impacts of sediment release on redband trout that would occur under the Proposed Project would be substantially less under the Two Dam Removal Alternative.~~ Release of sediment currently trapped behind Copco No. 1 Dam would remain a short-term impact on redband trout within the 1.4-mile riverine reach downstream of Copco No. 1 and upstream of Iron Gate Reservoir under the Two Dam Removal Alternative. A productive population of redband trout exists upstream of Copco No.1 Dam; however, downstream of Copco No. 1 Dam, redband trout are less abundant with relatively few and sporadic observations in the 1.4-mile riverine section between Copco No. 2 Dam and the upstream end of Iron Gate Reservoir (PacifiCorp 2004a). Redband trout observed in this section of the Klamath River likely migrate upstream from Iron Gate Reservoir during the fall when water conditions are more favorable. Therefore, only a small proportion of the population is expected to be exposed to short-term effects.

Volume I Section 4.5.3.8 Alternatives – Two Dam Removal Alternative – Aquatic Resources – Fish Passage – Potential Impact 3.3-14 Effects on the redband trout population due to short-term sediment releases and long-term changes in habitat quality and quantity due to dam removal, paragraph 3 on page 4-221:

Based on a long-term substantial increase in redband trout habitat quality and quantity compared to existing conditions, the Two Dam Removal Alternative would be beneficial for redband trout in the long term

Volume I Section 4.5.3.8 Alternatives – Two Dam Removal Alternative – Aquatic Resources – Fish Passage – Potential Impact 3.3-19, paragraph 2 on page 4-222:

~~Potential impacts on freshwater mollusks in California would be similar under the Two Dam Removal Alternative as those described for the Proposed Project (Section 3.3.5.9, Potential Impact 3.3-19), with a few subtle differences. As described in Section 4.5.3.1 *Suspended Sediment*, impacts on freshwater mollusks from sediment releases would be similar to the Proposed Project.~~ Based on the distribution of freshwater mollusks primarily downstream of Iron Gate Dam (summarized in Section 3.3.5.9, Potential Impact 3.3-19~~3.3-14~~), the potential impacts of the Two Dam Removal Alternative ~~would~~ are expected to be similar to ~~the same as~~ those described for the Proposed Project (Section 3.3.5.9, Potential Impact 3.3-19~~3.3-14~~) with one exception. Under the Two Dam Removal Alternative, suitable habitat for floater mussels (*Anodonta spp.*) would remain within J.C. Boyle Reservoir and within a section of the Hydroelectric Reach downstream of J.C. Boyle Reservoir. ~~The Proposed Project would have the most substantial impact on the floater mussels (*Anodonta spp.*) which occur in the mainstem Klamath River in the Hydroelectric Reach, within Lower Klamath Project reservoirs, in a reach (<15 miles) directly downstream of Iron Gate Dam,~~

~~and within the Upper Shasta River.~~ *Anodonta spp.* have been found in high abundance within J.C. Boyle Reservoir as recently as summer 2018 (Troy Brandt, River Design Group, pers. comm., November 2018). Therefore, under the Two Dam Removal Alternative the *Anodonta spp.* would remain unaffected within a portion of their range in J.C. Boyle Reservoir and the Upper Shasta River. Therefore, while the impacts to other species of freshwater mollusks would be the same under the Proposed Project (not significant), impacts to the *Anodonta spp.* would be less substantial under the Two Dam Removal Alternative than under the Proposed Project. However, impacts on ~~the~~ *Anodonta spp.* would still occur under the Two Dam Removal Alternative in the mainstem Klamath River (primarily downstream of Iron Gate Dam) as described for the Proposed Project (Section 3.3.5.9, Potential Impact 3.3-19~~3.3-14~~), and without any protective measures, ~~based on~~ it is predicted that there would be a substantial short-term decrease in *Anodonta spp.* abundance of a year class, ~~there would be a significant impact to the *Anodonta spp.* population~~ under the Two Dam Removal Alternative in the short term.

~~However,~~ To reduce the potential short-term impacts of sediment transport during dam removal on freshwater mussels, as described for the Proposed Project (Section 3.3.5.9, Potential Impact 3.3-19), the Two Dam Removal Alternative includes Aquatic Resource Measure AR-7 (Freshwater Mussels)~~to reduce the short-term effects of sediment transport during dam removal on *Anodonta spp.*, as described for the Proposed Project (Section 3.3.5.9, Potential Impact 3.3-14).~~ This measure includes ~~Under the Proposed Project this~~ salvage ~~and relocation plan~~ of freshwater mussels from the reach downstream of Iron Gate Dam and relocation at potential sites ~~would consider sites for translocation~~ located downstream from the Trinity River confluence (RM 43.4), and between J.C. Boyle Dam (RM 230.6) and Copco No. 1 Reservoir (RM 209.0). These areas would have less impact from increased SSCs but would not be completely protected from short-term effects. Under the Proposed Project, these ~~The~~ areas ~~downstream of the Trinity River confluence do not currently support *Anodonta spp.* and~~are unlikely to provide suitable habitat to support *Anodonta spp.* due to increased hydraulic variability from the loss of regulating reservoirs.~~in the future (Davis et al. 2013).~~ However, under the Two Dam Removal Alternative *Anodonta spp.* could be salvaged from the reach downstream of Iron Gate Dam and relocated to J.C. Boyle Reservoir and directly downstream of J.C. Boyle Reservoir, which does support suitable *Anodonta spp.* habitat. Therefore, with aquatic resource measure AR-7, there would likely not be a substantial reduction in the abundance of *Anodonta spp.* species in the short term, and impacts would be not significant ~~with~~ for *Anodonta spp.* in the short term. No significant short-term impacts are expected for other freshwater mollusks under the Two Dam Removal Alternative. The re-formation of river channel that would occur following the removal of Iron Gate Dam is expected to have long term benefits for *Anodonta spp., M. falcata, G. angulate,* and freshwater clams by providing more suitable substrates (i.e., large gravel, cobble, and boulder) than currently exists, especially within the current reservoir reaches.

4.5.5 Terrestrial Resources

Volume I, Section 4.5.5 Alternatives – Two Dam Removal Alternative – Terrestrial Resources, paragraph 2 on page 4-228:

Although short-term dam deconstruction activities would not occur for Copco No. 2 Dam under the Two Dam Removal Alternative, deconstruction of Copco No. 1 and Iron Gate dams and associated facilities, and construction of upstream and downstream fish passage facilities and a new day use area near Copco No. 2 Dam would occur, and thus the level of overall construction activities in the Hydroelectric Reach in California would be only slightly less than those described under the Proposed Project. Therefore, in general the Two Dam Removal Alternative would have slightly less short-term potential impacts on vegetation communities, culturally significant species, special status species, wildlife corridors and habitat connectivity, as those described for the Proposed Project (see Section 3.5.5 *[Terrestrial Resources] Potential Impacts and Mitigation*). The mitigation measures and recommended terrestrial measures would be the same as those identified for the Proposed Project. Implementation of Mitigation Measures TER-2, TER-3, TER-6, and TER-7 would reduce construction-related impacts, including in-water work, on all special-status amphibian species, gray wolf, and bald and golden eagles to less than significant. There could be impacts on wetlands during activities associated with fish ladder construction in the absence of a wetland delineation; implementation of Mitigation Measure TER-5 described in Section 4.4.5 short and long-term impacts on wetland communities would be reduced to less than significant. Long-term potential impacts and any short-term potential impacts that would be different under the Two Dam Removal Alternative than the Proposed Project are discussed below.

In the long term, since Copco No. 2 Dam and Reservoir would remain under the Two Dam Removal Alternative, the reduction of ~~existing wet habitat that currently supports the following~~ wetland vegetation communities would not occur ~~and there would be no significant impact compared with existing conditions:~~

- ~~Palustrine Scrub-shrub Wetland and Palustrine Forested Wetland on the southern slope of Copco No. 2 Dam.~~
- ~~• Small, local patches of Palustrine Emergent Wetland supported by water leaks from the Copco No. 2 penstock.~~

While retaining the existing wetland habitat at Copco No. 2 Reservoir would reduce potential long-term impacts to these wetland and riparian vegetation communities described under the Proposed Project and thus may be relatively beneficial, the proposed acreage (~~150~~182 acres) for restored riparian and wetland vegetation under the Proposed Project is well above the total acreage that would potentially be impacted (~~68 acres~~ approximately 10.2 acres of riparian vegetation and 9.6 acres of wetlands due to the removal of Iron Gate Reservoir), such that ~~the~~ there would be ~~policy of~~ no net loss of wetlands compared with

existing conditions ~~would be achieved~~ under the Proposed Project, regardless of whether the Copco No. 2 Dam remains under the Two Dam Removal Alternative.

In summary, relative to existing conditions, the potential long-term impacts of the Two Dam Removal Alternative on terrestrial resources would be different from those described for the Proposed Project, as follows:

- Long-term reduction of existing wet habitat that supports the ~~aforementioned~~ wetland vegetation communities associated with ~~on the southern slope of~~ Copco No. 2 Dam ~~and associated with the Copco No. 2 penstock (Potential Impact 3.5-2)~~ would not occur and there would be no significant impact.
- Long-term disturbance of potentially suitable rock talus habitat for the terrestrial invertebrates Oregon shoulderband, Trinity shoulderband, Siskiyou shoulderband, and Tehama chaparral located just downstream of Copco No. 2 Dam (Potential Impact 3.5-9) would not occur and there would be no significant impact.
- Long-term impacts to small day roosts and large maternity colonies in or near the Copco No. 2 Powerhouse and other Copco No. 2 facility structures (Potential Impact 3.5-15) would not occur and there would be no significant impact.

4.5.12 Historical and Tribal Cultural Resources

Volume I Section 4.5.12 Alternatives – Two Dam Removal Alternative – Historical Resources and Tribal Cultural Resources, paragraph 2 on page 4-235:

Copco No. 1 and Iron Gate dams would be removed under this alternative and potential impacts to the built environment and historic-period archaeological resources (Potential Impacts 3.12-11 through 3.12-16) and tribal cultural resources (Potential Impacts 3.12-1 through 3.12-8) would be the same as those described for the Proposed Project and would be significant and unavoidable. However, under the Two Dam Removal Alternative, the Copco No. 2 facility, which contributes to the Klamath Hydroelectric Historic District 214, would not be removed and direct impacts to the historical significance of its structures and hydroelectric facilities (e.g., wooden-stave penstock) would not occur (Potential Impact 3.12-11). Installation of upstream and downstream fish passage at Copco No. 2 dam, including all associated construction activities, may impact Copco No. 2 Dam and its associated facilities, and combined with the removal of Copco No. 1 and Iron Gate facilities, the Two Dam Alternative could possibly affect the overall integrity of the Klamath Hydroelectric Historic District. This would be a significant and unavoidable impact for the reasons described under the Proposed Project (Potential Impact 3.12-11). Direct impacts to historic-period archaeological resources due to the construction of upstream and downstream fish passage at Copco No. 2 dam and a new day use area near Copco No. 2 Dam would also result in significant and unavoidable impacts for the reasons

described under the Proposed Project (Potential Impact 3.12-12 through 3.12-16).

Section 4.5.12 Alternatives – Two Dam Removal Alternative – Historical and Tribal Cultural Resources, paragraph 1 on page 4-236:

Leaving Copco No. 2 Dam, Copco No. 2 Powerhouse, and the powerhouse penstocks in place under the Two Dam Removal would potentially avoid disturbance-related impacts to two known tribal cultural resources, and potentially additional unknown tribal cultural resources, ~~reduce impacts to known, or as yet unknown, tribal cultural resources~~ located within the footprint of Copco No. 2 reservoir and its associated hydroelectric facilities. However, installation of upstream and downstream fish passage at Copco No. 2 dam and a new day use area near Copco No. 2 Dam, including all associated construction activities, may impact known, or as yet unknown, tribal cultural resources to a similar degree as that described for the Proposed Project. For this reason, and because Copco No. 1 and Iron Gate dams would be removed under this alternative as described for the Proposed Project, potential impacts to tribal cultural resources (Potential Impacts 3.12-1 through 3.12-8) would be the same as those described for the Proposed Project. Implementation of Mitigation Measures TCR-1 through TCR-8 would reduce impacts to tribal cultural resources, but for the reasons described under the Proposed Project, the impacts would remain significant and unavoidable.

4.5.17 Public Services

Volume I Section 4.5.17 Alternatives – Two Dam Removal Alternative – Public Services, paragraph 1 on page 4-237:

For reasons described for the Proposed Project, removal of the two largest California dams under this alternative would still result in significant impacts due to short-term increased response times for emergency fire, police, and medical services (Potential Impact 3.17-1)~~.~~, and implementation of Mitigation Measure HZ-1 and Mitigation Measure TR-1 would reduce impacts to a less than significant level. ~~In addition, the KRRC is developing a Traffic Management Plan to identify mitigation and other protective measures that would be implemented to reduce impacts to public services. It would also be appropriate for the final Traffic Management Plan to include Recommended Measure TR-1. Overseeing development and implementation of the Traffic Management Plan does not fall within the scope of the State Water Board's water quality certification authority. While the State Water Board expects that this plan will be finalized and implemented, at this time the plan is not finalized, and the State Water Board cannot require its implementation. Accordingly, while the State Water Board anticipates that implementation of Mitigation Measure HZ-1 would reduce impacts to public services, because it cannot require implementation of Recommended Measure TR-1, it is analyzing the impacts under this alternative as significant and unavoidable.~~

4.5.19 Aesthetics

Volume I Section 4.5.19 Alternatives – Two Dam Removal Alternative – Aesthetics, paragraphs 1 and 2 on page 4-240:

Under the Two Dam Removal Alternative, the Copco No. 2 facilities would not be removed and installation of new upstream and downstream fish passage at Copco No. 2 Dam, including all associated construction activities, would occur. ~~However, due to the small size of the Copco No. 2 facilities, their inaccessibility to the public, and the fact that they are already inconsistent with the area VRM classification, this would not change the significance determination.~~ Construction of the new infrastructure to support fish passage would occur near and potentially directly adjacent to the existing infrastructure such that there would be no long-term (permanent) visual changes for key observation points C3, C4, and C5; Table 3.19-3 and Figure 3.19-2 in Volume III Attachment 1 Section 3.19.5 *Aesthetics – Potential Impacts and Mitigation*) (Potential Impact 3.19-5). The construction of new infrastructure to support fish passage under the Continued Operations with Fish Passage Alternative would not cause the VRM class to be degraded at a key observation point, would not adversely impact a scenic vista for those areas that were not assigned a VRM class, and would not result in a significant long-term (permanent) impact.

Visual changes due to removal of Copco No. 1 and Iron Gate dams and facilities (Potential Impact 3.19-5), construction activities (Potential Impact 3.19-6) including fishway construction at Copco No. 2 Dam, would be the same as those of the Proposed Project since the manner of dam deconstruction for these two relatively large facilities would be the same under the Two Dam Removal Alternative; impacts would be less than significant. Similarly, impacts to nighttime views from construction lighting would be significant and unavoidable as under the Proposed Project (Potential Impact 3.19-7).

4.5.22 Transportation and Traffic

Volume I Section 4.5.22 Alternatives – Two Dam Removal Alternative – Transportation and Traffic, paragraph 1 on page 4-244:

As described in Section 3.22.5 *[Transportation and Traffic] Potential Impacts and Mitigation*, the Proposed Project would result in significant ~~and unavoidable~~ short-term impacts to traffic flow, road safety, road conditions, emergency access, public transit, and non-motorized transportation. Implementation of Mitigation Measure TR-1 would reduce these impacts to a less than significant level (Potential Impacts 3.22-1 through 3.22-5). ~~, unless and until KRRC reaches enforceable 'good citizen' agreements that are finalized and implemented through the FERC process and that include proposed items for the final Traffic Management Plan and Emergency Response Plan (Appendix B: *Definite Plan – Appendices O1 through O4*), as well as the additional components included in~~

~~Recommended Measure TR-1 (Potential Impacts 3.22-1 through 3.22-5). Because the level of overall construction activities and impacts to transportation and traffic in California would be only slightly less than those described under the Proposed Project, the Two Dam Removal would also result in significant and unavoidable short-term impacts to the aforementioned traffic- and transportation-related activities and would require similarly enforceable 'good citizen' agreements to reduce impacts to less than significant, as described for the Proposed Project.~~

Volume I Section 4.5.22 Alternatives – Two Dam Removal Alternative – Transportation and Traffic, paragraph 3 on page 4-244 through paragraph 1 on page 4-245:

As described previously, fish passage under the Two Dam Removal Alternative would either be provided by volitional fishways, or trap and haul, or some combination. Facility construction, and thus any related potential transportation and traffic impacts (Potential Impacts 3.22.5-1 through 3.22.5-5) for trap and haul would be less than that described above for fish ladders.

Potential Impact 4.4.22-1 Trap and haul operational traffic could potentially result in a substantial increase in traffic in excess of the capacity or design of the road improvements or impairs the safety or performance of the circulation system, including transit, roadways, bicycle lanes and pedestrian paths, or otherwise result in an increased risk of harm to the public due to an increase in traffic.

Long-term (ongoing) trap and haul operations would consist of trapping adult upstream migrants downstream of Copco No. 2 Dam and releasing them in J.C. Boyle Reservoir as an ongoing activity. Similarly, downstream migrating smolts would be trapped at J.C. Boyle Reservoir, and released downstream of Copco No. 2 Dam. Roads within the traffic and transportation Area of Analysis currently carry substantially fewer vehicles than the planning capacity (Table 3.22-2 and Section 3.22.2.1*Traffic Flow*), such that additional truck trips, assuming both upstream and downstream trap and haul operations, would not substantially change traffic conditions. Although the exact extent and timing of these ongoing hauling activities is not known, it is unlikely that more than ten truck trips per day would be necessary, including a conservative assumption of round trip (i.e., upstream and downstream) hauling for 30 to 40 miles each way between Copco No. 2 Dam and J.C. Boyle Reservoir. Therefore, long-term (ongoing) trap and haul traffic would be a less than significant impact.

Significance

No significant impact in the long term

4.5.23 Noise

Volume I Section 4.5.23 Alternatives – Two Dam Removal Alternative – Noise – Potential Impact 4.5-1 Trap and haul-related noise, Section header on page 4-245:

Potential Impact 4.5-~~1~~23-1 Trap and haul-related noise.

4.6 Three Dam Removal Alternative

4.6.1 Introduction

Volume I Section 4.6.1.1 Alternatives – Three Dam Removal Alternative – Introduction – Alternative Description, paragraph 1, bullet 1, and paragraph 2, on page 4-248:

The following conditions under the Three Dam Removal Alternative are a modification to the 2012 KHSA EIS/EIR *Fish Passage at J.C. Boyle and Copco 2, Remove Copco 1 and Iron Gate Alternative*:

- Flows specified in the NMFS and USFWS 2013 BiOp for the USBR Klamath Irrigation Project~~, which are currently being considered under reinitiated consultation~~ (see also 3.1.6.1 *Klamath River Flows under the Klamath Irrigation Project's 2013 BiOp* [as revised in Volume III Attachment 1 Section 3.1.6]).

As described in Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project* (as revised in Volume III Attachment 1 Section 3.1.6), 2017 court-ordered flushing and emergency dilution flows ~~are~~ were required to be released from Iron Gate Dam during the period February 2017 – March 2019 as part of re-initiation of consultation on the 2013 BiOp Flows, but they ~~are~~ were not modeled as part of existing conditions hydrology. The 2019 BiOp Flows are now the current operational flow requirement for the Klamath River (USFWS 2019, NMFS 2019) thus they would represent hydrology moving forward under the Three Dam Removal Alternative. ~~Potential new BiOp flow requirements under this alternative are speculative at this time, and it is not clear whether flushing and emergency dilution flow requirements would continue under the new BiOp during or after dam removal. However, the 2017 flow requirements are considered to be the most reasonable assumption for conditions until agency formal consultation is completed and a new BiOp is issued.~~ For analysis of potential impacts related to fish disease, the Three Dam Removal Alternative considers conditions with and without 2017 court-ordered flushing and emergency dilution flows and with the 2019 BiOp flushing flows (see also Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project* [(as revised in Volume III Attachment 1 Section 3.1.6]).

4.6.3 Aquatic Resources

Volume I Section 4.6.3.3 Alternatives – Three Dam Removal Alternative – Aquatic Resources – Water Quality, paragraph 4 on page 4-267:

~~California~~ For the reasons discussed below, potential impacts of water quality on aquatic resources in California would be the same under the Three Dam Removal Alternative as those described for the Proposed Project (see also Section 3.3.5.3 *Water Quality*).

Volume I Section 4.6.3.4 Alternatives – Three Dam Removal Alternative – Aquatic Resources – Fish Disease and Parasites, paragraph 4 on page 4-268:

As described in Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project* (as revised in Volume III Attachment 1 Section 3.1.6), 2017 court-ordered flushing and emergency dilution flows ~~are~~ were required to be released from Iron Gate Dam during the period February 2017 – March 2019 as part of re-initiation of consultation on the 2013 BiOp Flows, but they ~~are~~ were not modeled as part of existing conditions hydrology. The 2019 BiOp Flows are now the current operational flow requirement for the Klamath River (USFWS 2019, NMFS 2019) thus they would represent hydrology moving forward under the Three Dam Removal Alternative. Under the Three Dam Removal Alternative, it is anticipated that the nidus would no longer form downstream of Iron Gate Dam, and the risk of a new nidus forming upstream is low, even in the absence of the 2017 flushing flow and emergency dilution requirements or the 2019 BiOp surface flushing flows (see also Section 3.3.5.5 *Fish Disease and Parasites*). Although the conditions leading to a reach that would exhibit the highest infectivity (nidus) for *C. shasta* and *P. minibicornis* downstream of Iron Gate Dam would be ameliorated once Copco No. 1 and Iron Gate dams are removed, some disease factors would continue under the Three Dam Removal Alternative, including eight years of additional Iron Gate Hatchery operations potentially resulting in continued (through post-dam removal year 10) congregations of mostly adult fall-run Chinook salmon in the reach from Iron Gate Dam to Seiad Valley (see also Section 3.3.5.6 *Fish Hatcheries*). Under the Three Dam Removal Alternative, if a nidus were to remain in the vicinity of Iron Gate Hatchery, or theoretically were to form within newly accessible upstream habitat such as the reach immediately downstream of Copco No. 2 or J.C. Boyle dam where future fish passage facility entrances would be located, flushing and emergency dilution flows as required by the 2017 court order, or the 2019 BiOp, may be required from a new upstream location to achieve the same ecological benefits (i.e., disruption of nidus).

Volume I Section 4.6.3.8 Alternatives – Three Dam Removal Alternative – Aquatic Resources – Fish Passage – Potential Impact 3.3-14, paragraph 1 on page 4-283:

Therefore, for those individuals upstream of Copco No. 1, despite the relatively small volume of sediment stored in J.C. Boyle Reservoir, impacts of sediment release on redband trout ~~that would occur~~ would be less under the Three Dam Removal Alternative ~~would be substantially less under~~ compared to the Proposed Project.

Volume I Section 4.6.3.8 Alternatives – Three Dam Removal Alternative – Aquatic Resources – Fish Passage – Potential Impact 3.3-14, paragraph 3 on page 4-283:

Based on a long-term substantial increase in redband trout habitat quality and quantity compared to existing conditions, the Three Dam Removal Alternative would be beneficial for redband trout in the long term.

Volume I Section 4.6.3.8 Alternatives – Three Dam Removal Alternative – Aquatic Resources – Fish Passage – Potential Impact 3.3-19, paragraph 2 on page 4-284:

~~Potential impacts on freshwater mollusks in California would be similar under the Two Dam Removal Alternative as those described for the Proposed Project (Section 3.3.5.9, Potential Impact 3.3-19), with a few subtle differences. As described in Section 4.5.3.1 *Suspended Sediment*, impacts on freshwater mollusks from sediment releases would be similar to the Proposed Project.~~ Based on the distribution of freshwater mollusks primarily downstream of Iron Gate dam (summarized in Section 3.3.5.9, Potential Impact 3.3-19~~3.3-14~~), the potential impacts of the Three Dam Removal Alternative ~~would~~ are expected to be similar to ~~the same as~~ those described for the Proposed Project (Section 3.3.5.9, Potential Impact 3.3-19~~3.3-14~~) with one exception. Under the Three Dam Removal Alternative, suitable habitat for floater mussels (*Anodonta spp.*) would remain within J.C. Boyle Reservoir and within a section of the Hydroelectric Reach downstream of J.C. Boyle Reservoir. ~~The Proposed Project would have the most substantial impact on the floater mussels (*Anodonta spp.*) which occur in the mainstem Klamath River in the Hydroelectric Reach, within Lower Klamath Project reservoirs, in a reach (<15 miles) directly downstream of Iron Gate Dam, and within the Upper Shasta River.~~ *Anodonta spp.* have been found in high abundance within J.C. Boyle Reservoir as recently as summer 2018 (Troy Brandt, River Design Group, pers. comm., November 2018). Therefore, under the Three Dam Removal Alternative the *Anodonta spp.* would remain unaffected within a portion of their range in J.C. Boyle Reservoir and Upper Shasta River. Therefore, while the impacts to other species of freshwater mollusks would be the same under the Proposed Project (not significant), impacts to the *Anodonta spp.* would be less substantial under the Three Dam Removal Alternative than under the Proposed Project. However, impacts to ~~the~~ *Anodonta spp.* would still occur under the Three Dam Removal Alternative in the mainstem Klamath River (primarily downstream of Iron Gate Dam) as described for the Proposed Project (Section 3.3.5.9, Potential Impact 3.3-19~~3.3-14~~), and

without any protective measures, ~~based on~~ it is predicted that there would be a substantial short-term decrease in *Anodonta spp.* abundance of a year class, ~~there would be a significant impact to the *Anodonta spp.* population~~ under the ~~Proposed Project~~ Three Dam Removal Alternative. ~~in the short term.~~

~~However,~~ To reduce the potential short-term effects of sediment transport during dam removal on freshwater mussels, as described for the Proposed Project (Section 3.3.5.9, Potential Impact 3.3-19), the Three Dam Removal Alternative includes Aquatic Resource Measure AR-7 (Freshwater Mussels)~~to reduce the short-term effects of sediment transport during dam removal on *Anodonta spp.*, as described for the Proposed Project (Section 3.3.5.9, Potential Impact 3.3-14).~~ This measure includes ~~Under the Proposed Project this~~ salvage ~~and relocation plan~~ of freshwater mussels from the reach downstream of Iron Gate Dam and relocation at potential sites ~~would consider sites for translocation~~ located downstream from the Trinity River confluence (RM 43.4), and between J.C. Boyle Dam (RM 230.6) and Copco No. 1 Reservoir (RM 209.0). These areas would have less impact from increased SSCs but would not be completely protected from short-term effects. Under the Proposed Project, these ~~The~~ areas ~~downstream of the Trinity River confluence do not currently support *Anodonta spp.* and~~are unlikely to provide suitable habitat to support *Anodonta spp.* due to increased hydraulic variability from the loss of regulating reservoirs.~~in the future (Davis et al. 2013).~~ However, under the Three Dam Removal Alternative *Anodonta spp.* could be salvaged from the reach downstream of Iron Gate Dam and relocated to J.C. Boyle Reservoir and directly downstream of J.C. Boyle Reservoir, which does support suitable *Anodonta spp.* habitat. Therefore, with Aquatic Resource Measure AR-7, there would likely not be a substantial reduction in the abundance of *Anodonta spp.* species in the short term, and impacts would be not significant ~~with~~ for *Anodonta spp.* in the short term. No significant short-term impacts are expected for other freshwater mollusks under the Three Dam Removal Alternative. Deposition of sediment following dam removal resulting in short-term impacts to freshwater mollusks described above are predicted to be short in duration (< 1year). The re-formation of river channel that would occur following the removal of Iron Gate Dam is expected to have long term benefits for *Anodonta spp., M. falcata, G. angulate,* and freshwater clams by providing more suitable substrates (i.e., large gravel, cobble, and boulder) than currently exists, especially within the current reservoir reaches."

Volume I Section 4.6.3.8 Alternatives – Three Dam Removal Alternative – Aquatic Resources – Fish Passage – Potential Impact 3.3-19, paragraph 3 on page 4-284:

Therefore, with aquatic resource measure AR-7, there would likely not be a substantial reduction in the abundance of *Anodonta spp.* species in the short term, and impacts would be not significant ~~with for *Anodonta spp.*~~ in the short term. ~~—~~No significant short-term impacts are expected for other freshwater mollusks under the Three Dam Removal Alternative. The reformation of river

channel that would occur following the removal of Iron Gate Dam is expected to have long term benefits for *Anodonta spp., M. falcata, G. angulate,* and freshwater clams by providing more suitable substrates (i.e., large gravel, cobble, and boulder) than currently exists, especially within the current reservoir reaches.

4.6.5 Terrestrial Resources

Volume I Section 4.6.5 Alternatives – Three Dam Removal Alternative – Terrestrial Resources, paragraph 1 on page 4-290:

Relative to the Proposed Project, leaving the J.C. Boyle Dam and associated facilities in place would reduce overall construction activities related to dam removal. However, the Three Dam Removal Alternative also includes construction of a new fish ladder at J.C. Boyle Dam (and removal of the existing one within a similar footprint to the existing ladder). While there would potentially be less construction activities resulting in noise or habitat removal under this alternative than under the Proposed Project, the relative decrease in construction activities under the Three Dam Removal Alternative would not change the level of impacts to terrestrial resources in California since J.C. Boyle is located in Oregon. Thus, potential impacts on sensitive habitats (wetlands and riparian habitat), rare natural communities, culturally significant species, special-status species, wildlife corridors and habitat connectivity within the Primary Area of Analysis for terrestrial resources would be the same under the Three Dam Removal Alternative as those described for the Proposed Project (Potential Impacts 3.5-1 through 3.5-31) with the exception that there could be impacts on wetlands during activities associated with fish ladder construction in the absence of a wetland delineation; implementation of Mitigation Measure TER-5 described in Section 4.4.5 short and long-term impacts on wetland communities would be reduced to less than significant. Implementation of Mitigation Measures TER-2, TER-3, TER-6, and TER-7 would reduce construction-related impacts, including in-water work, on all special-status amphibian species, gray wolf, and bald and golden eagles to less than significant.

4.6.12 Historical and Tribal Cultural Resources

Volume I Section 4.6.12 Alternatives – Three Dam Removal Alternative – Historical Resources and Tribal Cultural Resources, paragraph 1 on page 4-294:

The potential for flood disturbance of known or unknown historical and/or tribal cultural resources located further downstream along the Klamath River would not be different under this alternative from that described for the Proposed Project (Potential Impact 3.12-3) since Copco No. 1, Copco No. 2, and Iron Gate dams would still be removed.

4.6.17 Public Services

Volume I Section 4.6.17 Alternatives – Three Dam Removal Alternative – Public Services, paragraph 1 on page 4-296:

Thus, for reasons described in Section 3.17.5 [Public Services] Potential Impacts and Mitigation, impacts and associated mitigation measures from increased public service response times for emergency fire, police, and medical services due to construction and demolition activities, elimination of a long-term water source for wildfire services substantially increasing the response time for suppressing wildfires, and potential effects on schools services and facilities would be the same under the Three Dam Removal Alternative as those described for the Proposed Project (Potential Impacts 3.17-1 through 3.17-3) ~~(Potential Impacts 3.5-1 through 3.5-3)~~.

4.6.21 Hazards and Hazardous Materials

Volume I Section 4.6.22 Alternatives – Three Dam Removal Alternative – Transportation and Traffic, paragraph 1 on page 4-299:

As described in Section 3.22.5 *[Transportation and Traffic] Potential Impacts and Mitigation*, the Proposed Project would result in significant ~~and unavoidable~~ short-term impacts to traffic flow, road safety, road conditions, emergency access, public transit, and non-motorized transportation. Implementation of Mitigation Measure TR-1 would reduce these impacts to a less than significant level (Potential Impacts 3.22-1 through 3.22-5). ~~, unless and until KRRC reaches enforceable 'good citizen' agreements that are finalized and implemented through the FERC process and that include proposed items for the final TMP and Emergency Response Plan (Appendix B: *Definite Plan – Appendices O1 through O4*), as well as the additional components included in Recommended Measure TR-1 (Potential Impacts 3.22-1 through 3.22-5)~~. As described for the Proposed Project, the Lower Klamath Project dams are not located within two miles of an airport nor would their removal result in a change in air traffic patterns that would result in a substantial safety risks, regardless of whether J.C. Boyle Dam remains place, and there would be no significant impact (Potential Impact 3.22-6).

4.7 No Hatchery Alternative

4.7.1 Introduction

Volume I Section 4.7.1.1 Alternatives – No Hatchery Alternative – Introduction – Alternative Description, paragraph 2 on page 4-303:

Under the No Hatchery Alternative, the Fall Creek Hatchery would not reopen with upgraded facilities (e.g., renovated raceways, upgraded plumbing) for raising coho salmon and Chinook salmon. Construction of the settling pond would not be needed on Parcel B lands downstream of the Fall Creek Hatchery.

Water diversion from the PacifiCorp Fall Creek powerhouse return canal downstream of the City of Yreka's diversion facility at Fall Creek Dam ~~A~~ would not be needed. ~~As Fall Creek Hatchery is part of PacifiCorp's Klamath Hydroelectric Project No. 2082, the existing Fall Creek Hatchery facilities are subject to the terms of any new FERC action for Project No. 2082.~~ Accordingly, this alternative analysis assumes the status quo, i.e., that the Fall Creek Hatchery facilities would not be demolished or re-purposed.

4.7.3 Aquatic Resources

Volume I Section 4.7.3 Alternatives – No Hatchery Alternative – Aquatic Resources, paragraph 3 on page 4-305:

While the Proposed Project includes continued operation of Iron Gate Hatchery for eight years using flows diverted from Bogus Creek (Section 3.3.5.9, Potential Impact 3.3-23) and the reopening of Fall Creek Hatchery for eight years using flows diverted from Fall Creek (Section 3.3.5.9, Potential Impact 3.3-24), the No Hatchery Alternative does not include continued hatchery operations, and thus there would be no flow diversions from Bogus Creek or Fall Creek and no change relative to existing conditions. Therefore, potential impacts 3.3-23 and 3.3-24 discussed for the Proposed Project do not pertain to the No Hatchery Alternative.

4.7.4 Phytoplankton and Periphyton

Volume I Section 4.7.4 Alternatives – No Hatchery Alternative – Phytoplankton and Periphyton, paragraph 2 on page 4-313:

While Iron Gate Hatchery nutrient releases would decrease under the No Hatchery Alternative, the hatchery nutrient discharges are less-than-significant based on an analysis of the water quality impacts of California Department of Fish and Wildlife hatcheries, including Iron Gate Hatchery (ICF 2010) (for more detail see Potential Impact 3.2-17), and decreases in hatchery nutrient releases would not necessarily result in a beneficial effect on phytoplankton or periphyton conditions downstream of the hatchery discharge.

4.7.5 Terrestrial Resources

Volume I Section 4.7.5 Alternatives – No Hatchery Alternative – Terrestrial Resources, paragraph 2 on page 4-314:

Full removal of Iron Gate Hatchery under the No Hatchery Alternative would result in a similar degree of construction activities and associated impacts to terrestrial resources as the Iron Gate Hatchery modifications (i.e., relocation of fish trapping and holding facilities, relocation of the cold-water supply) and Fall Creek Hatchery upgrades are included under the Proposed Project. Further, not operating the hatcheries under this alternative would have no bearing on the

anticipated long-term changes in terrestrial habitat that would result from removal of the Lower Klamath Project dams, reservoirs, and associated facilities. Therefore, the No Hatchery Alternative would have the same short-term and long-term potential impacts on vegetation communities, culturally significant species, special-status species, wildlife corridors, and habitat connectivity as those described for the Proposed Project (Potential Impacts 3.5-1 through 3.5-24 and 3.5-28 through 3.5-30). Implementation of Mitigation Measures TER-2, TER-3, TER-6, and TER-7 would reduce construction-related impacts, including in-water work, on all special-status amphibian species, gray wolf, and bald and golden eagles to less than significant.

4.7.7 Groundwater

Volume I Section 4.7.7 Alternatives – No Hatchery Alternative – Groundwater, paragraph 2 on page 4-316:

Removing Iron Gate Hatchery and not reopening Fall Creek Hatchery under the No Hatchery Alternative would have the same potential ~~not affect~~ effects on groundwater levels or wells immediately adjacent (potentially extending up to a mile from the reservoirs under certain conditions) to Copco No. 1 and Iron Gate reservoirs ~~relative to~~ as described for the Proposed Project. This is because the proposed diversions for both Iron Gate Hatchery (from Bogus Creek) and Fall Creek Hatchery (from Fall Creek) under the Proposed Project are non-consumptive and the proposed points of diversion and points of return are within several hundred feet of one another, with no groundwater wells located between these points (see location of "Fall Creek Dam" along Fall Creek in Figure 3.7-9 and hatchery area just downstream of Iron Gate Dam along Bogus Creek in Figure 3.7-10). ~~Therefore, t~~The groundwater impacts of the No Hatchery Alternative would be the same as those described for the Proposed Project (Potential Impacts 3.7-1 and 3.7-2) and there would be no significant impacts relative to existing conditions.

4.7.12 Historical and Tribal Cultural Resources

Section 4.7.12 Alternatives – No Hatchery Alternative – Historical and Tribal Cultural Resources, paragraph 4 on page 4-318:

Since the Iron Gate Hatchery would not be operated for eight years following dam removal, construction activities to convert two of the existing raceways to adult holding tanks, and construction of a new spawning facility within the portion of the Limits of Work containing the Iron Gate Hatchery footprint (Figure 2.7-4), would not occur. This level of construction would potentially avoid disturbance-related impacts to one known tribal cultural resource, and potentially additional unknown tribal cultural resources, that are located within the Iron Gate Hatchery footprint, which would mean fewer overall impacts to tribal cultural resources (Potential Impact 3.12-1) and historic-period archaeological resources (Potential Impact 3.12-12) under this alternative as compared with the Proposed Project

~~would be returned to more natural conditions In the short term, which would be beneficial relative to existing conditions and the Proposed Project~~. Further, since construction/upgrading activities would not occur at Fall Creek Hatchery, there would be no pre-dam removal construction activities (Potential Impact 3.12-1) at the Fall Creek site and thus no significant impacts to one known ~~or as yet~~ and other potentially unknown tribal cultural resources (Potential Impact 3.12-1) or historic-period archaeological resources (Potential Impact 3.12-12) relative to existing conditions, and fewer impacts relative to the Proposed Project.

4.7.16 Population and Housing

Volume I Section 4.7.16 Alternatives – No Hatchery Alternative – Population and Housing, paragraph 4 on page 4-320:

Full removal of Iron Gate Hatchery under the No Hatchery Alternative would result in a similar degree of construction activities and associated impacts related to population and housing as the Iron Gate Hatchery modifications (i.e., relocation of fish trapping and holding facilities, relocation of the cold-water supply) and Fall Creek Hatchery upgrades are included under the Proposed Project. Construction activities are the only part of the Proposed Project and this alternative that merit analysis for potential impacts on population and housing. This is because the number of operational staff at the Iron Gate Hatchery under existing conditions, and the number of operational staff at the reopened Fall Creek Hatchery under the Proposed Project, are expected to be far less than the number of construction workers required during the majority of the two-year construction activity period (35-105) under the Proposed Project and this alternative. As noted in Potential Impact 3.16-1, there would be no significant impact of the relatively large number of construction workers under the Proposed Project due to the general availability of vacant units in the City of Yreka and the County, as a whole. Thus, eliminating the need for hatchery operational staff under this alternative would be inconsequential with respect to population and housing. The number of construction workers in California would be the same as those described for the Proposed Project and would not result in a substantial influx of population (Potential Impact 3.16-1), nor would there be a need to displace existing residents or build replacement housing elsewhere (Potential Impact 3.16-2), and there would be no significant impacts relative to existing conditions.

4.7.17 Public Services

Volume I Section 4.7.17 Alternatives – No Hatchery Alternative – Public Services, paragraph 4 on page 4-320:

Thus, for reasons described in Section 3.17.5 *[Public Services] Potential Impacts and Mitigation*, impacts and associated mitigation measures from increased public service response times for emergency fire, police, and medical services due to construction and demolition activities, elimination of a long-term water

source for wildfire services substantially increasing the response time for suppressing wildfires, and potential effects on schools services and facilities would be the same under the No Hatchery Alternative as those described for the Proposed Project (Potential Impacts 3.17-1 through 3.17-3) ~~(Potential Impacts 3.5-1 through 3.5-3)~~.

4.7.19 Aesthetics

Volume I Section 4.7.19 Alternatives – No Hatchery Alternative – Aesthetics, paragraphs 2 and 3 on page 4-321:

Under the No Hatchery Alternative, long-term (permanent) potential visual ~~changes~~ impacts resulting from the removal of the Lower Klamath Project dams and associated facilities would be the same as described for the Proposed Project (Potential Impact 3.19-5). This remains the case in spite of minor aesthetic differences from the Proposed Project ~~with the exception of~~ for the portions of the Limits of Work that contain the Iron Gate Hatchery (i.e., key observation points IG9, IG10, IG11, IG12; Table 3.19-3 and Figure 3.19-2 in Volume III Attachment 1 Section 3.19.5 *Aesthetics – Potential Impacts and Mitigation*) and Fall Creek Hatchery (i.e., key observation points FC2, FC3, FC4; Table 3.19-3 and Figure 3.19-2 in Volume III Attachment 1 Section 3.19.5 *Aesthetics – Potential Impacts and Mitigation*) footprints. The removal of Iron Gate Hatchery would not cause the VRM class to be degraded at a key observation point, would not adversely impact a scenic vista for those areas that were not assigned a VRM class, and would not result in a significant long-term (permanent) impact. The aesthetics of the Fall Creek Hatchery itself would remain unchanged from the baseline. ~~Since Iron Gate Hatchery would not be operated for eight years following dam removal, the portion of the Limits of Work containing the Iron Gate Hatchery footprint (Figure 2.7-13) would be returned to more natural conditions in the short term. This would be beneficial relative to existing conditions and the Proposed Project. Since construction/upgrading activities would not occur at the Fall Creek Hatchery, there would be no impact (no change from existing conditions) and a small reduction in short-term impacts on aesthetic resources for the portion of the Limits of Work containing the Fall Creek Hatchery footprint (Figure 2.7-15) relative to the Proposed Project.~~

Construction-related activities at Fall Creek Hatchery under this alternative would not occur, and would result in no change from existing conditions and would not be a significant impact. Other short-term (temporary) visual impacts of construction activities (Potential Impact 3.19-6) and nighttime views during short-term construction activities (Potential Impact 3.19-7) would be the same as those described for the Proposed Project.

4.8 Alternatives References

Volume I Section 4.8 [Alternatives References], pages 4-325 through 4-338, includes the following revisions:

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5 OTHER REQUIRED CEQA DISCUSSION AND CONSIDERATION OF SOCIAL AND ECONOMIC FACTORS

5.4 Social and Economic Factors Under CEQA

5.4.1 Consideration of Economic Information for Resources Potentially Affected by Dam Removal

Volume I Section 5.4.1.1 Other Required CEQA Discussion and Consideration of Social and Economic Factors – Social and Economic Factors Under CEQA – Consideration of Economic Information for Resources Potentially Affected by Dam Removal – Commercial Fishing, paragraph 2 on page 5:

Primarily using the EDRRA model, and dependent on the management area, dam and facilities removal was estimated by USBR (2012) to provide an additional 11 to 218 commercial fishing industry jobs within the five management areas (San Francisco Management Area Area—218; Fort Bragg Management Area—69; KMZ-CA—19; KMZ-OR—11; Central Oregon Management Area—136), an increase of labor income between $0.06 million to $2.56 million, and an economic output of $0.13 million to $6.6 million (all 42 to 43 percent increases) for commercial fishing compared with the status quo (see Table V-4 in NMFS 2012). The average annual increase in net revenue for all areas modeled with removal of the dams and associated facilities would be $7.296 million (43 percent increase), and ocean commercial fishery benefits for 2012 to 2061 were estimated to be $134.5 million (discounted to 2012 value). The KMZ-CA portion of this annual net revenue benefit was estimated to be $381,396 ~~$267,131~~ (2012 dollars).

Volume I Section 5.4.1.3 Other Required CEQA Discussion and Consideration of Social and Economic Factors – Social and Economic Factors Under CEQA – Consideration of Economic Information for Resources Potentially Affected by Dam Removal – Real Estate and Property Taxes, paragraph 3 on page 5-7:

USBR (2012) qualitatively assessed dam removal based on net economic benefits associated with various resources, and found that removal of the four dams and facilities could result in short-term declines in real estate values of parcels surrounding Copco 1 and Iron Gate reservoirs, which would be partially offset as the barren landscape is revegetated.

Volume I Section 5.4.1.3 Other Required CEQA Discussion and Consideration of Social and Economic Factors – Social and Economic Factors Under CEQA – Consideration of Economic Information for Resources Potentially Affected by Dam Removal – Real Estate and Property Taxes, paragraph 3 on page 5-7:

For other riverine parcels downstream of Iron Gate Dam, USBR (2012) indicated that detectable improvements of water quality could lead to increased real estate values in the long term.

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APPENDIX C. WATER QUALITY SUPPORTING TECHNICAL INFORMATION

After circulation of the Draft EIR, numerous additional comments were received regarding water quality (see Volume III), and changes to this appendix in response to those comments are flagged in the comment responses and then printed in this Final EIR Appendix C. None of the changes result in significant new information in the EIR under the meaning of CEQA Guidelines, section 15088.5, subdivision (a):

> New information added to an EIR is not 'significant' unless the EIR is changed in a way that deprives the public of a meaningful opportunity to comment upon a substantial adverse environmental effect of the project or a feasible way to mitigate or avoid such an effect (including a feasible project alternative) that the project's proponents have declined to implement.

However, the changes were numerous enough that reprinting this appendix rather than simply including a list of revisions was warranted to improve clarity and readability of the document.

C.1 Water Temperature

C.1.1 Upper Klamath Basin

C.1.1.1 Keno Impoundment/Lake Ewauna

Water temperatures in much of the Upper Klamath River, including the reach from Link River Dam through the Keno Impoundment/Lake Ewauna, exceed 20°C (68°F) in June through August. The Keno Impoundment/Lake Ewauna experiences periods of intermittent, weak summertime stratification, however water temperatures are generally similar throughout the water column and are among the warmest in the Klamath Basin with peak values greater than 25°C (77°F). Weekly measurements in 2007 in the Link River and upper portion of the Keno Impoundment indicate maximum temperatures of 25°C (77°F) in mid-to-late summer (Deas and Vaughn 2006; Sullivan et al. 2008). Recorded average monthly temperatures for the period 2001 to 2004 in Keno Impoundment were 22.4°C (72.3°F) in July, 20.8°C (69.4°F) in August and 18.0°C (64.4°F) in September (FERC 2007). Average monthly temperatures reported by PacifiCorp downstream from Keno Dam for the same period were 23.2ºC (73.8ºF), 21.1ºC (70.0°F), and 16.9°C (62.4°F) during July, August, and September, respectively (FERC 2007). Similarly, during 2009, summer water temperatures downstream from Keno Dam were generally greater than 16°C (60.8°F) from June through September, with peak temperatures exceeding 26°C (78.8°F) in late-July (Watercourse Engineering, Inc. 2011a).

C.1.1.2 Hydroelectric Reach

The Hydroelectric Reach spans the Oregon–California state line from J.C. Boyle to Iron Gate Dam. During summer months, maximum weekly maximum temperatures (MWMTs) in the Hydroelectric Reach regularly exceed the range of chronic effects temperature thresholds (13 to 20ºC [55.4 to 68ºF]) for full salmonid support (North Coast Regional Board 2010; Kirk et al. 2010; Asarian and Kann 2011).

In general, water temperatures in this reach follow a seasonal pattern, with average monthly water temperatures from March through November ranging from just over 5°C (41°F) in November to more than 22°C (71.6°F) during June through August (FERC 2007). Winter water temperatures throughout the reach are largely driven by the temperature of river inflows (Deas and Orlob 1999). In the summer, the relatively shallow J.C. Boyle Reservoir does not exhibit long-term thermal stratification, with a typical vertical temperature difference of less than 2°C (3.6°F) in the water column (FERC 2007; Raymond 2008a, 2009a, 2010a), so the reservoir does not directly alter summertime water temperatures in reaches farther downstream (NRC 2004). However, current bypass operations at the J.C. Boyle Dam affect water temperatures in the river immediately downstream from the dam. While natural diel (24-hour) water temperature variations occur in the river, bypass operations between J.C. Boyle Dam (river mile [RM] 229.8) and the J.C. Boyle Powerhouse (RM 225.2) result in water temperatures that are typically cooler from May to September and warmer from November to March than ambient river temperatures upstream or downstream (PacifiCorp 2004b). In the J.C. Boyle Bypass Reach downstream from J.C. Boyle Dam, at approximately RM 225.8, water from cold groundwater springs enters the river at a relatively constant 11 to 12°C (51.8 to 53.6°F). Decreases in the daily water temperature (i.e., cooler water temperature than upstream of J.C. Boyle Reservoir) and the range of daily water temperature variations occur in the J.C. Boyle Bypass Reach during the summer/fall when daily peaking operations at J.C. Boyle Powerhouse (RM 225.2) divert warmer reservoir discharges around the J.C. Boyle Bypass Reach (see also Section 2.3.1 *J.C. Boyle Dam Development*) and leave the cold groundwater springs to dominate the river flow. Water temperatures in the J.C. Boyle Bypass Reach can decrease by 9 to 27°F when bypass operations are underway due to the influence of the springs (Kirk et al. 2010). In the J.C. Boyle Peaking Reach, downstream of the J.C. Boyle Bypass Reach, the flow diverted around the J.C. Boyle Bypass Reach rejoins the Klamath River at the J.C. Boyle Powerhouse (see Figure 2.3-1). The cooler, spring-influenced river exiting the J.C. Boyle Bypass Reach mixes rapidly with the warmer water discharged from the J.C. Boyle Powerhouse that can exceed 25°C (77°F) in July and August (Kirk et al. 2010). At the upstream end of the J.C. Boyle Peaking Reach, the natural, cold groundwater input from the J.C. Boyle Bypass Reach, combined with fluctuations in river flow due to hydroelectric power operations in the J.C. Boyle Peaking Reach also produces an observed increase in daily water temperature range above the natural diel water temperature fluctuations (Kirk et al. 2010). For example, in 2002 daily water

temperature in the J.C. Boyle Peaking Reach varied by approximately 3 to 13°F during hydroelectric power operations, while daily water temperature varied by approximately 1 to 2°F during non-peaking flows. Based on available data, the influence of the springs dominates water temperatures in this reach; for example, while daily variations in water temperature increased during peaking operations, water temperatures in the J.C. Boyle Peaking Reach still decreased by 9 to 16°F compared to upstream of J.C. Boyle Reservoir (PacifiCorp 2004b; FERC 2007).

Further downstream in the J.C. Boyle Peaking Reach, near the confluence of the Klamath River and Shovel Creek (Figure 2.2-3), there are natural hot springs that contribute flows to the mainstem river. The natural hot springs were not found to result in warming of the Klamath River based on two measurements made in November and December 2017. Water temperature data collected upstream and downstream of the confluence of the Klamath River and Shovel Creek showed a 1.4°F increase in the downstream direction during the November 2017 measurement, but a 0.2°F decrease during the December 2017 measurement (KRRC Recreation Technical Team 2018).

Within and downstream from Copco No. 1 Reservoir, spring, summer and fall temperatures in the Hydroelectric Reach are heavily influenced by the large thermal mass of the two deepest reservoirs, Copco No. 1 and Iron Gate reservoirs, and their seasonal stratification patterns. Spring temperatures are generally cooler than would be expected under natural conditions, and summer and fall temperatures are generally warmer (PacifiCorp 2004b; North Coast Regional Board 2010). Both Iron Gate and Copco No. 1 reservoirs thermally stratify beginning in April/May and do not mix again until October to December (Figure C-1, Table C-1) (Raymond 2008a, 2009a, 2010a; Asarian and Kann 2011). Water temperature data indicate thermal stratification in Copco No. 1 Reservoir begins about a month later and ends about a month earlier than stratification in Iron Gate Reservoir (Asarian and Kann 2011). The onset of spring/summer stratification and the timing of fall turnover in Iron Gate and Copco No. 1 Reservoirs are driven by meteorological conditions (Deas and Orlob 1999; Asarian and Kann 2011).

In 2015, PacifiCorp installed a powerhouse intake barrier/thermal curtain in Iron Gate Reservoir under IM 11. While the primary purpose of the curtain is to isolate surface waters that have high concentrations of blue-green algae (cyanobacteria) such that extensive summer and fall blooms are not readily released downstream to the Middle and Lower Klamath River, PacifiCorp reports that the curtain also provides a secondary benefit of isolating warmer surface waters and draws deeper cooler water for release to the Klamath River downstream of Iron Gate Dam (PacifiCorp 2016a, 2017a, 2018). Results from the intake barrier/thermal curtain studies indicate that modest 1 to 2°C (1.8 to 3.6°F) water temperature improvement is possible (PacifiCorp 2016a, 2017a), although data do not indicate that this measure could achieve compliance with the Thermal Plan or to meet the Klamath River TMDLs temperature requirement

in the Middle Klamath River (North Coast Regional Board 2010). Additionally, water temperature improvements from operation of the intake barrier/thermal curtain would be potentially limited by the need to access water with higher dissolved oxygen concentrations to comply with dissolved oxygen standards, with the curtain completely rolled up during portions of 2017 to maximize dissolved oxygen concentrations for aquatic life (PacifiCorp 2018).

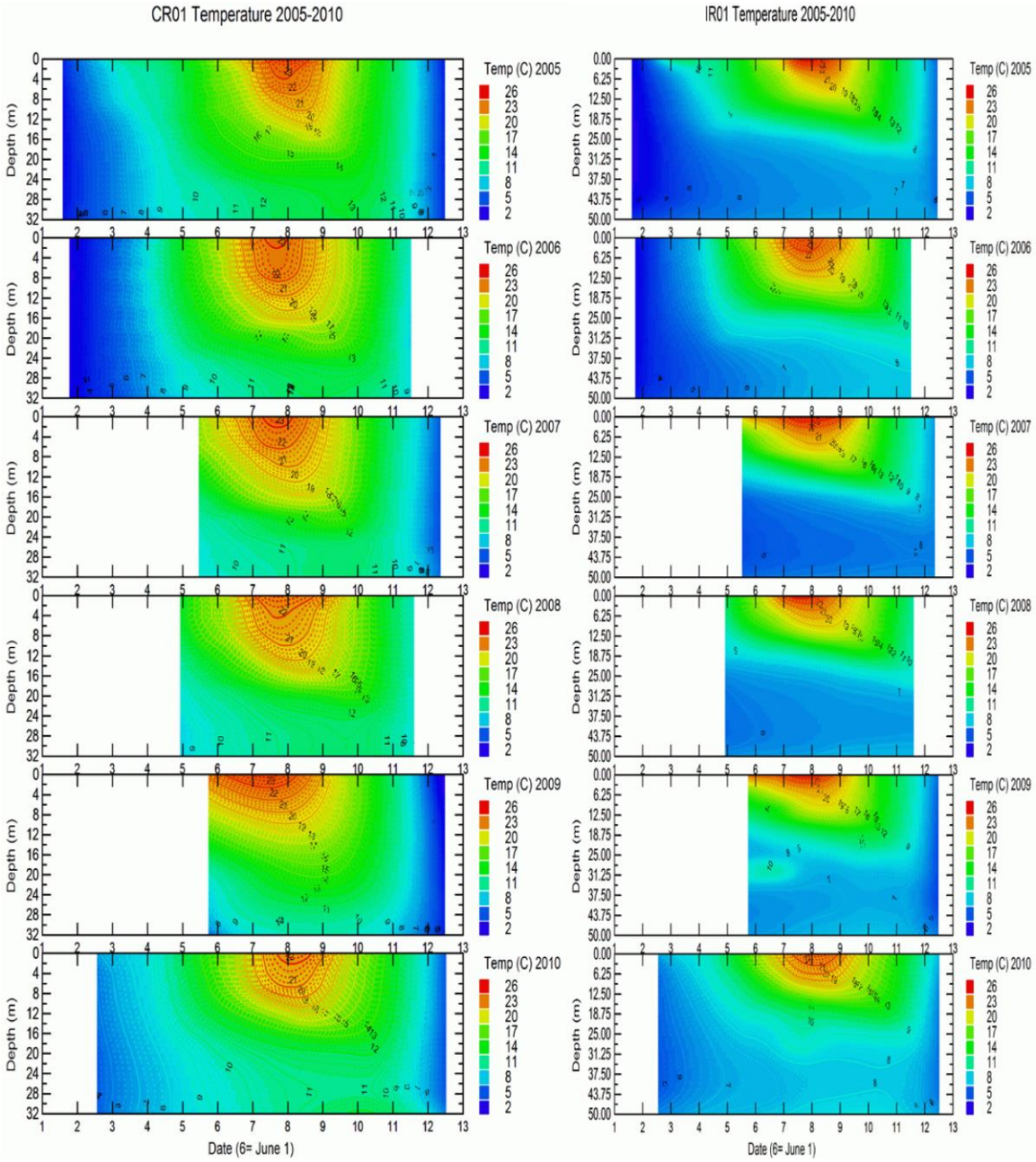

Figure C-1. Depth-time Distribution of Isopleths of Water Temperature at Station CR01 in Copco No. 1 Reservoir and IR01 in Iron Gate Reservoir from January 2005 to December 2010. Source: Asarian and Kann 2011.

Table C-1. General Reservoir Turnover Dates for Copco No. 1 and Iron Gate Reservoirs (2007 to 2009).

Year	Thermally Stable Hypolimnion Establishment Date		Approximate Reservoir Turnover Date		Source
	Copco	Iron Gate	Copco	Iron Gate	
2007	By June 6	By June 6	Before October 23	Before November 28	Raymond 2008a
2008	By April 30	By April 30	Before October 22	Before November 19	Raymond 2009a
2009	By May 24	By May 24	Before October 13	Before November 17	Raymond 2010a

Powerhouse withdrawals for Copco No. 1 and Iron Gate dams are primarily from the epilimnion (surface water). The depth of the epilimnion changes over time based on the season and characteristics of each reservoir. The depth of the thermocline (metalimnion) separating the epilimnion (surface waters) from the hypolimnion (bottom waters) is approximately 50 feet below the water surface in both Copco No. 1 and Iron Gate reservoirs by mid-summer when thermal stratification is present in the reservoirs (FERC 2007). In Copco No. 1 Reservoir, powerhouse withdrawal is from approximately 9.8 m (32 ft) below the water surface when the reservoir is full (full pool). The design and operation of the Iron Gate Dam intake structure results in the water temperature in the Klamath River immediately downstream of Iron Gate Dam being similar (i.e., within a few degrees or less) to the water temperature measured approximately 10 to 30 feet below the surface of Iron Gate Reservoir near the dam (PacifiCorp 2004b; FERC 2007). Occasionally, withdrawals extend into the hypolimnion; for example, in Iron Gate Reservoir, the withdrawal envelope has been estimated to extend down to approximately 18 m (60 ft) in depth (Deas and Orlob 1999). After deployment of PacifiCorp's intake barrier/thermal curtain in Iron Gate Reservoir, the water temperature in the Klamath River immediately downstream of Iron Gate Dam was most similar to the water temperature measured approximately 16 feet below the surface of Iron Gate Reservoir (PacifiCorp 2017a).

Additionally, a small withdrawal (about 50 cfs) for the Iron Gate Hatchery occurs from the hypolimnion at Iron Gate Reservoir. In general, however, temperature in waters discharged from Copco No. 1 and Iron Gate reservoirs reflect the warmer temperatures of surface water (NRC 2004). Seasonal stratification of these two reservoirs also prevents mixing of waters within the water column and adversely affects dissolved oxygen concentrations, nutrient concentration (and speciation), and pH in bottom waters, limiting the potential for hypolimnetic cool water releases to the Mid- and Lower Klamath River (FERC 2007). The small relative volumes of the hypolimnions in Copco No. 1 and Iron Gate reservoirs

also limit the potential for seasonal releases to decrease water temperatures in downstream river reaches. Since J.C. Boyle Reservoir does not exhibit long-term thermal stratification (i.e., it lacks a seasonal hypolimnion), there are no controllable actions that can be taken to cool water released from this waterbody (FERC 2007).

C.1.2 Mid- and Lower Klamath Basin

C.1.2.1 Iron Gate Dam to Salmon River

Water temperature in the Lower Klamath Basin varies seasonally, with mean monthly temperatures in the river downstream from Iron Gate Dam ranging from 3 to 6°C (37 to 43°F) in January to 20 to 22.5°C (68 to 72.5°F) in July and August (Bartholow 2005; Karuk Tribe of California 2009, 2010a, 2010b, 2011, 2012, 2013; Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016; Asarian and Kann 2013). Water temperature increases with distance downstream from Iron Gate Dam due to meteorological controls (Basdekas and Deas 2007; Asarian and Kann 2013). The presence of the Lower Klamath Project exerts less influence on water temperatures farther downstream of Iron Gate Dam, so the Klamath River water temperature is more influenced by solar energy, the natural heating and cooling regime of ambient air temperatures, and tributary inputs of surface water. Based upon annual water temperature monitoring conducted by the Karuk Tribe, water temperatures peak during the summer when air temperatures increase and flows decrease in the Klamath Basin (Figure C-2; Karuk Tribe of California 2002, 2003, 2007, 2009, 2010a, 2010b, 2011, 2012, 2013). Figures C-2, C-3, C-4, C-5, and C-6 show the range of annual variability in daily average water temperature at several Klamath River locations downstream of Iron Gate Dam from 2006 to 2013. Daily average summer water temperatures regularly exceed 20°C during summer months near Seiad Valley, while daily average values documented immediately downstream from Iron Gate Dam are generally cooler and less variable. Daily average temperatures between June and September are between 1 to 6°C (1.8 to 10.8°F) higher near Seiad Valley than those just downstream from Iron Gate Dam (Figure C-2 to C-6; Karuk Tribe of California 2009, 2010a, 2010b, 2011, 2012, 2013). Water temperature modeling in the Klamath River indicates releases from Iron Gate Dam do not affect mainstem water temperature by the Salmon River (RM 66.3) (PacifiCorp 2005a, 2005b; Dunsmoor and Huntington 2006; North Coast Regional Board 2010; Perry et al. 2011; Risley et al. 2012).

Water temperature trends under the 2013 BiOp flows are consistent with measured water temperature between 2001 and 2012 (Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019; Asarian and Kann 2013). Water temperature trends under the 2019 BiOp Flows cannot be compared with those under the pre-2013 BiOp Flows and the 2013 BiOp Flows since water temperature data from the Klamath River, including KHSA IM 15 data, after the 2019 BiOp Flows became the applicable flow criteria (i.e., April 1, 2019) has not been reviewed and approved for distribution. Water

temperature trends under the 2019 BiOp Flows are expected to be similar to those under 2013 BiOp Flows due to the similarities in 2019 BiOp Flows and 2013 BiOp Flows. An average of water temperature data from 2001 to 2011 at locations along the Klamath River shows that daily mean and daily maximum water temperature peaked between July and August with a maximum temperature of approximately 24°C (Figure C-7; Asarian and Kann 2013). A comparison of water temperature and flow measured in 2009 (Figure C-8) and 2015 (Figure C-9) demonstrates that water temperature downstream of Iron Gate Dam in 2015 peaked in July under 2013 BiOp minimum flows of 900 cfs (NMFS and USFWS 2013, Watercourse Engineering, Inc. 2016), similar to the water temperature downstream of Iron Gate Dam in 2009 which peaked between July and August under 2002 Biological Opinion minimum flows of 1,000 cfs (NMFS 2002; Watercourse Engineering, Inc. 2010). Similar water temperature trends are also observed in the Klamath River at Seiad Valley (Figures C-8 and C-9).

With respect to the longer term water temperature record (i.e., prior to 2000), Bartholow (2005) presents evidence that water temperatures in the lower Klamath River have been increasing since before 1950. Bartholow (2005) indicates that the observed multi-decade trend of increasing water temperatures in the lower river is related to the cyclic Pacific Decadal Oscillation and is consistent with a measured average basin wide air temperature increase of 0.33°C/decade (0.59°F/decade). Bartholow (2005) estimates that the season of high temperatures that are potentially stressful to salmonids has lengthened by about 1 month in the Klamath River since the early 1960s, and the average length of the lower river exhibiting summer water temperatures less than 15°C (59°F) has declined by about 8.2 km/decade (5.1 mi/decade). Potential climate change effects on water temperature are discussed in more detail as part of the effects determination for the No Project Alternative (see Section 3.2.4.3).

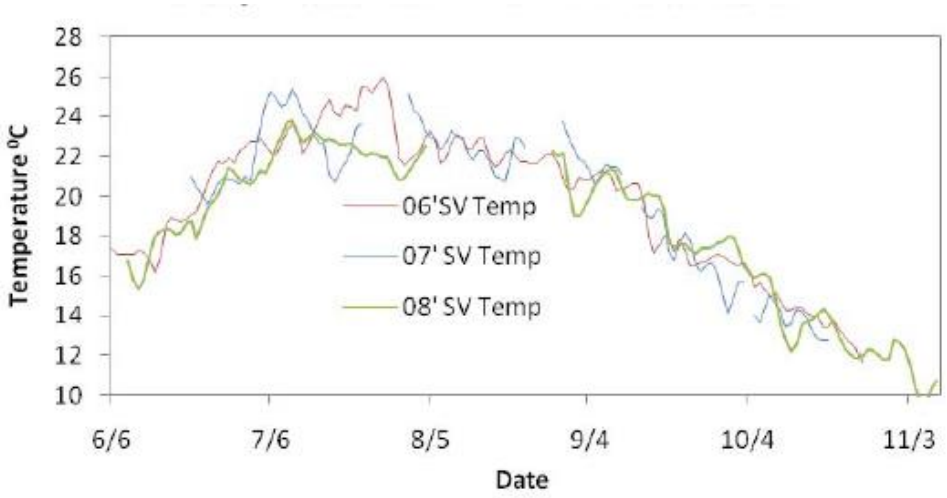

Figure C-2. Daily Average Water Temperature in the Klamath River near Seiad Valley (RM 132.7) June through November 2006, 2007, and 2008. Source: Karuk Tribe of California 2009.

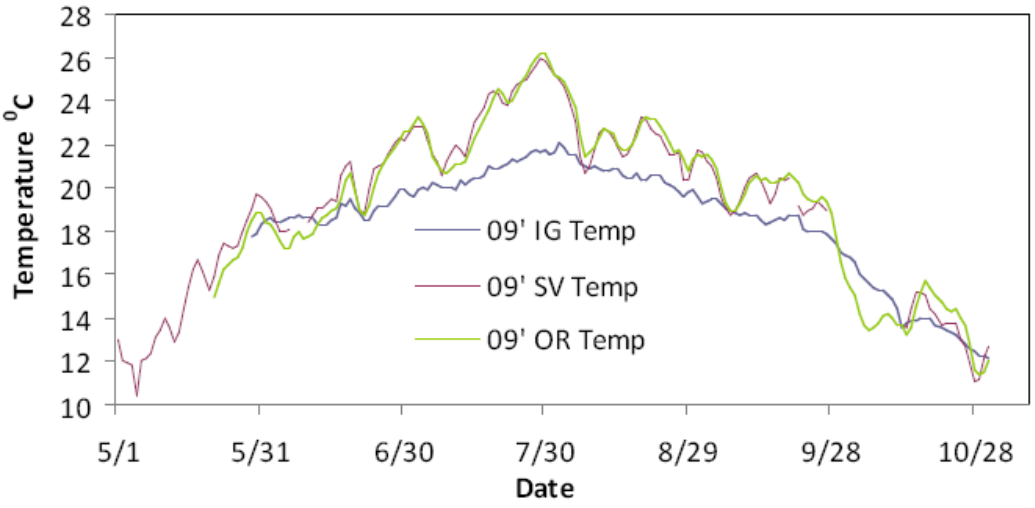

Figure C-3. Daily Average Water Temperature in the Klamath River Downstream from Iron Gate Dam (≈RM 193.1), near Seiad Valley (RM 132.7) and at Orleans (RM 58.9) During May through October 2009. Source: Karuk Tribe of California 2010a.

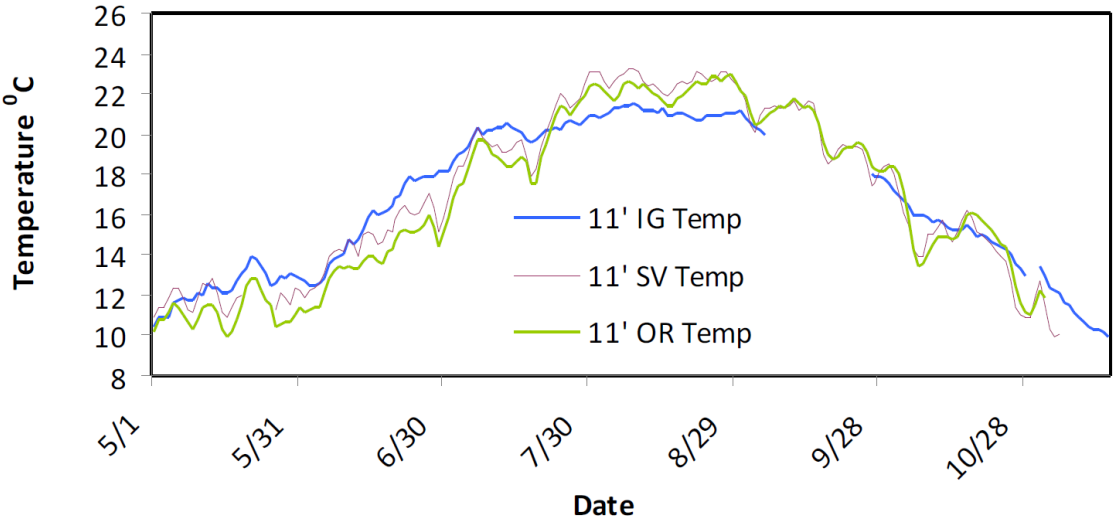

Figure C-4. Daily Average Water Temperature in the Klamath River Downstream from Iron Gate Dam (≈RM 193.1), near Seiad Valley (RM 132.7) and at Orleans (RM 58.9) During May through November 2011. Source: Karuk Tribe of California 2011.

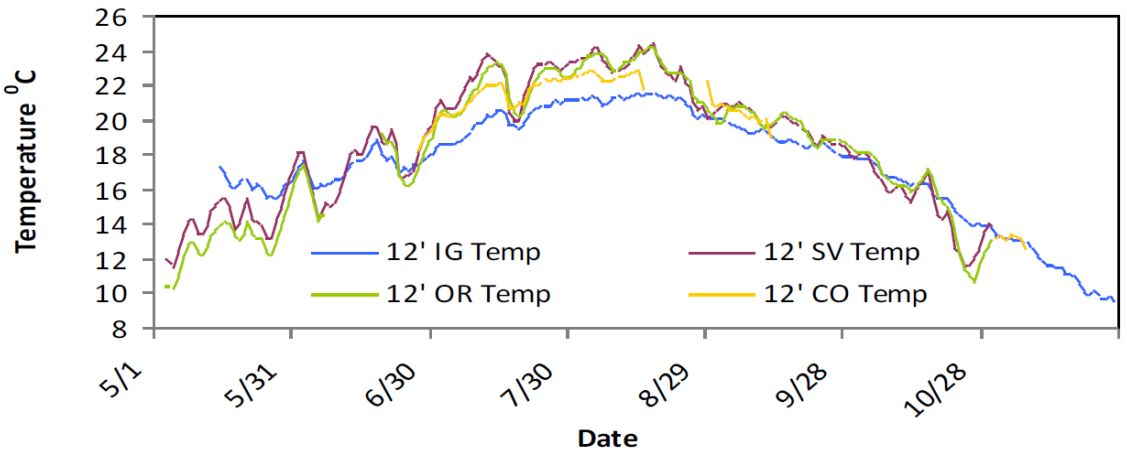

Figure C-5. Daily Average Water Temperature in the Klamath River Downstream from Iron Gate Dam (≈RM 193.1), near Colliers Rest Area/I-5 Bridge upstream of the Shasta River confluence (≈RM 179.5), near Seiad Valley (RM 132.7) and at Orleans (RM 58.9) During May through November 2012. Source: Karuk Tribe of California 2012.

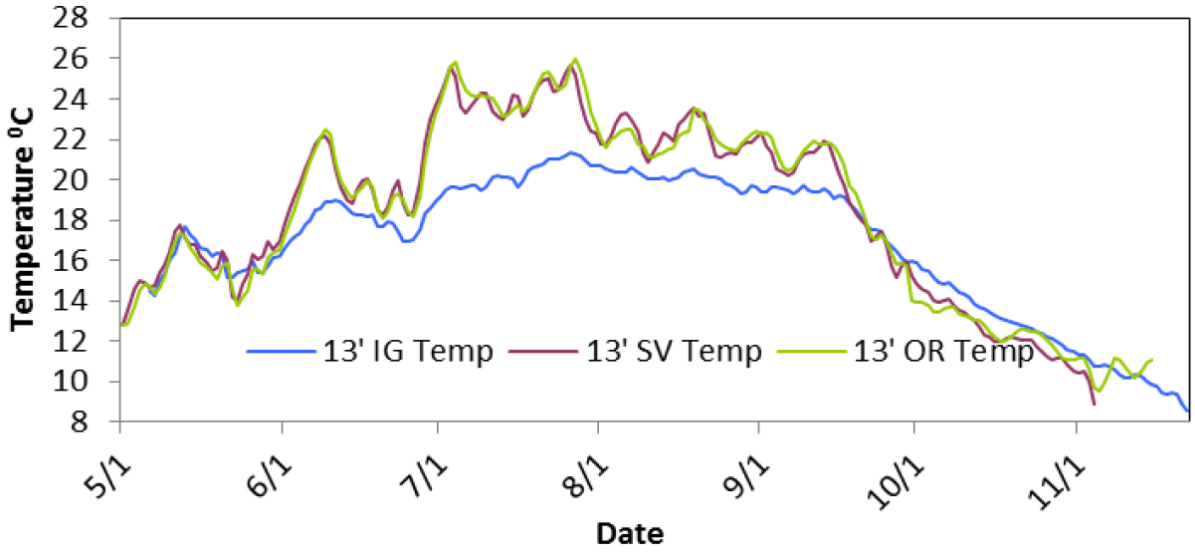

Figure C-6. Daily Average Water Temperature in the Klamath River Downstream from Iron Gate Dam (≈RM 193.1), near Seiad Valley (RM 132.7) and at Orleans (RM 58.9) During May through November 2013. Source: Karuk Tribe of California 2013.

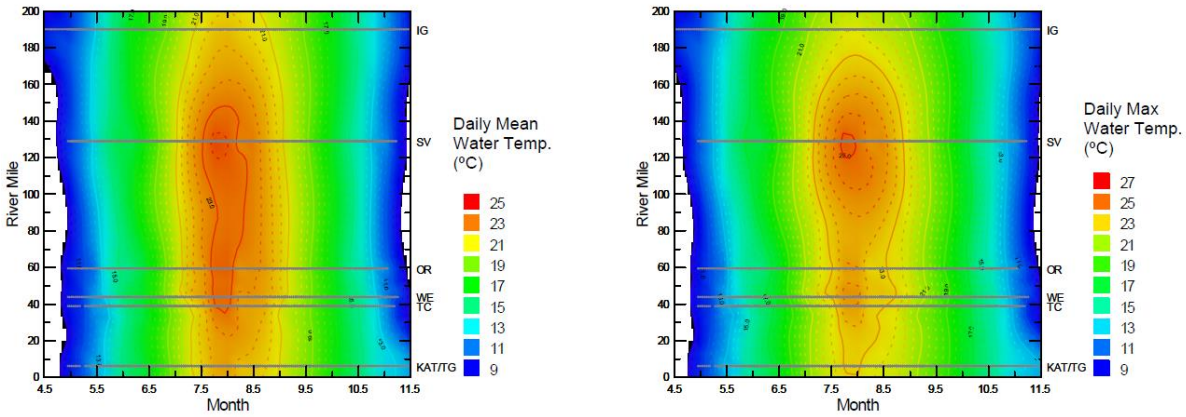

Figure C-7. Daily Mean and Daily Maximum Water Temperature in the Klamath River Downstream from Iron Gate Dam (≈RM 193.1) to the Klamath River at Turwar (≈RM 5.6) Averaged from 2001 to 2011 Data. Horizontal Grey Lines Indicate the Location and Time Period of Measurement in the Klamath River at Iron Gate (IG), Seiad Valley (SV), Orleans (OR), Weitchpec Upstream of the Trinity River (WE), Upstream of Tully Creek (TC), and Turwar (KAT/TG). Source: Asarian and Kann 2013.

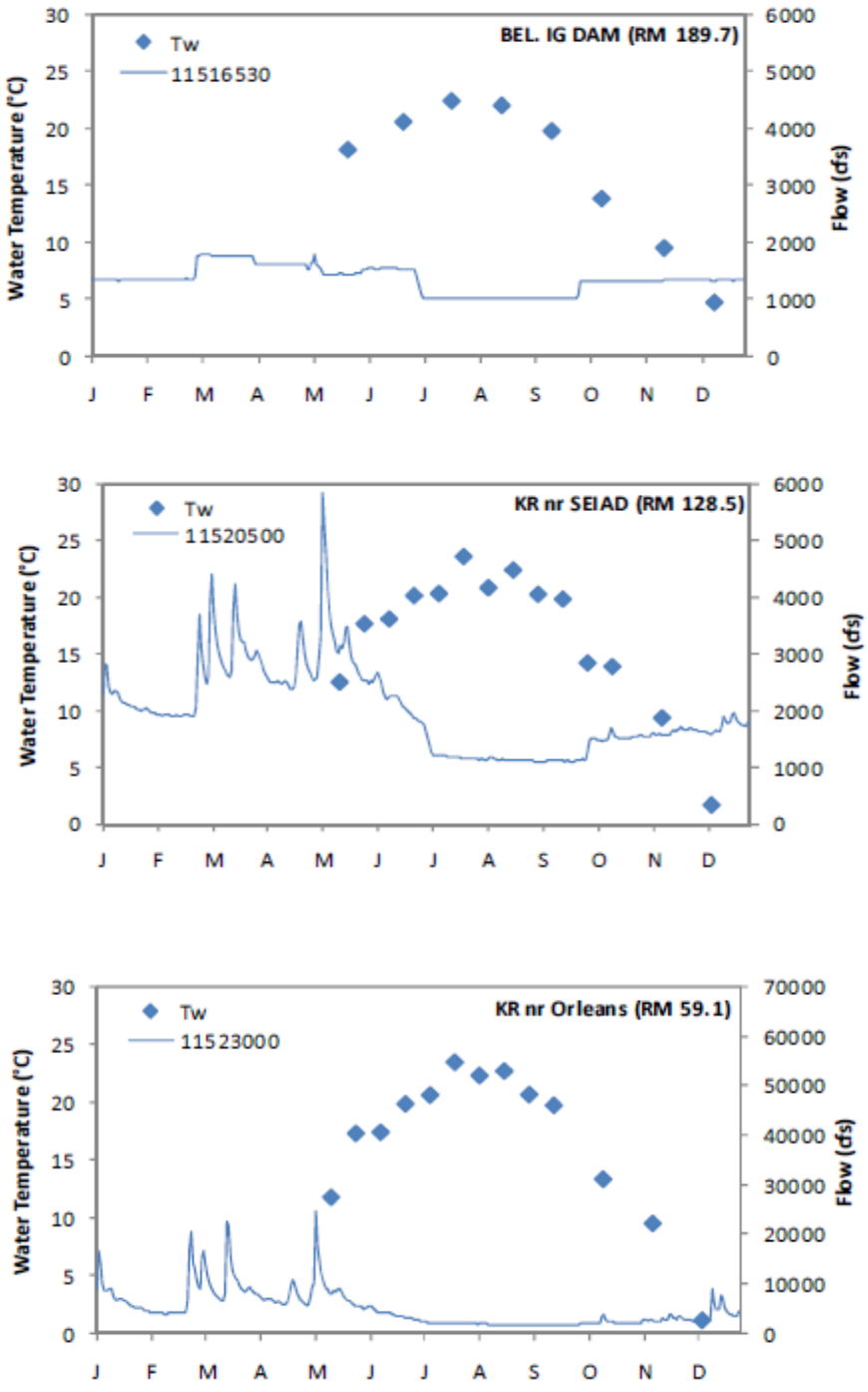

Figure C-8. Klamath River Water Temperature in 2009 During Monthly Water Quality Grab Samples and Flow at USGS Gage Stations (Station Number Listed in the Legend). Source: Watercourse Engineering, Inc. 2011a.

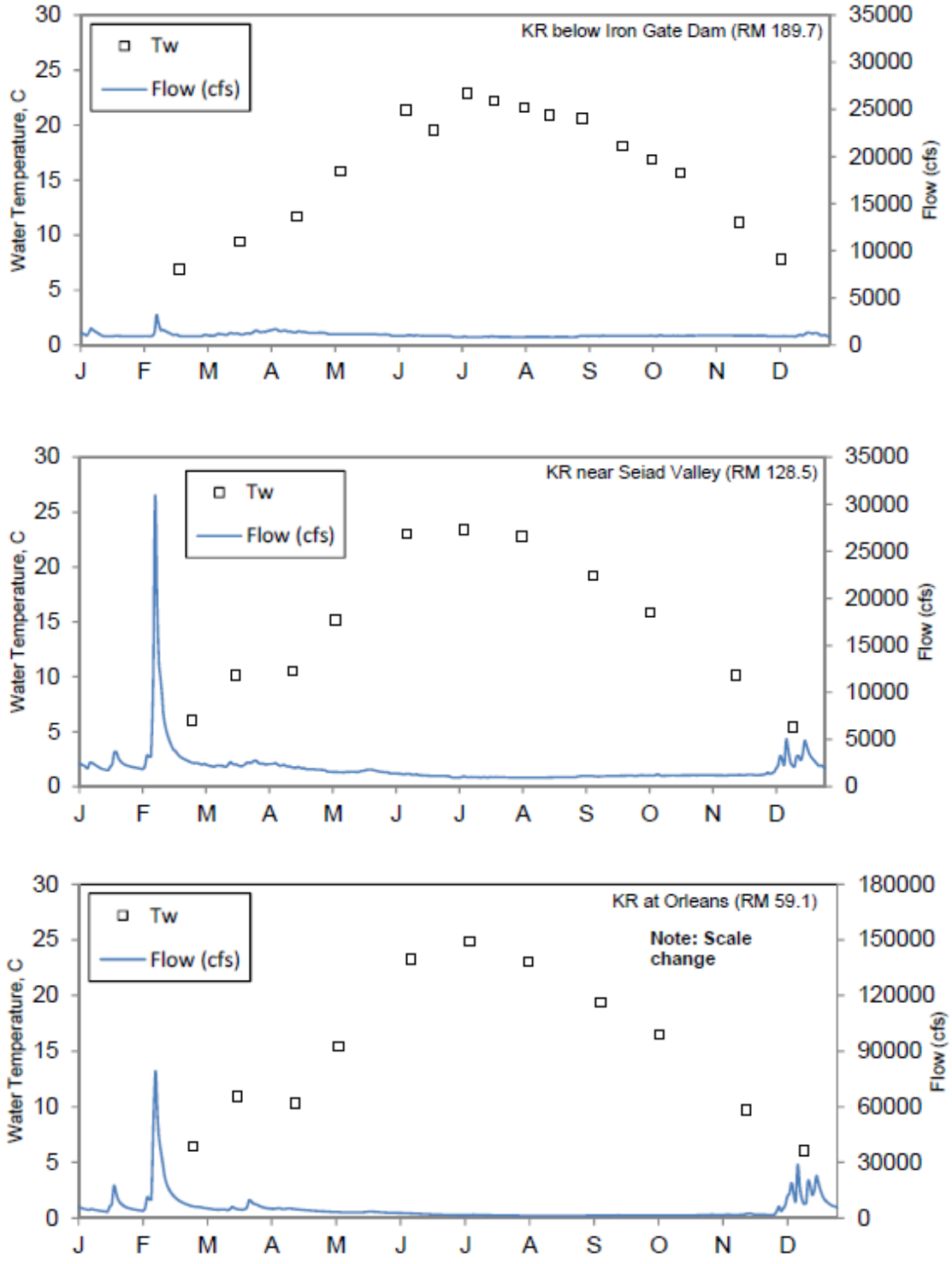

Figure C-9. Klamath River Water Temperature in 2015 During Monthly Water Quality Grab Samples and Flow at USGS Gage Stations. Source: Watercourse Engineering, Inc. 2016.

C.1.2.2 Salmon River to Estuary

Water temperature monitoring by the Karuk Tribe includes data from Orleans (RM 58.9), which is just downstream from the Salmon River confluence with the mainstem Klamath River. Daily average water temperature at Orleans was 10.5 to 26°C (50.9 to 78.8°F) from June through November 2006 to 2008, with the warmest temperatures generally occurring during July (Figure C-10; Karuk Tribe of California 2009). More contemporary data from 2009 to 2015 (Figures C-3 to C-9) further support these water temperature trends at Orleans (Karuk Tribe of California 2009, 2010a, 2010b, 2011, 2012, 2013; Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016; Asarian and Kann 2013). Asarian and Kann (2013) reports that average daily maximum water temperature between 2001 and 2011 is approximately 23°C to 24°C between July and August from the Salmon River (RM 66.3) to Turwar Creek (RM 5.6) (Figure C-7).

In the mainstem river between the Klamath River's confluence with the Trinity River and the Klamath River Estuary, the Yurok Tribe, through the Yurok Tribe Environmental Program (YTEP), has conducted annual water temperature monitoring since 2002 (YTEP 2004; Sinnott 2010a, 2011a, 2012a; Hanington 2013; Hanington and Ellien 2014). Between 2009 and 2013, peak temperatures generally occur in mid-July to mid-August with the highest daily maximum temperatures recorded at the most upstream locations (Sinnott 2010a, 2011a, 2012a; Hanington 2013; Hanington and Ellien 2014). The effect of the Trinity River on the mainstem Klamath River water temperature varied within individual years and between years. A small (0.5°C [0.9°F] or less) cooling effect was usually observed from the contribution of the Trinity River to the mainstem Klamath River between 2009 and 2011, but inflows from the Trinity River caused a 0.5°C (0.9°F) or less warming effect between mid-May and late June during 2010 and 2011 (Sinnott 2010a, 2011a, 2012a). During 2012 and 2013, inflows from the Trinity River usually altered water temperature in the Klamath River by 0.5°C (0.9°F) or less, but from mid-August to late September inflow from the Trinity River cooled Klamath River water temperature on average by approximately 1°C (Hanington 2013, Hanington and Ellien 2014). During May through November 2009, water temperatures ranged from approximately 11.1°C (52.0°F) in October to 26.8°C (80.2°F) in July (Sinnott 2010a). Similar trends were measured during 2013 with the lowest water temperature of 12.4°C (54.2°F) occurring in October while the highest water temperature of 26.4°C (79.4°F) occurred in July (Hanington and Ellien 2014). Between 2009 and 2013, the daily maximum summer water temperatures ranged from approximately 23.8 to 26.9°C (74.8 to 80.4°F) just upstream of the confluence with the Trinity River (Weitchpec [RM 43.3]), decreasing to approximately 23.4 to 24.9°C (74.1 to 76.8°F) near Turwar Creek (RM 5.6) (YTEP 2005; Sinnott 2010a, 2011a, 2012a; Hanington 2013; Hanington and Ellien 2014). Figure C-11 shows the upper range of the daily maximum water temperature which occurred in 2009, while Figure C-12 shows the lower range of the daily maximum water temperature which occurred in 2011 (Sinnott 2010a, 2012a). These summer temperatures exceed optimal growth thresholds as well as critical thermal maxima for coho,

Chinook salmon, and steelhead (Brett 1952, Armour 1991, Stein et al. 1972, McGeer et al. 1991). Historically, summer water temperature maxima in the lower Klamath River have been greater than in other coastal rivers to the north and south. For example, Blakey (1966, as cited in Bartholow 2005), reports water temperatures in the Klamath River downstream from the Trinity River confluence (RM 43.3) reaching 26.6°C (79.9°F) for up to 10 days per year, in contrast to proximal coastal rivers that never reach this temperature.

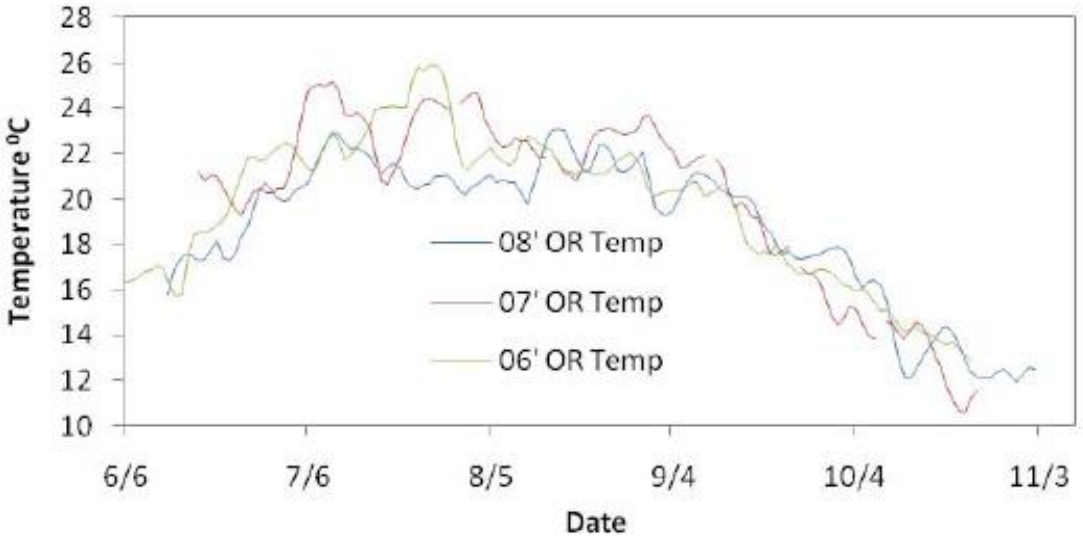

Figure C-10. Daily Average Water Temperature in the Klamath River at Orleans (RM 58.9) June through November 2006, 2007, and 2008. Source: Karuk Tribe of California 2009.

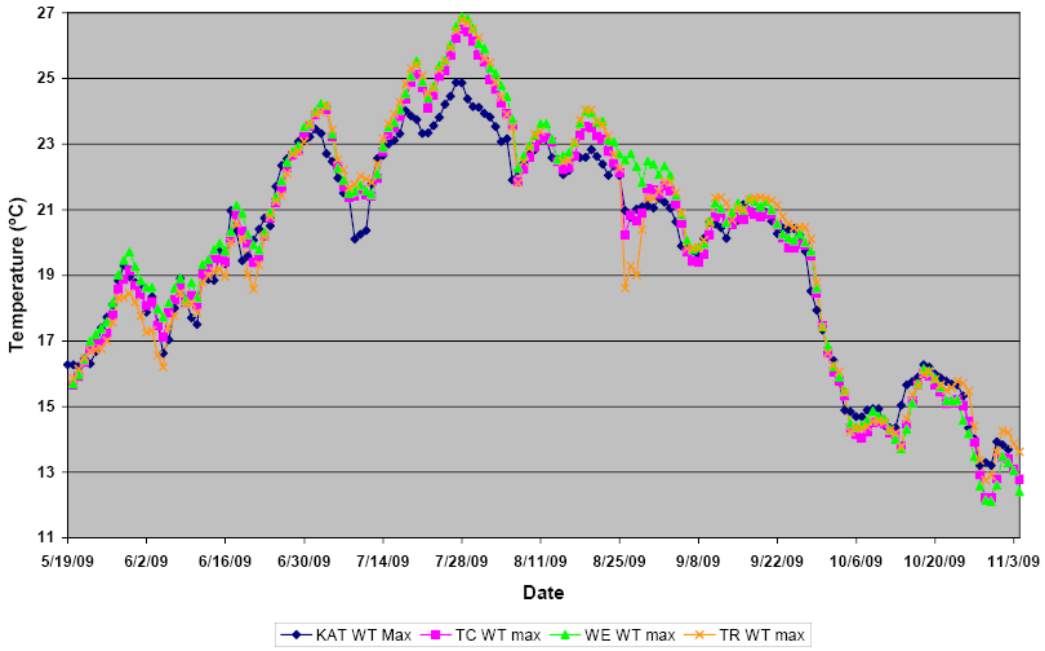

Figure C-11. Daily Maximum Water Temperatures in the Klamath River at Weitchpec (RM 43.6 [WE]), Upstream of Tully Creek (RM 40.1 [TC]), and Upstream of Turwar Boat Ramp (RM 6 [KAT]), as well as in the Trinity River (RM 43.3) near the Confluence with the Klamath River (RM 0.5 [TR]) May through November 2009. Source: Sinnott 2010a.

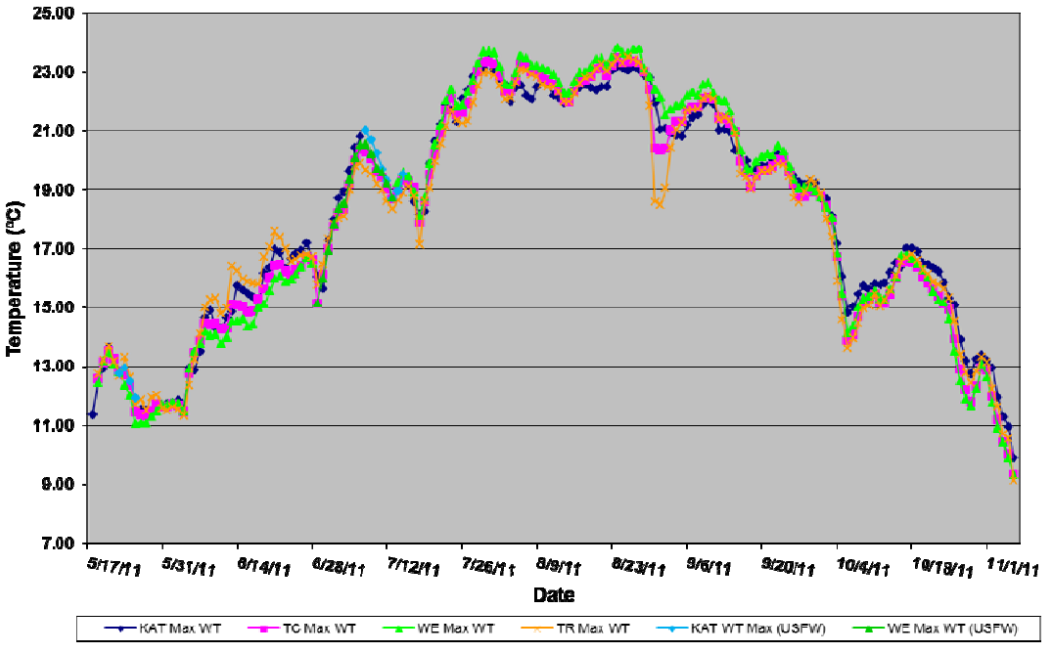

Figure C-12. Daily Maximum Water Temperatures in the Klamath River at Weitchpec (RM 43.6 [WE]), Upstream of Tully Creek (RM 40.1 [TC]), and Upstream of Turwar Boat Ramp (RM 6 [KAT]), well as in the Trinity River (RM 43.3) near the Confluence with the Klamath River (RM 0.5 [TR]), at Upstream of Turwar Boat Ramp from the U.S. Fish and Wildlife (RM 6 [KAT (USFW)]), and at Weitchpec from U.S. Fish and Wildlife (RM 43.6 [WE (USFW)]) May through November 2011. Source: Sinnott 2012a.

C.1.2.3 Klamath River Estuary

Hydrodynamics and water quality within the Klamath River Estuary are highly variable spatially and temporally and are greatly influenced by season, river flow, vertical water column stratification (thermal and/or chemical), and location of the estuary mouth, the latter changing due to periodic sand bar movement. Input of cool ocean water and meteorological conditions (e.g., solar radiation and coastal fog) along the coast minimizes extreme water temperatures much of the time (Scheiff and Zedonis 2011). Water temperature has been monitored in the Klamath River Estuary by California Department of Fish and Game (Wallace 1998) and most recently by the Yurok Tribe Fisheries Program (Hiner 2006) and the YTEP (2005), with support from the North Coast Regional Board. Water temperatures in the Klamath River Estuary from December through April are roughly 5 to 12°C (41 to 54°F) (Hiner 2006). In summer and fall months, warmer air temperatures and lower flows result in increased water temperatures. Under low-flow summertime conditions, water temperatures in the Klamath River Estuary have been observed at 20 to 24°C (68 to 75.2°F) (Wallace 1998) or

greater than 24°C (75.2°F) (Hiner 2006). During June to September from 2009 to 2015, water temperatures during water quality grab samples ranged from approximately 13.1 to 21.9°C (55.6 to 71.4°F) (Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016). These levels exceed optimal growth thresholds for salmonids, as cited in the previous section.

Estuarine water temperature is linked to upstream hydrology and periods of mouth closure because when the estuary mouth is open, denser salt water from the ocean sinks below the less dense fresh river water, resulting in chemical stratification and a "salt wedge" that moves up and down the estuary with the daily tides (Horne and Goldman 1994, Wallace 1998, Hiner 2006). The salt wedge is also thermally stratified with cooler, higher salinity ocean waters remaining near the estuary bottom, and warmer, lower salinity river water near the surface. Upstream hydrology can affect the location of the salt water wedge and thus, affect thermal structure in the Klamath River Estuary. For example, during pulse flows released from the Lewiston Dam on the Trinity River in August 2004, the upstream extent of the salt wedge moved downstream approximately one mile (YTEP 2005). In the Klamath River Estuary, mouth closure has been reported to reduce the size of the salt water wedge, decrease overall salinity, and subsequently increase water temperatures in the Klamath River Estuary (Hiner 2006). Mouth closure, caused by formation of a sand berm across the mouth of the Klamath River Estuary, is a function of off-shore and alongshore wave power and sediment supply, freshwater inflows, the tidal prism, and morphological characteristics of the inlet (Escoffier 1940; Brunn 1966; O'Brien 1971; Barnes 1980). The historical frequency and duration of mouth closure in the Klamath River Estuary has not been documented, although it is expected to occur during low-flow periods (June to October).

C.2 Suspended Sediments

For the purposes of the Lower Klamath Project EIR, "suspended sediments" refer to settleable suspended material in the water column. Bed materials, such as gravels and larger substrates, are discussed in Section 3.11.2.4 *Sediment Load*. Two types of suspended sediments are considered for the analysis in the Lower Klamath Project EIR: algal-derived (organic) suspended material and mineral (inorganic) suspended material. Sources of each type of suspended material differ, as do spatial and temporal trends for each within the Upper, Mid-, and Lower Klamath Basins.

Suspended sediments in the water column are quantified using different methods, depending on the study. Two standard methods widely used for determining the amount of suspended sediments in water are Method D 3977-97, which reports suspended sediments as suspended sediment concentrations (SSCs), and Method 2450 D, which reports the suspended sediments as total suspended solids (TSS) (Gray et al. 2000). While data produced by the SSC method are more representative of natural suspended sediments, SCC is

considered equivalent to TSS for this report. SSC and TSS are generally similar (i.e., follow a 1:1 line of equal value), but TSS measurements tend to underestimate actual suspended material when the suspended material contains larger particles (i.e., sand-sized particles or greater) due to the TSS measurement methodology potentially underestimating larger particles that rapidly settle or clog measurement tools. SSC and TSS are more or less evenly distributed around the 1:1 line of equal value when particle sizes are smaller than 0.062 mm (i.e., silts or clays) and TSS is greater than approximately 5 mg/L. As needed, data from multiple sources, reported as either TSS or SSC, are used interchangeably for the Lower Klamath Project EIR, but TSS measurements may underestimate actual suspended material when sand-sized or larger particles comprise more than 25 percent of a sample mass (Gray et al. 2000).

Turbidity, an optical property referring to the amount of light scattered or absorbed by a fluid, is another common way to quantify suspended sediments and is measured in nephelometric turbidity units (NTUs). The exact relationship between turbidity and suspended sediment is dependent on the parent geology and must be determined for each watershed (Montgomery 1985; MacDonald et al. 1991). High suspended sediments in the water column affect organisms directly (e.g., interfering with vision) or indirectly by changing water temperature (e.g., suspended sediment particles absorb heat from sunlight) and reducing dissolved oxygen (DO) concentrations by scattering light and reducing photosynthetic activity. Suspended sediments are also a water quality concern because they are often associated with storing contaminants from the water column (e.g., polar organics and cationic metal forms). Municipal and domestic water supply beneficial uses can also be adversely affected by changes in suspended sediment concentrations and turbidity in streams.

For the Klamath River, coincident turbidity data is occasionally presented along with TSS data. However, as the dataset is not consistent in space or time, turbidity levels are not used to support significance determinations (see Section 3.2.4 *Impact Analysis Approach*) and are not analyzed in detail in the Lower Klamath Project EIR.

C.2.1 Upper Klamath Basin

C.2.1.1 Hydroelectric Reach

Suspended sediment generally decreases through the Hydroelectric Reach as suspended sediment from upstream is intercepted, decomposed, retained, or diluted between the J.C. Boyle and Copco No. 1 reservoirs. J.C. Boyle, Copco No.1, and Iron Gate reservoirs trap sediment and suspended material, reducing suspended sediment concentrations immediately downstream of their respective dams. Copco No. 2 Reservoir does not trap appreciable amounts of sediment or suspended material (USBR 2011) or reduce suspended sediment concentrations downstream of its dam, since the immediately upstream Copco No. 1 Dam traps upstream sediment and the relatively small volume of Copco No. 2 Reservoir

(i.e., 70 acre-feet) prevents suspended material from settling out inside the reservoir. Organic suspended sediment originating from Upper Klamath Lake is the predominant form of suspended sediment entering the Hydroelectric Reach from upstream and affecting water quality (PacifiCorp 2004a, 2004b; Deas and Vaughn 2006; Watercourse Engineering, Inc. 2011). During the winter and spring (November through April), the reservoirs at the Lower Klamath Project intercept and retain inorganic suspended sediment delivered from tributaries (e.g., Shovel Creek, Fall Creek, Jenny Creek) to the reservoirs, where peak concentrations occur in association with high-flow events. While this may be somewhat beneficial for downstream reaches by decreasing suspended sediment concentrations and turbidity, the interception of inorganic sediments by the reservoirs does not appear to be an important mechanism related to sediment delivery in the mainstem Klamath River. This is because a relatively small (3.4 percent) fraction of total inorganic sediment supplied to the Klamath River on an annual basis originates from the upper and middle Klamath River (i.e., from Keno Dam to the Shasta River) (Stillwater Sciences 2010) and beneficial uses in the upper Klamath River are currently not impaired due to inorganic suspended material (see Section 3.2, Table 3.2-8).

During the phytoplankton[106] growth season (May through October), organic suspended sediments exhibit a general decreasing trend from upstream to downstream in the Hydroelectric Reach, although the relative decrease through this reach is less than that occurring further upstream where phytoplankton blooms (also called algal blooms) originating in Upper Klamath Lake largely settle out of the water column (Figure C-13; PacifiCorp 2004a; Raymond 2008a, 2009a, 2010a). The most significant decrease (approximately 50 percent) in organic suspended sediments (as TSS) typically occurs between the mouth of Link River and Keno Dam. Further decreases in concentrations of organic suspended sediments can occur in the upstream end of the Hydroelectric Reach, which may be due to the mechanical breakdown of phytoplankton remains and sorting of progressively smaller sizes of natural organic matter (NOM) in the turbulent river reaches between J.C. Boyle Dam and Copco No. 1 Reservoir, as well as by dilution from the springs immediately downstream from J.C. Boyle Dam. By the upstream end of Copco No. 1 Reservoir, average TSS concentrations are approximately 70 percent lower than those measured at the mouth of Link River (Figure C-13; PacifiCorp 2004a, 2004b; Raymond 2008a, 2009a, 2010a).

[106] Microscopic organisms, including algae, bacteria, protists, and other single-celled plants, that float in the water column of fresh and salt waters and obtain energy from photosynthesis.

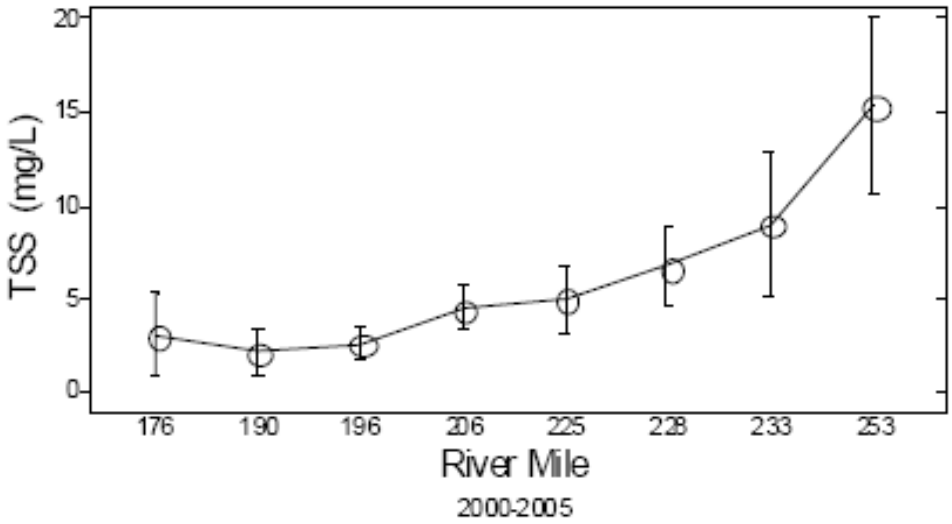

Figure C-13. Mean May to October Total Suspended Solids (TSS) Values for Data Collected from Various Sites in the Klamath River Between 2000 and 2005. Error bars depict 90 percent confidence interval of the mean. The location of features in the graph are specified using 2008 river mile designations, which are slightly different from updated 2018 river miles (see Table 3.2-1). The location of key landmarks in 2008 river mile designations: RM 176 = Klamath River at I-5 crossing; RM 190 = Klamath River downstream of Iron Gate Dam; RM 196 = Klamath River downstream of Copco No. 2 Powerhouse; RM 206 = Klamath River upstream of Copco No. 1 Reservoir; RM 220 = Klamath River downstream of J.C. Boyle Powerhouse; RM 225 = Klamath River downstream of J.C. Boyle Dam; RM 228 = Klamath River upstream of J.C. Boyle Reservoir; RM 233 = Klamath River downstream of Keno Dam; RM 253 = mouth of Link River. Source: Raymond 2008a.

Despite the mechanisms supporting decreased longitudinal concentrations of organic suspended sediments in the riverine portions of the Hydroelectric Reach, concentrations in this reach can also increase due to large seasonal phytoplankton blooms occurring in Copco No. 1 and Iron Gate reservoirs. TSS values in Copco No. 1 Reservoir during the phytoplankton growth season (May through October) typically range less than 2 to 20 mg/L and those in Iron Gate Reservoir range less than 2 to 14 mg/L, although intense phytoplankton blooms can result in TSS levels greater than 20 mg/L (Raymond 2008a, 2009a, 2010a). During 2003 sampling by PacifiCorp, a particularly high TSS measurement of 280 mg/L was recorded in the epilimnion of Copco No. 1 Reservoir during May. Simultaneous measurements of suspended sediments measured in the outflow to the reservoir indicated only 4.8 mg/L TSS (FERC 2007), suggesting that the suspended sediment source (phytoplankton cells) had largely settled out of the water column within the reservoir. Since powerhouse withdrawals for Copco No.

1 and Iron Gate dams are from depths of approximately 9.8 m (32 ft) to 10.7 m (35 ft) below the water surface when the reservoirs are full (see Section C.1.1.1), only portions of the extensive phytoplankton blooms positioned closer to the water surface may be transported to the downstream Klamath River. During 2009 water quality monitoring, TSS measured in J.C. Boyle Reservoir ranged less than 2 to 6.8 mg/L from May through November. Levels in Copco No. 1 and Iron Gate reservoirs levels were somewhat greater, with TSS ranging less than 2 to 9.6 mg/L in Copco No. 1 Reservoir (peak in August) and less than 2 to 7.2 mg/L in Iron Gate Reservoir (peak in May) (Watercourse Engineering, Inc. 2011a). Additional water quality monitoring has been conducted from 2010 to 2015 with TSS data from May through October that generally supports previous findings that TSS in Copco No. 1 Reservoir was higher than TSS in Iron Gate Reservoir. TSS in Copco No. 1 Reservoir from 2010 to 2015 usually ranged from the lower reporting limit (0.5 to 5 mg/L) to 17.6 mg/L, with peak TSS measured at 140 mg/L in 2013 and 72.4 mg/L in 2015. TSS in Iron Gate Reservoir from 2010 to 2015 usually ranged from the lower reporting limit (0.5 to 5 mg/L) to 9.2 mg/L, with a peak TSS of 37.6 mg/L measured in 2014 (Watercourse Engineering, Inc. 2011b, 2012, 2013, 2014, 2015, 2016).

There are currently 13.1 million cubic yards of sediment deposits stored within J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate reservoirs (USBR 2012) (see also Table 2.8). Prior estimates of the sediment deposits were 14.5 million cubic yards (Eilers and Gubala 2003) and 20.4 million cubic yards (GEC 2006). Sediment texture analysis results of the current reservoir deposits indicate that the deposits are composed of predominantly fine material (i.e., silt and clay less than 0.0625 mm [GEC 2006]; see also Section 3.11) with 3 to 5 percent of the accumulated material as organic carbon, corroborating interpretation of longitudinal suspended sediment patterns and indicating that in-reservoir and upstream phytoplankton growth is largely intercepted and retained in reservoir sediments in the Hydroelectric Reach.

C.2.2 Mid- and Lower Klamath Basin

C.2.2.1 Iron Gate Dam to Salmon River

Trapping of fine sediments and suspended materials by the Lower Klamath Project reservoirs reduces suspended sediment concentrations immediately downstream of Iron Gate Dam (RM 193.1), thus inorganic suspended material concentrations are generally low in the reach immediately downstream of Iron Gate Dam. Inorganic suspended sediment tend to increase with distance downstream from Iron Gate Dam during winter months. Two of the three tributaries that contribute the largest amount of sediment to the Klamath River on an annual basis are in this reach. The Scott River, which enters the mainstem Klamath River at RM 145.1, contributes 607,300 tons per year of suspended sediment or 10 percent of the cumulative average annual delivery from the basin. The Salmon River (RM 66.3) contributes 320,600 tons per year or 5.5 percent of

the cumulative average annual delivery from the basin (Stillwater Sciences 2010).

During the phytoplankton growth season (May to October), suspended sediments immediately downstream from Iron Gate Dam are relatively lower than upstream locations, with generally low (less than 5 to 8 mg/L) concentrations for 2000 to 2005 (PacifiCorp 2004a, 2004b; Raymond 2008a, 2009a, 2010a) (Figure C-13). However, in the summer months, organic suspended materials can increase in the Klamath River between Iron Gate Dam and Seiad Valley (RM 132.7) due to the transport of in-reservoir algal blooms to downstream reaches of Klamath River, resuspension of previously settled organic materials, and degradation (i.e., senescence) of periphyton communities along the stream (YTEP 2005; Sinnott 2008; Armstrong and Ward 2008; Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016, 2017). The relative magnitude of the contribution from the different sources of organic (algal-derived) suspended material in the Klamath River has not been and cannot be quantified from the available data since the measurements did not attempt to distinguish between the potential sources. TSS concentrations near the Shasta River confluence (RM 179.5) for the period 2000 to 2005 were roughly 1 mg/L greater than those measured further upstream at Iron Gate Dam (Figure C-13), and during 2009 monitoring, TSS ranged 0.87 to 4.4 mg/L downstream from Iron Gate Dam (RM 193.1), increasing to 2.5 to 11.5 mg/L downstream from Seiad Valley (RM 132.7) (Watercourse Engineering, Inc. 2011a)[107]. Additional TSS monitoring in the Klamath River was conducted from 2010 to 2015 with TSS in 2015 ranging from 0.8 to 3.8 mg/L downstream of Iron Gate Dam to 4.2 to 155.0 mg/L downstream of Seiad Valley (Watercourse Engineering, Inc. 2011b, 2012, 2013, 2014, 2015, 2016). In 2015, TSS in the Klamath River downstream of Seiad Valley peaked at 155.0 mg/L in July, but otherwise did not exceed 13.0 mg/L between May and October (Watercourse Engineering, Inc. 2016). The pattern of suspended sediments increasing in the Klamath River downstream from Seiad Valley compared to downstream of Iron Gate Dam may be related to the transport of some portion of the in-reservoir phytoplankton blooms to downstream reaches of Klamath River. River bed scour may also cause resuspension of previously settled materials and increases in summer and fall TSS from 0 to 20 miles downstream from Iron Gate Dam (Figure C-14). Farther downstream, near the confluence with the Scott River (RM 145.1 or approximately 47 miles downstream from Iron Gate Dam) concentration of suspended sediments tend to decrease with distance as suspended sediment gradually settle out of the water column or are diluted by tributary inputs (Armstrong and Ward 2008). Chlorophyll-*a* data show a similar trend (see Section C.6.2.1).

[107] This data set includes measurements in November and December 2009 as well.

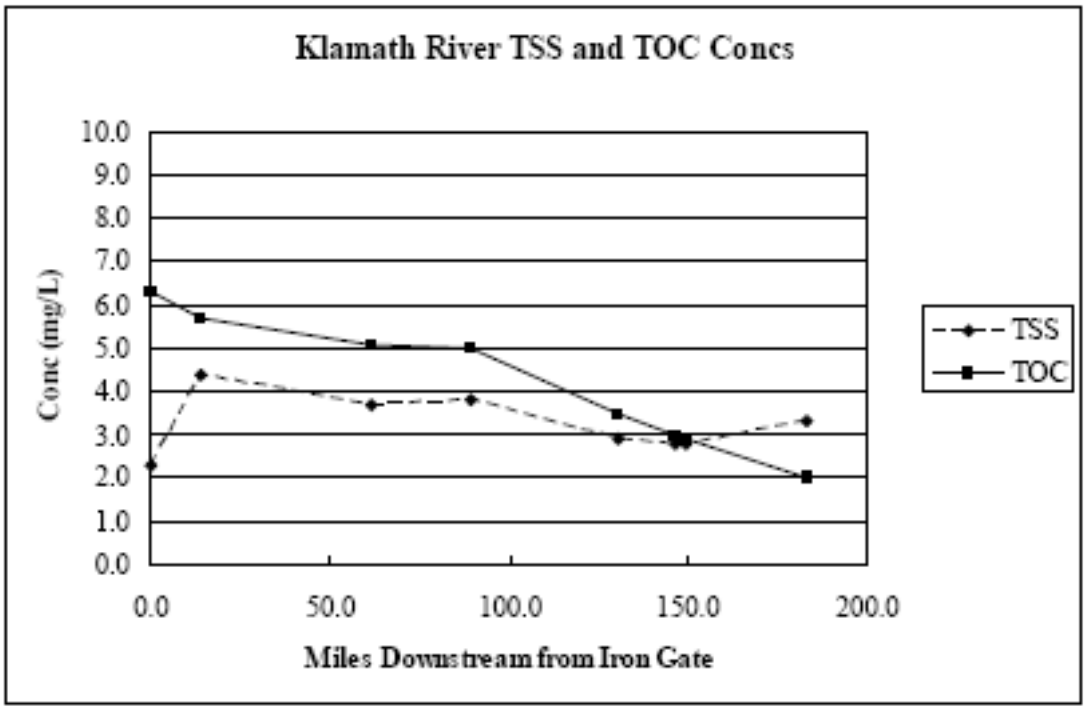

Figure C-14. Average TSS and Total Organic Carbon in the Klamath River Downstream from Iron Gate Dam during June to October 2001 to 2005. River Miles Specified Are Based on the River Miles Designations Used in 2008 and Differ Slightly from 2018 River Mile Designations. Source: Armstrong and Ward 2008.

C.2.2.2 Salmon River to Klamath River Estuary

As in other reaches of the Klamath River, seasonal variation in turbidity and suspended sediments is evident in the Klamath River from the Salmon River (RM 66.3) to the Klamath River Estuary (RM 0 to 3.9), with peak summer turbidity values associated with organic matter (i.e., algal blooms) and peak spring and winter turbidity values associated with inorganic sediments that are mobilized during high flow events (Stillwater Sciences 2009).

Historical (1950 to 1979) suspended sediment data (in SCC) for the Klamath River at Orleans (RM 58.9) (USGS gage no.11523000) range from less than 5 mg/L during summer (low-flow) periods to greater than 5,000 mg/L during winter (high-flow) periods, although some high (greater than 1,000 mg/L) suspended sediment events have occurred during summer months (e.g., 1974, see Figure C-15). During the winter periods, elevated suspended sediment levels are typically associated with storm events and high flows, lasting on the order of days to weeks. More recent data indicate that suspended material levels in the lower Klamath River from the Salmon River confluence (RM 66.3) to the Estuary (RM 0 to 3.9) can be similar to those measured in the upstream reach from Iron Gate

Dam to the Salmon River (RM 66.3). During 2009 monitoring, TSS values measured at Orleans were generally 1.1 to 13.3 mg/L between May and December, with peak values (approximately 56 mg/L) occurring during October (Watercourse Engineering, Inc. 2011a). TSS measured at Orleans from 2010 to 2015 had similar trends with TSS usually between 1.2 to 17 mg/L, but TSS occasionally peaking anywhere from 71 mg/L in August 2014 up to 437 mg/L in June 2010 (Watercourse Engineering, Inc. 2011b, 2012, 2013, 2014, 2015, 2016).

Results from grab samples collected by the Yurok Tribe Environmental Program during the period 2003 to 2004 indicate that TSS ranged less than 1.0 to 3.2 mg/L upstream of the Trinity River (RM 43.3) and less than 1.0 to 14.0 farther downstream at Turwar (RM 5.6), with the peak value (14.0 mg/L) occurring in December 2003 (YTEP 2005). However, the majority of the grab samples were collected from June to September and only two grab samples were collected in December and January. The data exhibit similar values for 2007, with the highest TSS (up to 16.0 mg/L) observed at Turwar in September of that year (Fetcho 2008). Additional water quality monitoring has been conducted by the Hoopa Valley Tribal Environmental Protection Agency (HVTEPA) from 2008 to 2012 and the Yurok Tribe Environmental Program from 2006 to 2014 with TSS at sites from upstream of the confluence with the Trinity River to the Klamath River Estuary (Sinnott 2008, 2009a, 2009b, 2010b, 2011b, 2012b; Hanington and Torso 2013; HVTEPA 2013; Hanington and Stawasz 2014; Hanington and Cooper-Carouseli 2014). Between 2008 and 2012, TSS in the Klamath River at Saints Rest Bar (RM 44.9) ranged from 1.0 to 15 mg/L, with TSS reaching a peak of 33.0 mg/L in October 2009. In 2014, TSS in the Klamath River at Weitchpec, upstream from the Trinity River (RM 43.6), ranged from 1 to 12 mg/L while TSS in the Klamath River at the Turwar Boat Ramp (RM 6) ranged 1 to 20 mg/L with the peak values occurring in February at Weitchpec and December at the Turwar Boat Ramp (Figure C-16; Hanington and Cooper-Carouseli 2014).

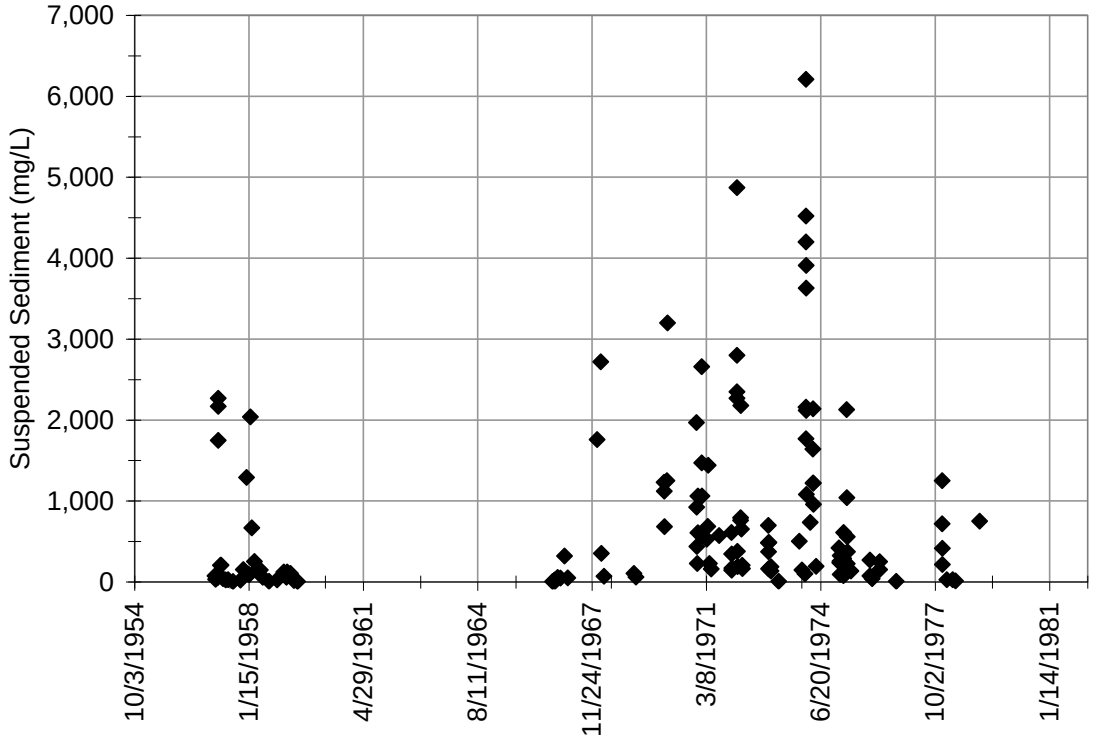

Figure C-15. Suspended Sediment (mg/L in SCC) Grab Samples for USGS Klamath River at Orleans (USGS Gage No. 11523000) (RM 58.9) 1950 to 1979. Source: USGS 2011 (http://waterdata.usgs.gov/nwis).

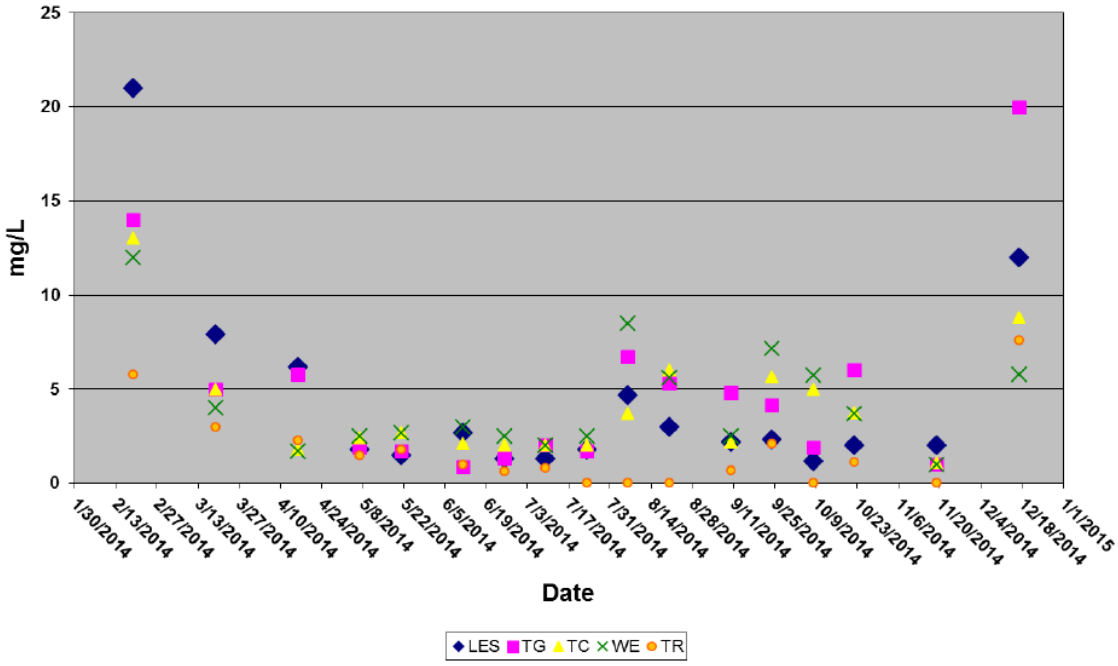

Figure C-16. Suspended Sediment (mg/L TSS) Grab Samples at the Lower Estuary Surface (LES [RM 0]), the Klamath River at Turwar Boat Ramp (TG [RM 6]), the Klamath River Upstream of Tully Creek (TC [RM 40.1]), the Klamath River at Weitchpec (Upstream of the Trinity River) (WE [RM 43.6]), and the Trinity River Upstream of the Confluence with the Klamath River (TR). Source: Hanington and Cooper-Carouseli 2014.

The Trinity River contributes 3,317,300 tons of sediment per year to the lower Klamath River or 57 percent of the cumulative average annual delivery from the basin (Stillwater Sciences 2010). Mass wasting, bank erosion, and other natural erosion processes contribute a large but currently unknown portion of the total fine sediment supply to the lower Klamath River, along with management activities such as timber harvest and road construction along tributaries (USDA Forest Service 2004; Stillwater Sciences 2010). When combined with the steep terrain, granular soil matrix, and high precipitation, these sources may be a primary contributor to fine sediment deposits found in deep pools near cultural sites in the lower Klamath River (FERC 2007).

Available historical (1958 to 1996) suspended sediment data for the Klamath River at Klamath Glen (RM 5.9) (USGS gage no. 11530500) indicates values of less than 5 mg/L (in SCC) during summer (low-flow) periods to greater than 500 mg/L during winter (high-flow) periods, although one high (greater than 750 mg/L) suspended sediment event appears to have occurred during the early fall (i.e., October 1977, see Figure C-17).

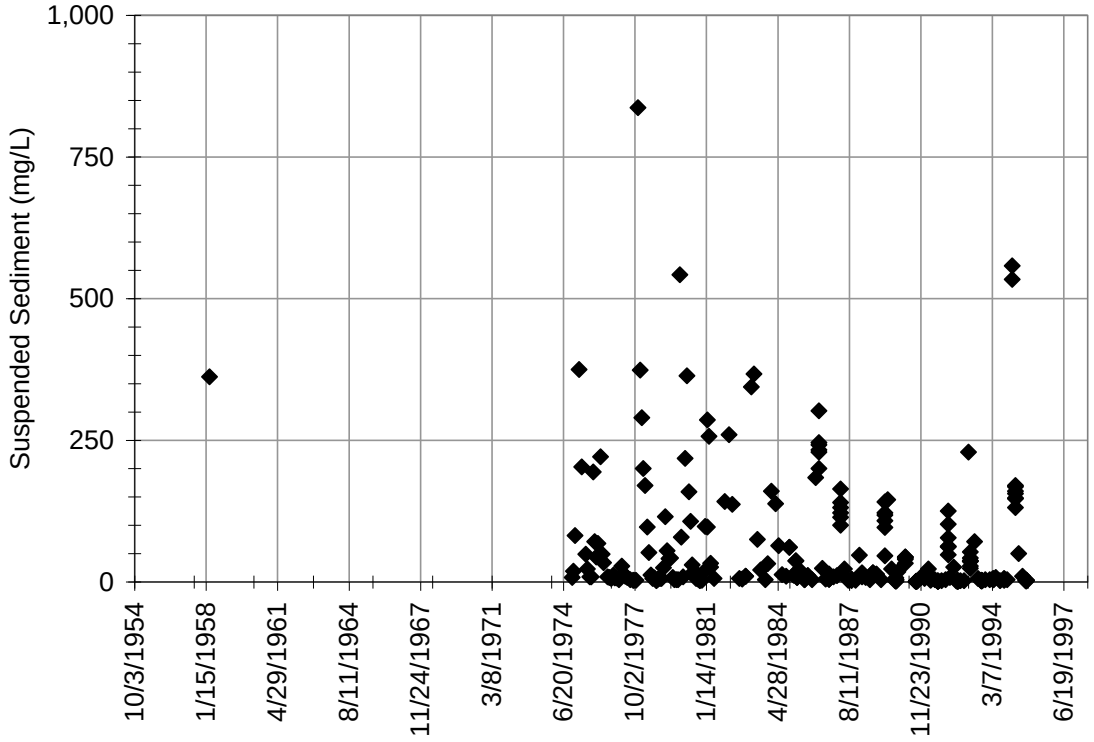

Figure C-17. Suspended Sediment (mg/L) Grab Samples for USGS Klamath River near Klamath (USGS Gage No. 11530500) (RM 7) 1958 to 1995. Source: USGS 2011 (http://waterdata.usgs.gov/nwis).

C.2.2.3 Klamath River Estuary

An analysis of collected TSS data in the Klamath River Estuary indicates that TSS are variable but generally similar to those measured at upstream sites in the lower Klamath River (YTEP 2004, 2005; Sinnott 2008). For 2003 to 2004, TSS levels were less than 1.0 to 3.2 mg/L for surface waters in the mid- and lower-estuary, and slightly greater (1.8 to 10.0 mg/L) at depth (YTEP 2004, 2005). During May to December 2009, measured TSS levels were generally 2.1 to 12.7 mg/L, with the peak value (17.9 mg/L) occurring in May (Watercourse Engineering, Inc. 2011a). More contemporary data measured between 2006 to 2014 show a larger range in the TSS in the lower Klamath River Estuary, with TSS ranging from 1.3 to 21 mg/L in 2014[108] (Figure C-16; Sinnott 2008, 2009a, 2009b, 2010b, 2011b, 2012b; Hanington and Torso 2013; Hanington and Stawasz 2014; Hanington and Cooper-Carouseli 2014). Turbidity measurements in small tributaries (e.g., McGarvey, Den, Blue, and Turwar creeks) immediately

[108] The various reports cited for available TSS information provide data for each individual year. There is currently no synthesis report for TSS monitoring data for the Klamath River. The most recent data range that highlights the intent of the discussion is presented, along with multiple citations to available reports.

upstream or within a few river miles upstream of the Klamath River Estuary exhibit peak values during winter high flow periods (i.e., storm events), with measured values exceeding 500 NTU during December through February 2004 (YTEP 2005). Additional turbidity measurements at sites from upstream of the confluence with the Trinity River to the Klamath River Estuary have been collected by the Yurok Tribe Environmental Program from 2010 to 2014 with peak turbidity typically occurring between December and April and a secondary smaller peak in turbidity occurring in the summer or fall (Sinnott 2008, 2009a, 2009b, 2010b, 2011b, 2012b; Hanington and Torso 2013; Hanington and Stawasz 2014; Hanington and Cooper-Carouseli 2014). In 2014, turbidity in the Klamath River Estuary ranged from 0.49 to 9.4 NTU with the peak occurring in February (Figure C-18; Hanington and Cooper-Carouseli 2014). During late spring through early fall, when average rates of precipitation in the Klamath Basin are relatively lower, inorganic suspended sediments and turbidity in the Klamath River Estuary are generally lower as well.

Blooms of phytoplankton within and upstream of the Klamath River Estuary have the potential to cause large spikes in turbidity and organic suspended sediments in the estuary. This occurred during the extensive phytoplankton bloom detected throughout at least 40 river miles of the lower Klamath River in September 2007 (Kann 2007a, b, c, d). In the lower estuary, increases in nutrient levels and phytoplankton concentrations were correlated with an increase in TSS from 2.2 mg/L on August 21, 2007 to 9.0 mg/L on September 18, 2007, and increases in nutrients, phytoplankton levels, and TSS during that period were measured as far upstream as Iron Gate and Copco No. 1 reservoirs (Asarian et al. 2009). Thus, the observed 2007 increase in estuarine TSS may have been influenced by phytoplankton growth originating in Iron Gate and Copco No. 1 reservoirs. The downstream transport of phytoplankton from Iron Gate and Copco No. 1 reservoirs into the Middle and Lower Klamath River and the Klamath River Estuary is discussed more in Section C.6 and Section 3.4 *Phytoplankton and Periphyton*.

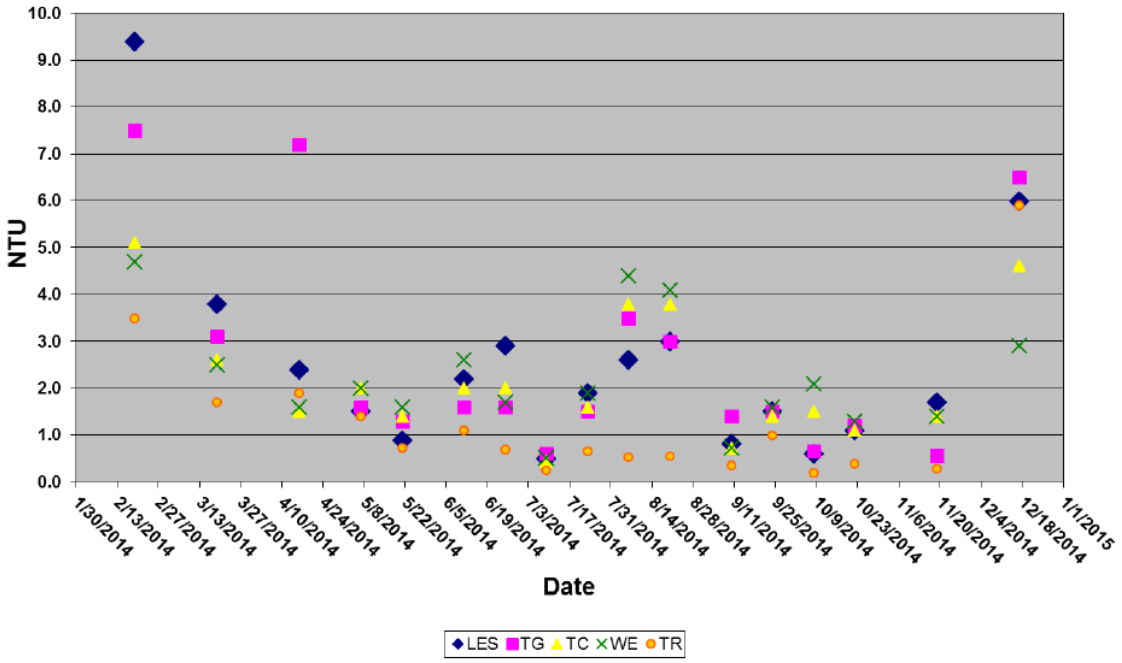

Figure C-18. Turbidity (NTU) Grab Samples at the Lower Estuary Surface (LES [RM 0]), the Klamath River at Turwar Boat Ramp (TG [RM 6]), the Klamath River Upstream of Tully Creek (TC [RM 40.1]), the Klamath River at Weitchpec (Upstream of Trinity River)(WE [RM 43.6]), and the Trinity River Upstream the Confluence with the Klamath River (TR). Source: Hanington and Cooper-Carouseli 2014.

C.3 Nutrients

Nutrients are critical for the support of primary productivity (i.e., plant growth) in both terrestrial and aquatic ecosystems. High levels of nutrients (nitrogen and phosphorus) in lakes and rivers have the potential to impact overall water quality by increasing rates of phytoplankton growth and decay, which can lead to increased levels of turbidity, large fluctuations in dissolved oxygen concentrations and pH levels, as well as potential increases of toxic substances such as ammonia (NH_4^+/NH_3), hydrogen sulfide (H_2S), and release of heavy metals from low oxidation-reduction potential at the sediment water interface (see Section 3.2.3.1 for additional background information on water quality processes in the Klamath Basin). Dissolved nutrients (e.g., ortho-phosphorus, nitrate, and ammonium) can be used directly by phytoplankton, whereas particulate nutrients (e.g., organic phosphorus, organic nitrogen) are not readily bioavailable for most phytoplankton species.

C.3.1 Upper Klamath Basin

C.3.1.1 Hydroelectric Reach

Nutrients are introduced into the mainstem Klamath River Area of Analysis primarily by the Upper Klamath Lake which inputs nitrogen and phosphorus (Kann and Walker 1999; ODEQ 2002; PacifiCorp 2004b; Deas and Vaughn 2006; FERC 2007; Sullivan et al. 2008; Asarian et al. 2010) and the Lost River Basin via the Klamath Straits Drain and the Lost River Diversion channel which inputs nutrients and organic matter (Lytle 2000; Mayer 2005; Sullivan et al. 2009; Sullivan et al. 2011; Kirk et al. 2010). Historical and contemporary nutrient data indicate that, on an annual basis, nutrients in the Hydroelectric Reach tend to be lower than upstream due in part to dilution from springs downstream of J.C. Boyle Reservoir. According to Asarian et al. (2010), who cited analysis by IFR and PCFFA (2009), Gard (2006), and TetraTech (2009), the long-term average nutrient concentrations of the springs downstream of J.C. Boyle Dam was estimated to be on the order of 0.2 mg/L for total nitrogen (TN) and on the order of 0.07 mg/L for total phosphorus (TP) using mixing equations and PacifiCorp's 2001 to 2007 nutrient sampling data. The Klamath TMDL model TN and TP concentrations, derived from model calibration through 2000, are consistent with these values.

Total Nitrogen and Total Phosphorus Patterns

The settling of particulate matter and associated nutrients in the larger Lower Klamath Project reservoirs contributes significantly to annual decreases in nutrient concentrations in the Klamath River from the Oregon-California state line to Iron Gate Dam (PacifiCorp 2004b; FERC 2007; Butcher 2008; Asarian et al. 2009; Asarian and Kann 2011; Oliver et al. 2014). In J.C. Boyle Reservoir (RM 229.8), the furthest upstream reservoir in the Hydroelectric Reach, concentrations of TN and TP measured between the inflow and outflow are typically similar, likely due to the shallow depth and short residence time characteristic of this impoundment (PacifiCorp 2006), indicating that relatively little nutrient retention occurs in this reservoir.

Annual data from 2000 through 2004 and early modeling studies by PacifiCorp conducted for the FERC relicensing process indicate that Copco No. 1 and Iron Gate reservoirs act primarily as TN and TP sinks due to trapping of phytoplankton detritus (PacifiCorp 2004b; FERC 2007). However, subsequent analyses found that while overall annual retention is likely occurring, the Lower Klamath Project reservoirs can also serve as seasonal sources of TN and TP (though far less for TN than for TP) through the following processes: release of nutrients from reservoir sediments into the water column during periods of phytoplankton decomposition and seasonal hypolimnetic anoxia; the hydraulic residence time of the reservoirs resulting in a temporal shift in the transport of upstream nutrients through the reservoirs; reservoir turnover during fall; and possibly direct nitrogen fixation from the atmosphere by cyanobacteria [blue-green algae] (Kann and Asarian 2005, 2006; Asarian and Kann 2006a, 2006b, 2011; Butcher 2008; Asarian et al. 2009, 2010; Oliver et al. 2014). On an annual

basis, a decreasing longitudinal trend in TN and TP from downstream of J.C. Boyle to Iron Gate Dam is generally consistent in analyses of datasets from 2005 to 2015, but the annual range and seasonal variations of TN and TP concentrations occasionally results in TN and TP plateauing or slightly increasing in the Copco No. 1 to Iron Gate portion. Analysis of nutrient data from 2005 to 2008 found the flow-weighted mean longitudinal TN and TP concentrations generally decrease with distance downstream from J.C. Boyle Dam with a strongly downward trend through Copco No. 1 and Iron Gate reservoirs, particularly for TN, due to nutrient retention in Copco No. 1 and Iron Gate reservoirs and dilution by the coldwater springs located downstream of J.C. Boyle Reservoir (see Figure C-19 and C-20; Asarian et al. 2009; Asarian et al. 2010; North Coast Regional Board 2010; Oliver et al. 2014). Annual total nitrogen (TN) inputs to Copco No. 1 and Iron Gate reservoirs ranged from approximately 2,026 to 3,443 metric tons TN between May 2005 and May 2007, with an annual TN retention of approximately 259 to 419 total metric tons TN. Thus, the annual TN retention in Copco No. 1 and Iron Gate reservoirs was approximately 12 percent (419 of 3,443 metric tons TN) from May 2005 to May 2006 and 13 percent (259 of 2,026 metric tons TN) from May 2006 to May 2007 (Asarian et al. 2009). The annual total phosphorus (TP) inputs to Copco No. 1 and Iron Gate ranged from approximately 210 to 335 metric tons TP between May 2005 and May 2007, with an annual TP retention of approximately 28 to 30 total metric tons TP. Thus, annual TP retention in Copco No. 1 and Iron Gate reservoirs was approximately 9 percent (30 of 335 metric tons TP) from May 2005 to May 2006 and 13 percent (28 of 210 metric tons TP) from May 2006 to May 2007 (Asarian et al. 2009). Overall, on an annual basis, external loading of nutrients from the Upper Klamath River appears to be the dominant source of total nutrients to the Hydroelectric Reach and the Lower Klamath Project reservoirs and is also responsible for the majority of total nutrients being transported downstream of the reservoirs.

Nutrient data from 2007 to 2015 support the overall annual longitudinal trend of TN and TP, but also reveal annual and seasonal longitudinal variability in both the range and median TN and TP concentrations through the Hydroelectric Reach (Raymond 2008a, 2009a, 2010a; Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016). Asarian and Kann (2011) observe an overall annual longitudinal decrease in TN between 2005 and 2010 through the Hydroelectric Reach of the Upper Klamath River with concentrations usually highest upstream of Copco No. 1, intermediate upstream of Iron Gate, and lowest downstream of Iron Gate Dam. Data from 2012 to 2015 further highlight the annual range of TN variations from upstream of J.C. Boyle Reservoir to downstream of Iron Gate Dam and support the generally decreasing annual TN trend through the Hydroelectric Reach (Figures C-21; Watercourse Engineering, Inc. 2013, 2014, 2015, 2016). TP data from 2012 to 2015 further demonstrate that TP measured at river locations is generally decreasing in the downstream direction through the Hydroelectric Reach, but the annual mean TP concentration occasionally is similar or increases in the downstream direction through the

Hydroelectric Reach during some years due to seasonal variations in TP (Figures C-22; Watercourse Engineering, Inc. 2013, 2014, 2015, 2016). For example, in 2012 the annual mean TP concentration in the Klamath River downstream of Iron Gate Dam (RM 189.7 in Figure C-22) is slightly greater than the annual mean TP concentration in the Klamath River upstream of Copco No. 1 Reservoir (RM 206.4 in Figure C-22).

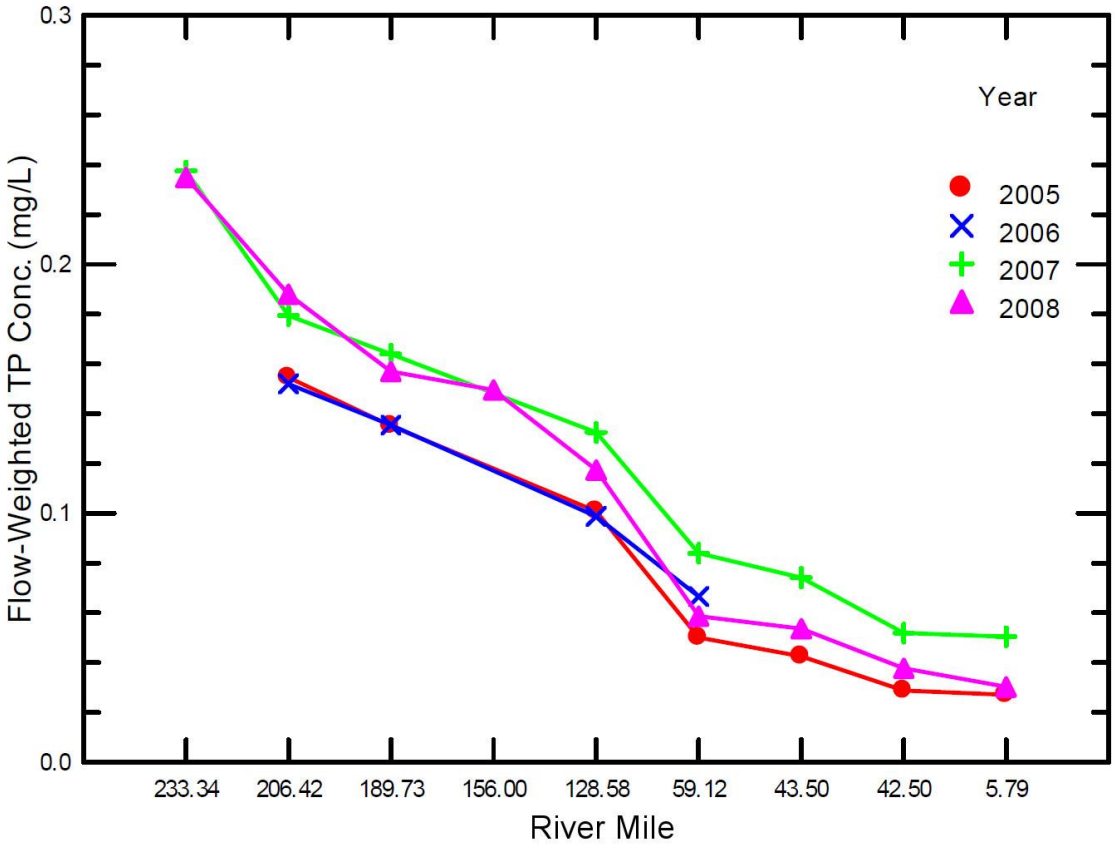

Figure C-19. Summary of Flow-Weighted Mean Concentration (mg/L) for TP at Mainstem Klamath River Sites for the Months of June to October (2005 to 2008). River Miles Specified Are Based on the River Miles Designations Used in 2010 and Differ Slightly from 2018 River Mile Designations (Table 3.2-1). Location of Mainstem Klamath River Measurements in 2010 River Mile Designations: Downstream Keno Dam (RM 233.34), Upstream Copco No. 1 Reservoir (RM 206.42), Downstream Iron Gate Dam (RM 189.73), Walker Bridge (RM 156.00), Seiad Valley (RM 128.58), Orleans (RM 59.12), Upstream Trinity River Confluence (RM 43.50), Downstream Trinity River Confluence (RM 42.50), Turwar (RM 5.79). Source: Asarian et al. 2010.

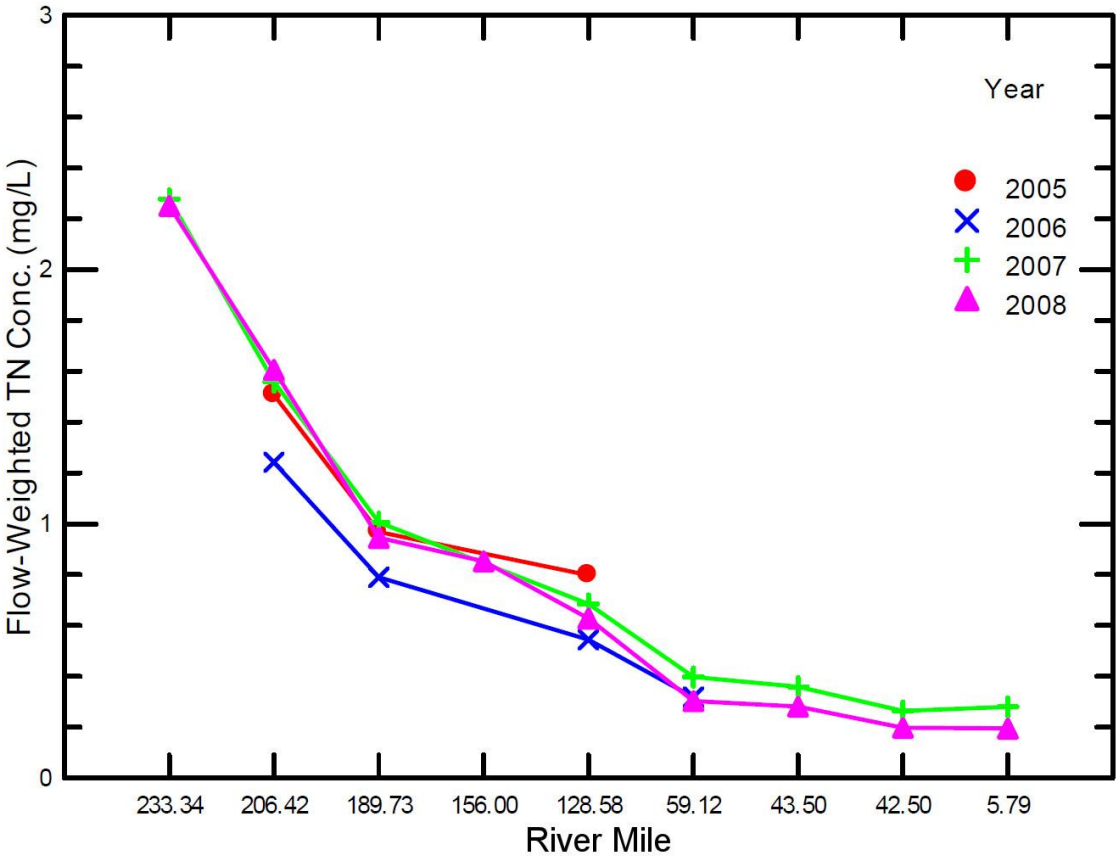

Figure C-20. Summary of Flow-Weighted Mean Concentration (mg/L) for TN at Mainstem Klamath River Sites for the Months of June to October (2005 to 2008). River Miles Specified Are Based on the River Miles Designations Used in 2010 and Differ Slightly from 2018 River Mile Designations (Table 3.2-1). Location of Mainstem Klamath River Measurements in 2010 River Mile Designations: Downstream Keno Dam (RM 233.34), Upstream Copco No. 1 Reservoir (RM 206.42), Downstream Iron Gate Dam (RM 189.73), Walker Bridge (RM 156.00), Seiad Valley (RM 128.58), Orleans (RM 59.12), Upstream Trinity River Confluence (RM 43.50), Downstream Trinity River Confluence (RM 42.50), Turwar (RM 5.79). Source: Asarian et al. 2010.

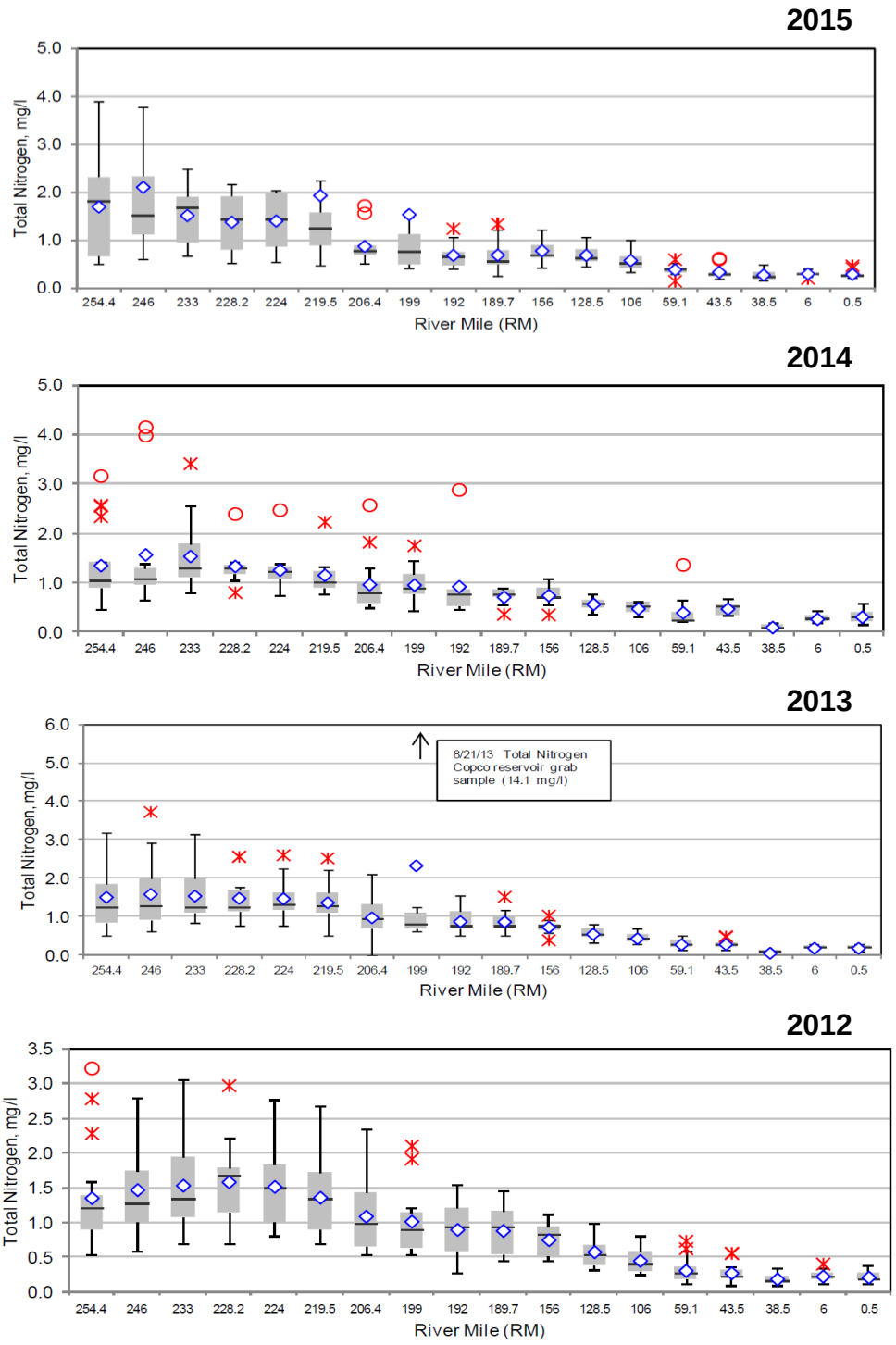

Figure C-21. Klamath River total nitrogen trends including Copco Reservoir (RM 198.7) and Iron Gate Reservoir (RM 189.7) with median (-), mean (◊), outlier (*), and extreme outliers (○) identified (Watercourse Engineering, Inc. 2013, 2014, 2015, 2016). River miles specified are based on those accurate at time of reports and differ slightly from 2018 river mile designations (Table 3.2-1).

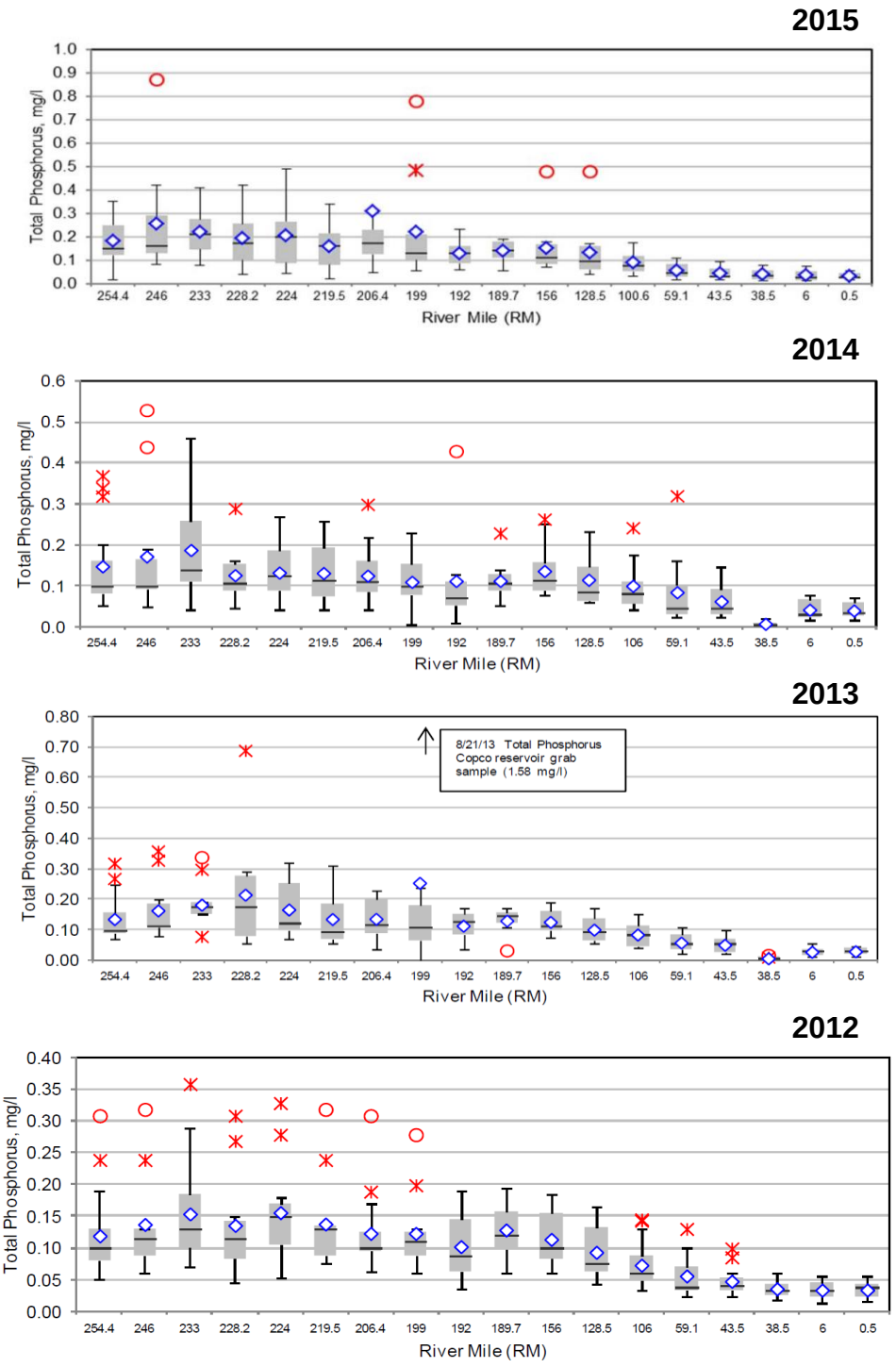

Figure C-22. Klamath River total phosphorus trends including Copco Reservoir (RM 198.7) and Iron Gate Reservoir (RM 189.7) with median (-), mean (◊), outlier (*), and extreme outliers (○) identified (Watercourse Engineering, Inc. 2013, 2014, 2015, 2016). River miles specified are based on those accurate at the time of the reports and differ slightly from 2018 river mile designations (Table 3.2-1).

Seasonal TN and TP variations in the Hydroelectric Reach result in longitudinal increases in TP, and to a limited degree the ammonia contribution to TN, during mid-summer/fall due to a combination of the release (export) of dissolved forms of phosphorus (ortho-phosphorus) and nitrogen (ammonium) from reservoir sediments during summer and fall when reservoir bottom waters are anoxic (i.e., internal nutrient loading), the hydraulic residence time of the reservoirs resulting in a temporal shift in the transport of upstream nutrients through Copco No. 1 and Iron Gate reservoirs, and reservoir turnover during fall (Kier Associates 2006; Kann and Asarian 2007; Stillwater Sciences 2009; Asarian et al. 2009, 2010; Oliver et al. 2014). Data from 2005 to 2008 show seasonal variations in TN and TP occurring from spring to fall as seasonal hypolimnetic anoxia resulted in nutrients being released into the water column (Figures C-23 and C-24; Asarian et al. 2010). Internal loading of nutrients on a seasonal basis is common in reservoirs that thermally stratify and become anoxic for several weeks to months during summer and fall. Asarian and Kann (2011) detail the 2005 to 2010 average monthly TN and TP variations at various depths in Copco No. 1 and Iron Gate reservoirs. TN concentrations generally are highest at the deepest depths in both reservoirs except in July to September when organic N was very high during phytoplankton blooms (also called algal blooms). Asarian and Kann (2011) report TP concentrations are approximately uniform with depth when the reservoirs are not stratified, but the TP increases significantly with depth, especially in the bottom layer, during the period the reservoirs stratify (June to October in Copco No. 1 and June through November in Iron Gate). Data presented in Asarian et al. (2009), Asarian et al. (2010), and Asarian and Kann (2011) suggest that much of the TP released from sediments in Copco No. 1 and Iron Gate reservoirs during summertime anoxia remains in the hypolimnion until the reservoirs begin to turn over in the fall, rather than being released to downstream river reaches during the summer period of peak periphyton growth. A frequent and notable exception occurs during August to November, when TP concentrations are often higher in Iron Gate Reservoir than upstream of Copco No. 1 Reservoir. This is likely due to the combination of internally-driven nutrient dynamics related to algal bloom crashes in Copco No. 1 and Iron Gate reservoirs and an approximately 1- to 2-month temporal lag due to the longer hydraulic retention time of the reservoirs as compared to free-flowing river reaches (Kann and Asarian 2007; Asarian et al. 2009, 2010; Asarian and Kann 2011; Watercourse Engineering, Inc. 2011a). Oliver et al. (2014) further explore the seasonality of TP dynamics with algal bloom variations highlighting measurements that show TP concentrations are lowest during May to July (“bloom period”), highest during August to October (“post-bloom period”), and then decrease during the winter periods. These results indicate that some release of TP may occur at times which could stimulate downstream periphyton growth.

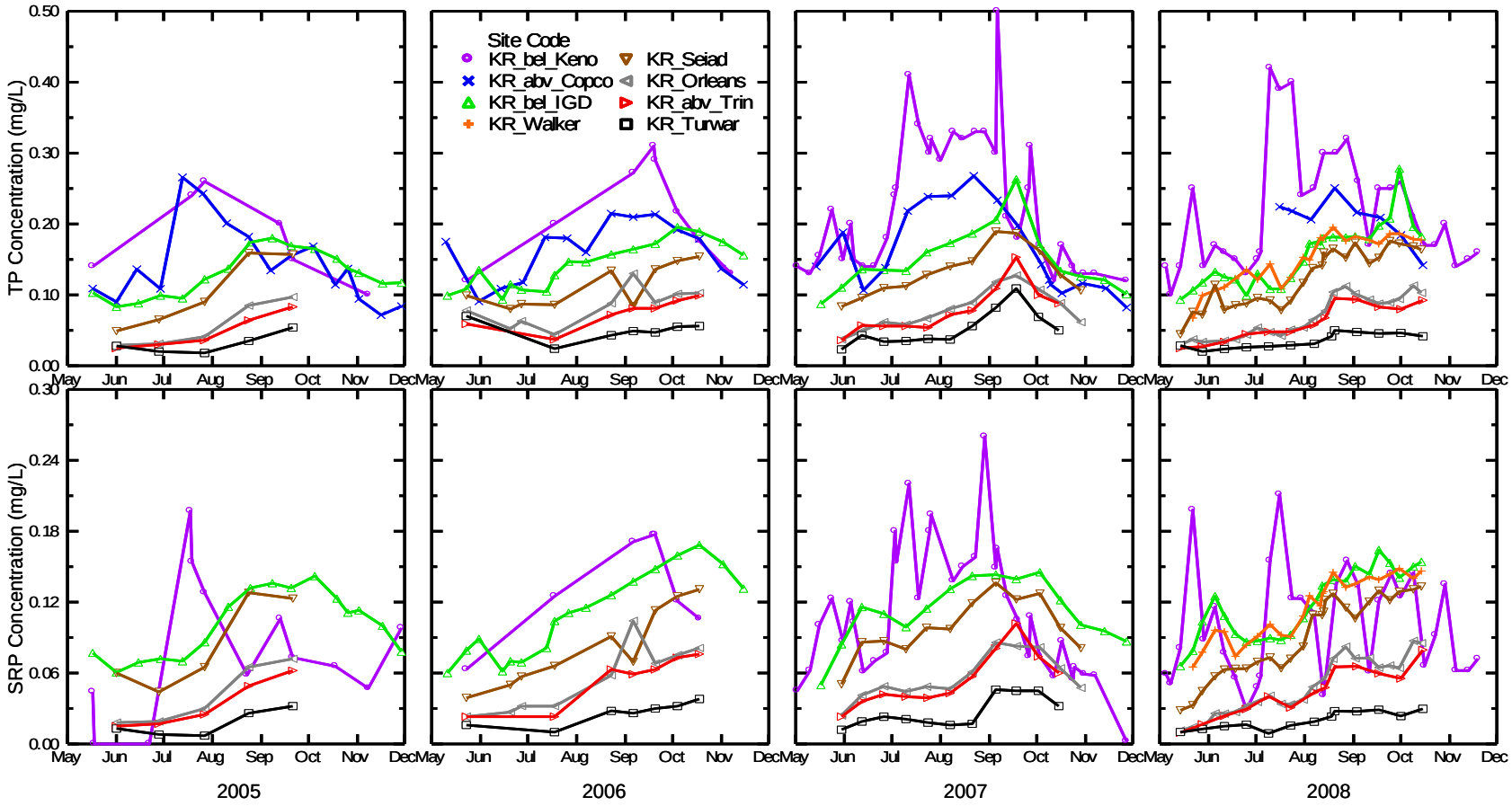

Figure C-23. Time Series of Total Phosphorus (TP) and Soluble Reactive Phosphorus (SRP) Concentrations for Selected Mainstem Klamath River Sites from Downstream Including the J.C. Boyle Dam (RM 229.8) to Turwar (RM 5.6) Reach, May 2005 to November 2008. Source: Asarian et al. 2010.

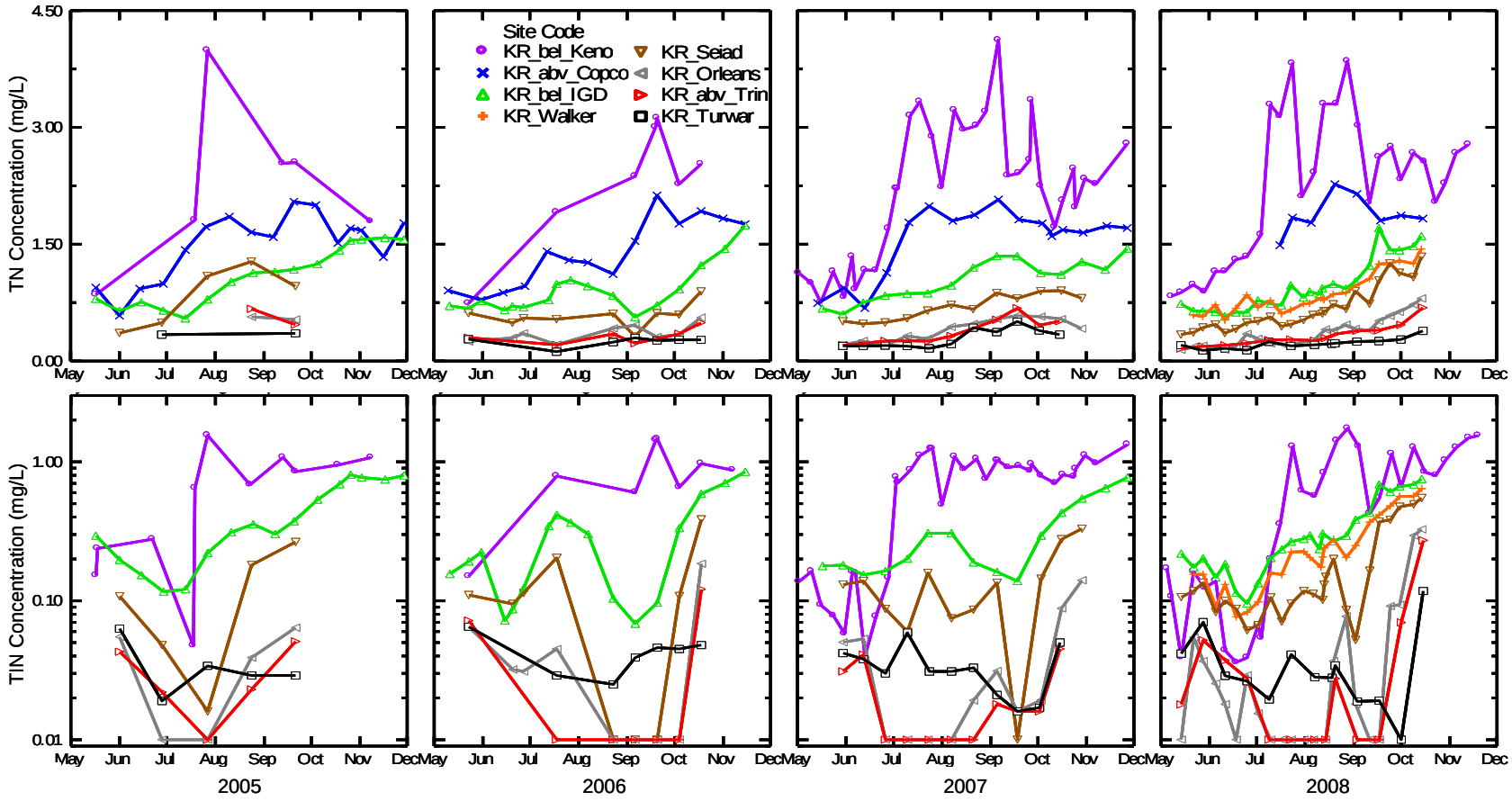

Figure C-24. Time Series of Total Nitrogen (TN) and Total Inorganic Nitrogen (TIN) Concentrations for Selected Mainstem Klamath Sites from Downstream Including the J.C. Boyle Dam (RM 229.8) to Turwar (RM 5.6) Reach, May 2005 to November 2008. Source: Asarian et al. 2010.

During the May 2005 to December 2007 period, TN and TP retention and release for Copco No. 1 and Iron Gate reservoirs are estimated based on a multiple regression modeling method, bi-weekly nutrient concentration measurements, and a daily reservoir water balance (Figures C-24-A, C-24-B, C-24-C, and C-24-D; Asarian et al. 2009). Three seasonal May through September periods spanning the main phytoplankton growing season in the reservoirs occur during May 2005 to December 2007, so the seasonal May through September nutrient retention is calculated for each individual reservoir along with the total combined nutrient retention for both reservoirs to evaluate seasonal TN and TP variations in the Hydroelectric Reach due to the reservoirs.

The May through September (i.e., seasonal) TN retention in Copco No. 1 Reservoir ranges from approximately 38 to 102 metric tons TN during 2005 through 2007, while the May through September TN retention in Iron Gate Reservoir ranges from approximately 44 to 80 metric tons TN during this same period. As a percent of the total inflow, the May through September TN retention in Copco No. 1 Reservoir ranges from approximately 7 to 16 percent, while the May through September TN retention in Iron Gate Reservoir ranges from approximately 9 to 17 percent. The total combined May through September (i.e., seasonal) TN retention in Copco No. 1 and Iron Gate reservoirs ranges from approximately 22 to 25 percent of the inflow, with an average of 23 percent over the three May through September periods in 2005, 2006, and 2007 (Asarian et al. 2009). The combined TN retention in Copco No. 1 and Iron Gate reservoirs during May through September is higher than the annual combined TN retention in Copco No. 1 and Iron Gate reservoirs (i.e., approximately 12 to 13 percent of inflow) due to settling of organic matter and algal material, denitrification, and/or ammonia volatilization (Asarian et al. 2009, 2010). While TN retention is seasonally higher in Copco No. 1 and Iron Gate reservoirs during May through September, the ammonia concentration downstream of Iron Gate Reservoir increases beginning in September from approximately 0.01 to 0.05 mg/L until peaking in October and November at approximately 0.1 to 0.2 mg/L due to the anoxic conditions in the lower section Iron Gate Reservoir (Asarian et al. 2009, 2010) (see discussion of Ammonium/Ammonia below).

In Copco No. 1 Reservoir, the May through September (i.e., seasonal) TP retention ranges from approximately negative 6.3 to negative 1.7 metric tons TP during 2005 through 2007, with the negative TP retention indicating a net export of TP from the reservoirs. The May through September TP retention in Iron Gate Reservoir ranges from approximately negative 4.7 to 3.5 metric tons TP during 2005 through 2007, indicating there may be a net export (e.g., negative 4.7 metric tons TP in 2006) or a net retention (e.g., 3.5 metric tons TP in 2007) from Iron Gate Reservoir between May and September depending on the year. As a percent of the total inflow, the May through September TP retention in Copco No. 1 Reservoir ranges from approximately negative 2 to negative 11 percent of inflow (i.e., export of TP), while the May through September TP retention in Iron Gate Reservoir ranges from approximately negative 6 to 5 percent of inflow (i.e.,

export or retention of TP) (Asarian et al. 2009). Data indicate much of the TP released from reservoir sediments in Copco No. 1 and Iron Gate reservoirs during summertime anoxia remains in the hypolimnion until the reservoirs begin to turn over in the fall (Asarian et al. 2009, 2010; Asarian and Kann 2011), but there is still an overall net export of TP from the two reservoirs during the main reservoir phytoplankton growth season as evidenced by the total combined TP retention in Copco No. 1 and Iron Gate reservoirs ranging from approximately negative 12 to negative 4 percent of inflow during May through September in 2005, 2006, and 2007 and the average combined TP retention in the reservoirs being equal to approximately negative 8 percent over these three years (Asarian et al. 2009). While the combined influence of the reservoirs is a net export of TP into the Hydroelectric Reach over the May through September period, Copco No. 1 and Iron Gate reservoirs typically retain TP during the earlier part of the May through September time period and export TP during the later part of the summer as internal nutrient loading associated with anoxic conditions increases (Asarian et al. 2009). Asarian and Kann (2011) observe TP measured at river locations generally decreasing through the Hydroelectric Reach from January to May and from July to August/September (varies by year), but TP exhibiting an increasing trend from August/September until approximately December. Oliver et al. (2014) also note TN and TP usually decrease with distance downstream from J.C. Boyle, but TP is found to occasionally slightly increase from J.C. Boyle Reservoir to Iron Gate Dam primarily between July and November.

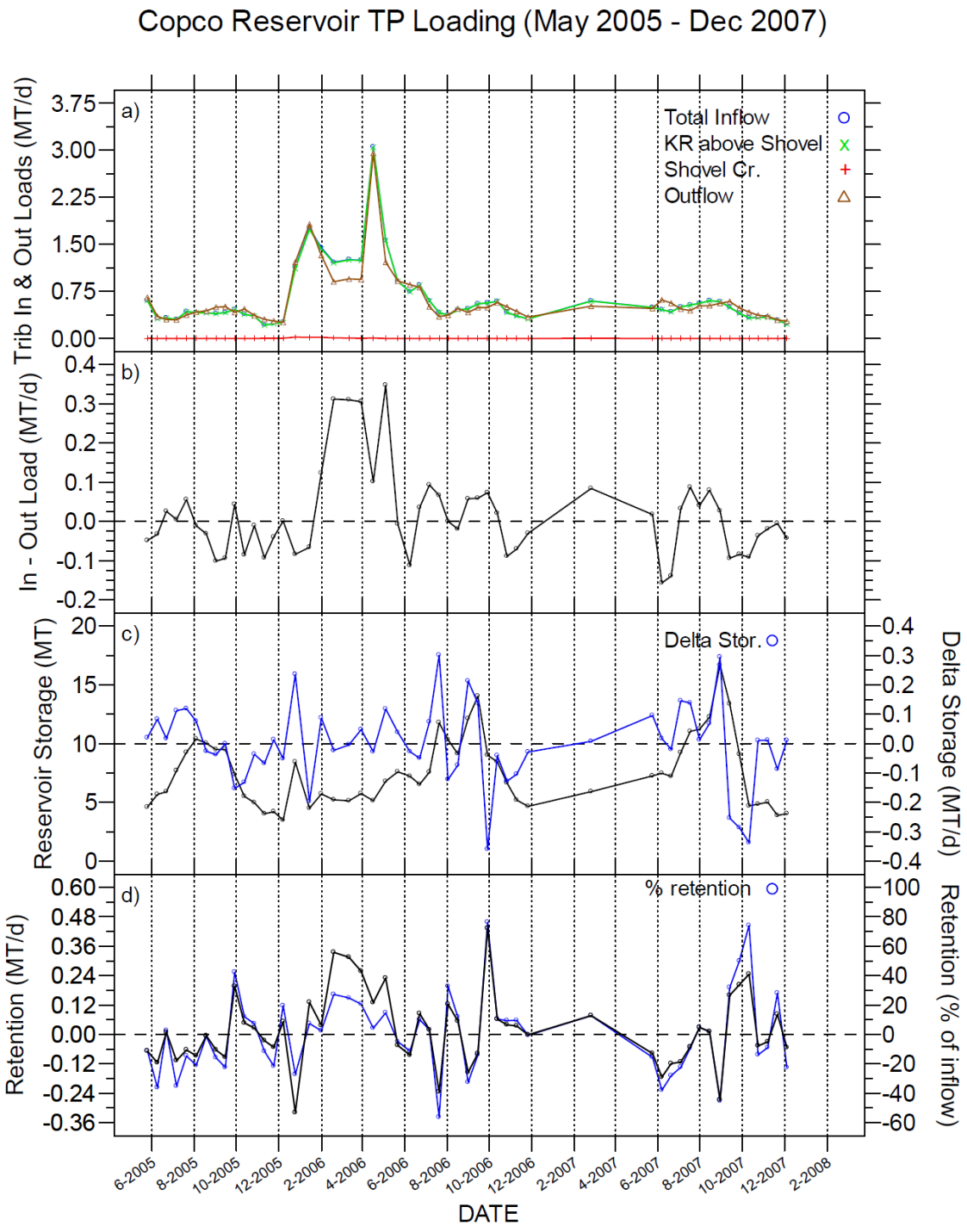

Figure C-24-A. Copco No. 1 Reservoir Total Phosphorus Loading, May 2005 to December 2007. Each Point Represents Data from an Entire Sampling Interval (Approximately Biweekly) and is Placed at the Midpoint of the Two Adjacent Sampling Dates. Horizontal Dashed Lines are Placed at Zero for Delta Storage and Retention. Source: Asarian et al. 2009.

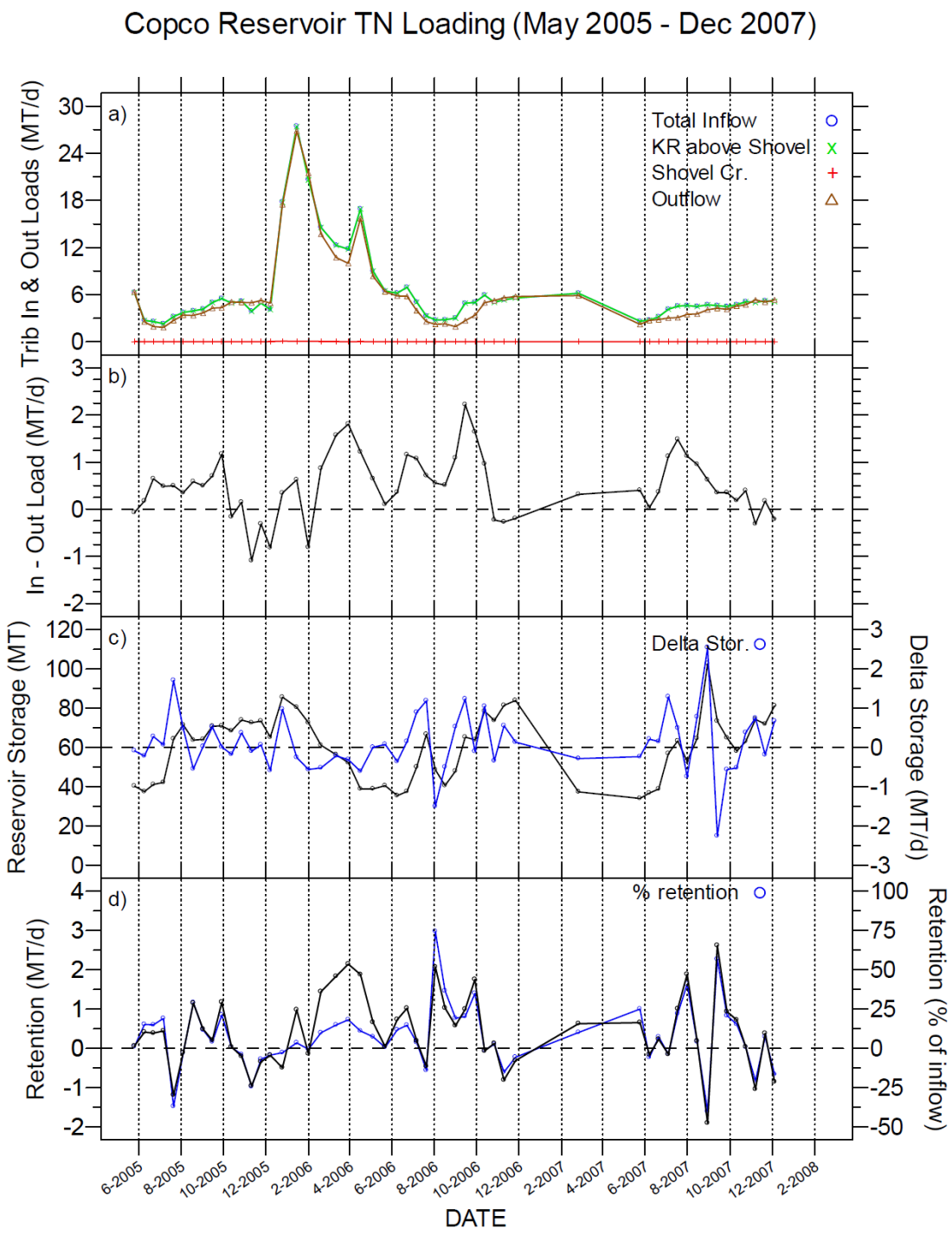

Figure C-24-B. Copco No. 1 Reservoir Total Nitrogen Loading, May 2005 to December 2007. Each Point Represents Data from an Entire Sampling Interval (Approximately Biweekly) and is Placed at the Midpoint of the Two Adjacent Sampling Dates. Horizontal Dashed Lines are Placed at Zero for Delta Storage and Retention. Source: Asarian et al. 2009.

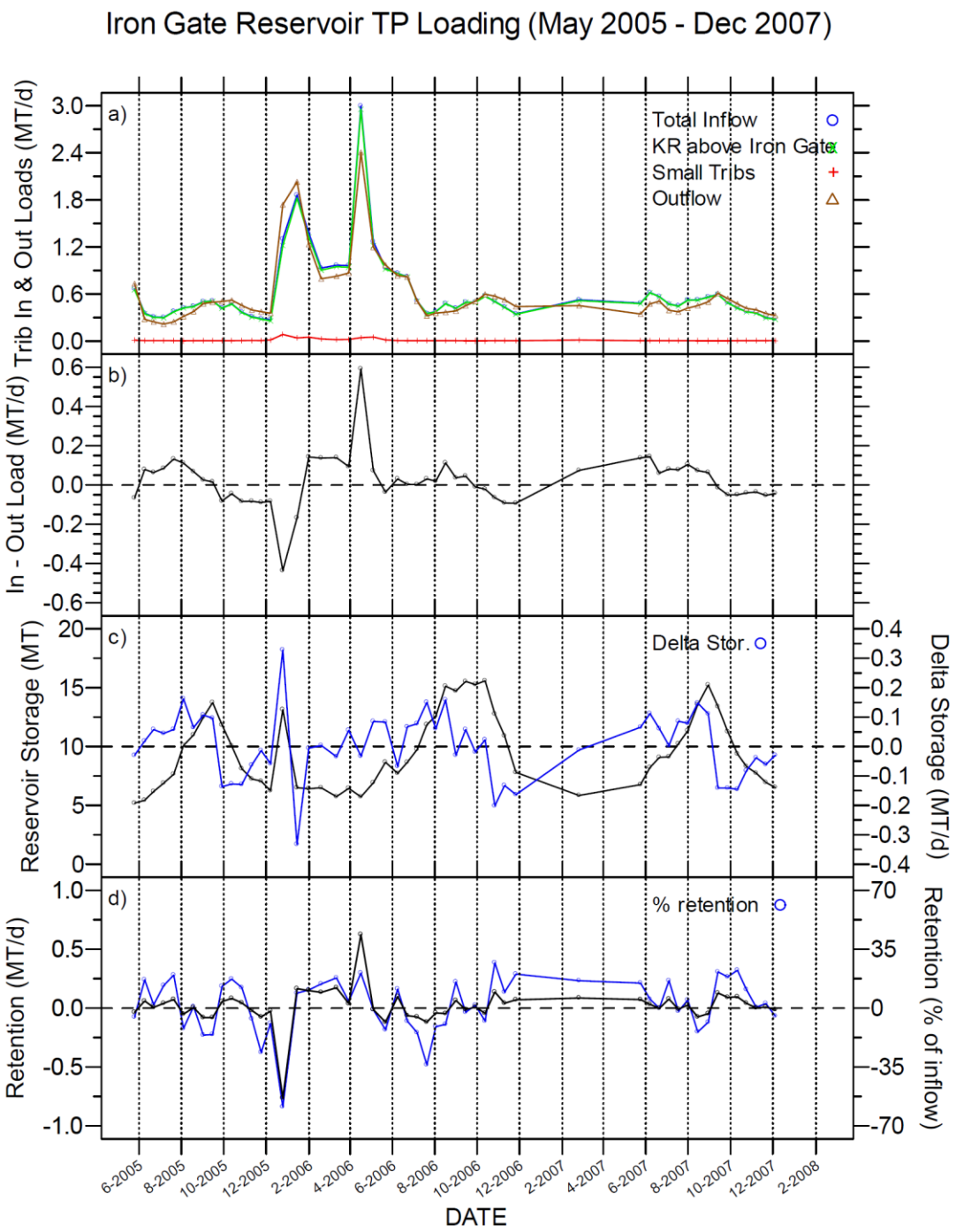

Figure C-24-C. Iron Gate Reservoir Total Phosphorus Loading, May 2005 to Dec 2007. Each Point Represents Data from an Entire Sampling Interval (Approximately Biweekly) and is Placed at the Midpoint of the Two Adjacent Sampling Dates. Horizontal Dashed Lines are Placed at Zero for Delta Storage and Retention. Source: Asarian et al. 2009.

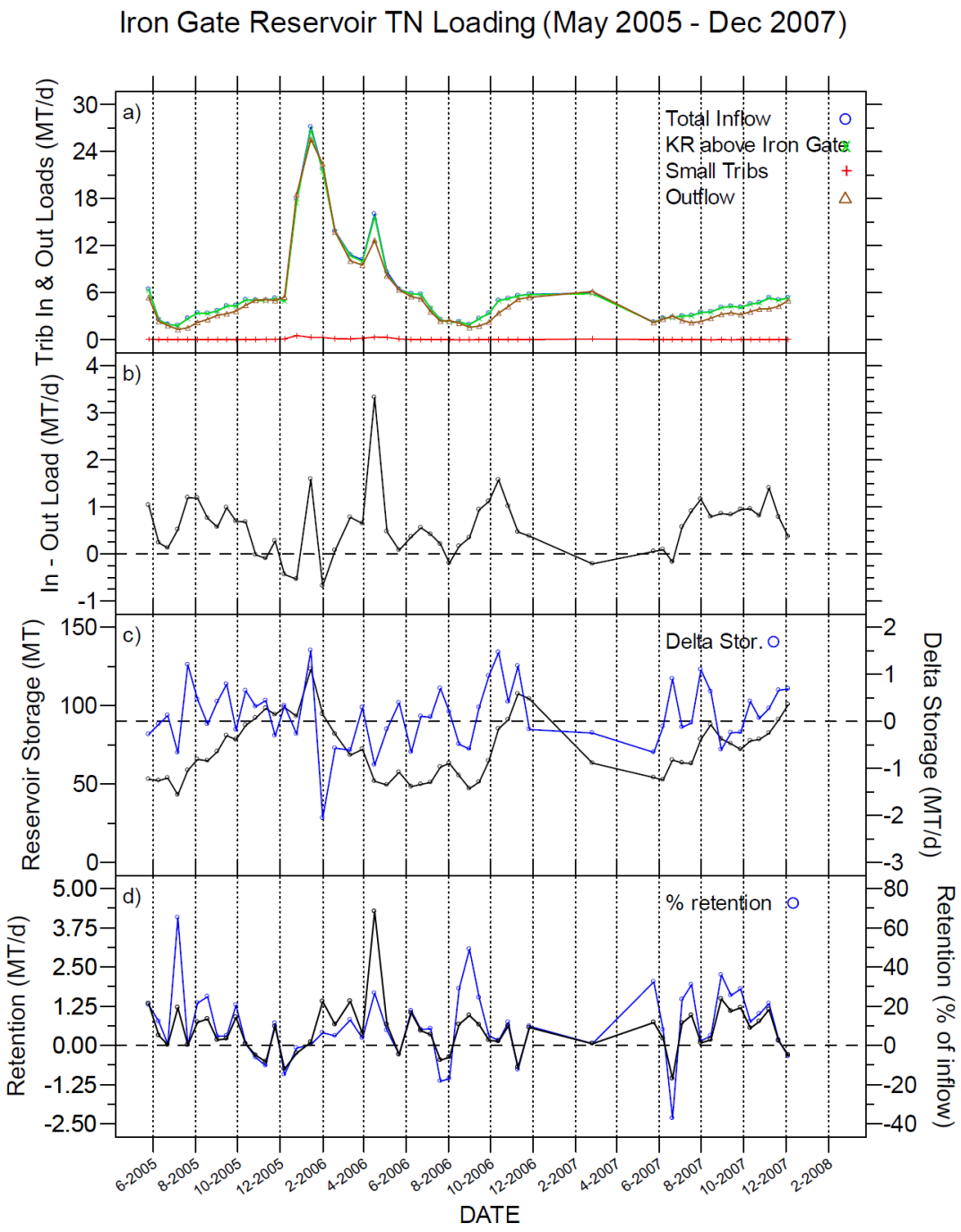

Figure C-24-D. Iron Gate Reservoir Total Nitrogen Loading, May 2005 to Dec 2007. Each Point Represents Data from an Entire Sampling Interval (Approximately Biweekly) and is Placed at the Midpoint of the Two Adjacent Sampling Dates. Horizontal Dashed Lines are Placed at Zero for Delta Storage and Retention. Source: Asarian et al. 2009.

With respect to nutrient speciation, internally driven reservoir nutrient dynamics due to stratification patterns and hydraulic residence time in Iron Gate and Copco No. 1 reservoirs appear to influence ortho-phosphorus and, to a lesser degree, ammonium concentrations within the Hydroelectric Reach.

Orthophosphate

Orthophosphate is a bioavailable and dissolved form of phosphorus that is frequently measured in addition to total phosphorus to assess the nutrients available for uptake by aquatic organisms. Orthophosphate is the most commonly measured form of dissolved phosphorus, but soluble reactive phosphorus (SRP) is also measured and can be used as a surrogate for orthophosphate. SRP concentrations in the riverine portions of the Hydroelectric Reach generally follow a decreasing longitudinal trend through this reach for summer and fall months (i.e., May through November; see Figure C-23). However, concentrations in Iron Gate Reservoir can exceed those of upstream sites (i.e., Klamath River downstream from J.C. Boyle and Copco No. 1 reservoirs) particularly between September and December (Asarian et al. 2009; Asarian et al. 2010; Raymond 2009a, 2010a; Asarian and Kann 2011; Oliver et al. 2014). Although there are limited data during winter months when the reservoirs are mixed, a synthesis of SRP data from 2005 to 2010 shows concentrations of orthophosphate appear to be more constant throughout the water column, while in stratified periods (i.e., May to October/November) concentrations near the bottom of the reservoirs can reach relatively high levels (Asarian and Kann 2011). For example, orthophosphate concentrations in the bottom waters of Copco No. 1 Reservoir reached 1.4 mg/L in September and October of 2008 and 2009, while surface water concentrations were approximately 0.2 to 0.3 mg/L (see Figure 26 in Raymond [2009a] and Figure 22 in Raymond [2010a]). Orthophosphorus concentrations in Iron Gate Reservoir during this same period ranged from approximately 0.1 mg/L to 0.3 mg/L (Raymond 2009a, 2010a). Vertical differences in orthophosphorus concentrations in Iron Gate Reservoir were less than 0.1 mg/L, but the highest concentrations often occurred near the bottom sediments (see Figure 26 in Raymond [2009a] and Figure 25 in Raymond [2010a]).

Nitrate

Data from 2001 to 2008 indicate that nitrate concentrations often peak in the vicinity of J.C. Boyle Reservoir and decrease through the remainder of the Hydroelectric Reach (Raymond 2009a). More recent analyses of nitrate concentrations from 2005 to 2011 in the Hydroelectric Reach support this conclusion and detail seasonal nitrate variations with nitrate substantially higher upstream of Copco No. 1 Reservoir than downstream of Copco No. 1 Reservoir or Iron Gate Reservoir (Asarian and Kann 2011, Oliver et al. 2014). On a seasonal basis, coupled nutrient and phytoplankton data indicate that nitrate levels decrease during algal blooms in the Hydroelectric Reach. Cyanobacteria [blue-green algae] blooms were recorded in Iron Gate and Copco No. 1 reservoirs in summer and fall 2005 coincident with a nitrate decrease of up to 0.8

mg/L between the inflow to Copco No. 1 and the outflow of Iron Gate reservoirs (Kann and Asarian 2007). In 2010 to 2011, Oliver et al. (2014) also observed low nitrate concentrations corresponding to algal blooms measuring nitrate concentrations from 0.01 to 0.08 mg/L NO_3^--N in May-July during the onset and initial peak of the algal bloom, 0.08 to 0.94 mg/L NO_3^--N in August to October following the bloom peak and during the initial bloom decline , 0.39 to 1.01 mg/L NO_3^--N in November to January, and 0.21 to 0.73 mg/L NO_3^--N in February to April. Dilution from the springs downstream from J.C. Boyle Dam also reduces nitrate concentrations in this reach even though the springs are also a relatively constant source of nitrate (Oliver et al. 2014).

Ammonium/Ammonia (NH_4^+/NH_3)

Ammonium (NH_4^+) and ammonia (NH_3) are two related forms of nitrogen that influence water quality, with the ratio of ammonium and ammonia dependent on the water temperature and pH (North Coast Regional Board 2010). Ammonium is converted to ammonia at higher water temperatures and higher pH. Ammonium and ammonia are naturally formed in the environment by microbes and some forms of blue-green algae that combine nitrogen from the air with hydrogen (nitrogen fixation), microbes that convert nitrogen in decaying organic matter into ammonia and ammonium, and fish excreting ammonia (USEPA 2013). Ammonium is a nutrient that is directly usable by phytoplankton and as such it can promote phytoplankton growth. At high concentrations, ammonium and ammonia are toxic to aquatic species, with toxicity levels varying by species. Ammonia is more toxic than ammonium (North Coast Regional Board 2010), so it is the form typically measured and reported.

Nutrient data from 2005 to 2010 show ammonia concentrations from May to September are often lowest upstream of Copco No. 1 Reservoir or downstream of Iron Gate Dam with the highest concentrations in Copco No. 1 Reservoir, but ammonia concentrations from October to December are higher upstream of Iron Gate Reservoir and downstream of Iron Gate Dam (Asarian and Kann 2011). Low ammonia concentrations between May and September are attributed to nitrification in the turbulent oxygen-rich Klamath River upstream of Copco Reservoir (Deas 2008). Asarian and Kann (2011) identify deterioration and decay of algal blooms along with reservoir turnover as the likely causes of higher ammonia concentrations from October to December. Seasonal longitudinal trends in the ammonium concentrations in the Hydroelectric Reach show minimums occur during May to July algal bloom periods and maximums occur during November to January (Oliver et al. 2014).

Relatively high levels of ammonium have been recorded in reservoirs in the Hydroelectric Reach especially in the lower reservoir depths. While available data collected to date suggests no actual ammonia toxicity events associated with the operation of the Lower Klamath Project (North Coast Regional Board 2010), elevated ammonia levels in the deeper portions of the hypolimnion of both Copco No. 1 and Iron Gate reservoirs in summer of 2005 exceeded 0.6 mg/L

(Figures 12 and 14 in Kann and Asarian 2007), indicating that anoxic conditions are likely causing conversion of organic nitrogen in reservoir deposits to ammonia. From 2001 to 2004, June and November mean ammonia concentrations in Iron Gate Reservoir were 0.1 to 0.3 mg/L to a depth of 45 meters, whereas Copco No. 1 Reservoir concentrations were consistently higher for the 20- to 32-meter depth and were 0.9 to 1.0 mg/L in September and October (FERC 2007). Only minor increases in ammonia (0.05 to 0.1 mg/L) have been observed to occur in the Hydroelectric Reach between upstream of Copco No. 1 Reservoir and downstream from Iron Gate Reservoir, most often during October and November (Kann and Asarian 2005, 2007). Data from 2005 to 2008 show ammonia concentrations downstream of Iron Gate Reservoir ranging from approximately 0.01 to 0.05 mg/L in September, increasing through September until becoming greater than ammonia concentrations upstream of Iron Gate Reservoir during October, and peaking between October and November at approximately 0.1 to 0.2 mg/L due to the anoxic conditions in the lower section Iron Gate Reservoir (Asarian et al. 2009, 2010). The 2005 to 2010 average monthly ammonia concentrations support previous findings showing ammonia concentrations increase substantially (often over an order of magnitude) with depth in Copco No. 1 Reservoir between May and October peaking at over 1.0 mg/L in September/October, while ammonia concentrations in Iron Gate Reservoir increase with depth between May and November usually peaking around 0.4 to 0.8 mg/L in October/November (Asarian and Kann 2011).

C.3.2 Mid- and Lower Klamath Basin

C.3.2.1 Iron Gate Dam to Salmon River

Historical (1950 to 2001) TP data indicate median values of 0.11 to 0.19 mg/L in the Lower Klamath Basin between Iron Gate Dam and Seiad Valley, with the highest values occurring just downstream from the dam (Figure C-25). Variability over the long-term record in this reach is lower than upstream reaches, with concentrations varying from near zero to over 0.3 mg/L for the period of record (Figure C-25). The historical record indicates relatively low variability in orthophosphate concentrations in the reach (as compared with variability in the Upper Klamath Basin), with median values of 0.03 to 0.1 mg/L (PacifiCorp 2004b).

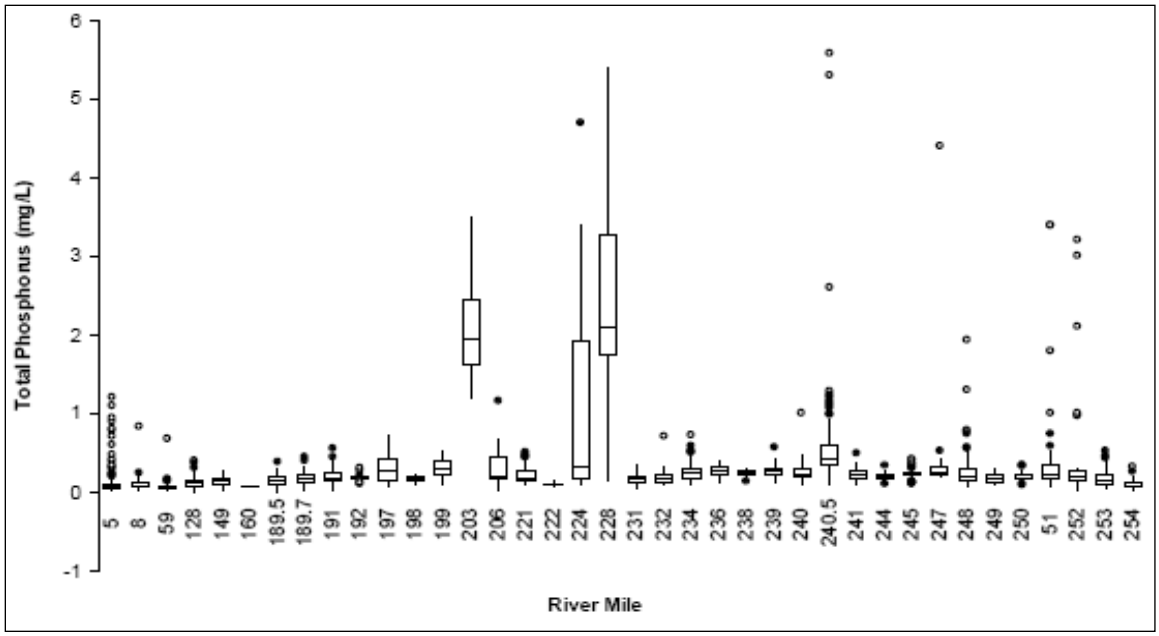

Figure C-25. Box and Whisker Plot of Historical TP Data Collected from Various Sites in the Klamath River from Klamath River at Klamath Glen (RM 5.9) to Klamath River at Link River Dam (RM 259.7) Between 1950 and 2001. Source: PacifiCorp 2004b.

More recent data from 2001 to 2015 also show TP concentrations generally decreasing with distance downstream from Iron Gate Dam and indicate that phosphorus dynamics in the Klamath River immediately downstream from Iron Gate Dam are affected by conditions within the Lower Klamath Project reservoirs (Section C.3.1.1) (Figures C-22 and C-26; Asarian et al. 2010; Asarian and Kann 2013; Oliver et al. 2014; Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016). Analysis of data from 2001 to 2011 shows the highest TP concentrations occurring during the low flow years of 2001 to 2004 when TP exceeded 0.4 mg/L downstream from Iron Gate Dam and the lowest TP concentrations occurring during the high flow years of 2006, 2010, and 2011 and the moderate flow year of 2005 (Asarian and Kann 2013). TP concentrations vary seasonally with TP peaking after the algal bloom peak and then decreasing during late fall and early winter (Oliver et al. 2014). During May 2005 to November 2008, peak TP concentrations at locations downstream from Iron Gate Dam occurred between mid-August and early October, which is roughly one to two months later than peak timing in upstream reaches and may be due to the hydraulic residence time in Iron Gate and Copco No. 1 reservoirs, or release of TP from anoxic sediments during summer stratification or following algal bloom and death (Figure C-23). After peaking, the TP concentrations declined steeply in late-fall in some years, but they exhibited a more gradual decline in others (Figure C-23). Orthophosphate or SRP tends to decrease in the mainstem Klamath River with distance downstream from Iron Gate Dam (FERC 2007; Asarian et al. 2010; Asarian and Kann 2013). Seasonal trends in

orthophosphate closely follow observed TP concentrations and for the period 2005 to 2008 this phosphorus species regularly accounts for 60 to 90 percent of TP sampled (Asarian et al. 2010; Asarian and Kann 2013; Oliver et al. 2014).

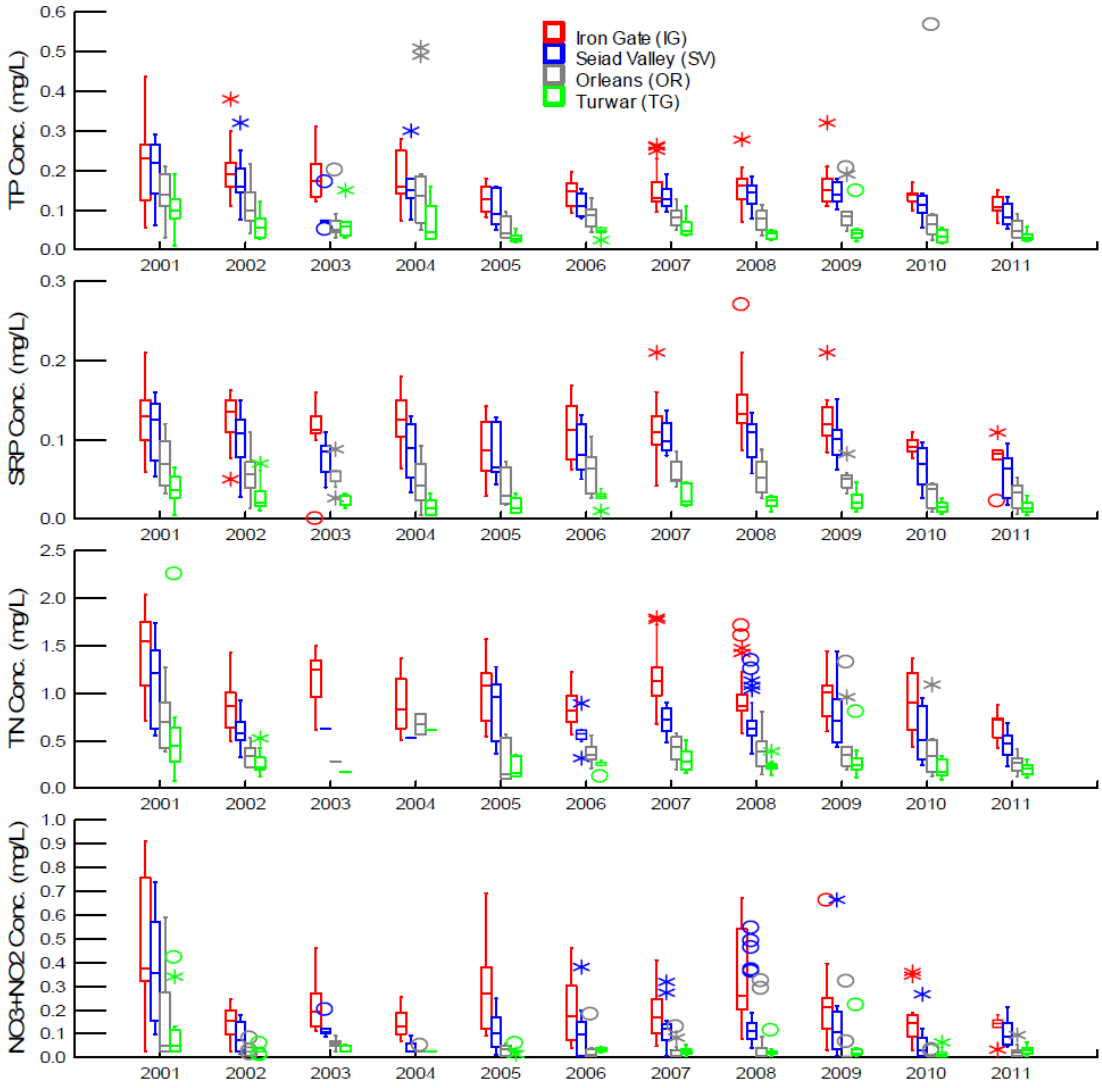

Figure C-26. Box and Whisker Plot of Total Phosphorus (TP), Soluble Reactive Phosphorus (SRP), Total Nitrogen (TN), and Nitrate plus Nitrite Nitrogen (NO3+NO2) for the June-October Period from 2001-2011 at Four Mainstem Klamath River Sites. Source: Asarian and Kann 2013.

For the period 1996 to 2007, average TN concentrations downstream from Iron Gate Dam (RM 193.1), vary by year, with mean concentrations of 1.2 mg/L (FERC 2007) and a range of measured concentrations from less than 0.1 to over 2.0 mg/L (North Coast Regional Board 2010). Additional historical (1951 to 2001) nitrogen data is available as Total Kjeldahl Nitrogen or TKN, a measure of

organic nitrogen plus ammonia. TKN median values for this period were 0.6 to 0.9 mg/L in the Lower Klamath Basin between Iron Gate Dam and Seiad Valley, with the highest median values occurring just downstream from the dam (PacifiCorp 2004b). Variability over the long-term record in this reach is relatively low compared with that of upstream reaches. For 1951 to 2001, high variability in nitrate concentrations is apparent in the reach between Iron Gate Dam and the Salmon River confluence, with some relatively high concentrations (greater than 5 mg/L) occurring at the Seiad Valley location (RM 132.7) (PacifiCorp 2004b).

More recent data from 2001 to 2015 show TN concentrations tend to decrease with distance downstream from Iron Gate Dam (Figures C-21, C-24, and C-26) and the nitrogen dynamics immediately downstream of Iron Gate Dam are affected by conditions within the Lower Klamath Project reservoirs (Asarian et al. 2010; Asarian and Kann 2013; Oliver et al. 2014; Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016). Based on data collected from 2001-2011, TN concentrations in the river downstream from Iron Gate Dam are generally lower than those in upstream reaches (Figures C-24 and C-26) due to dilution from the springs downstream from J.C. Boyle Dam and reservoir retention in the Hydroelectric Reach (Asarian et al. 2009; Asarian and Kann 2013). Further decreases in TN occur in the mainstem river downstream from Iron Gate Dam due to a combination of tributary dilution and in-river nitrogen removal processes such as denitrification and/or storage related to biomass uptake (Asarian et al. 2010). TN concentrations between 2001 and 2011 are highest in the low flow year 2001 and lowest in the high flow year 2011 (Asarian and Kann 2013). On a seasonal basis, TN increases from May through November, with peak concentrations (1−1.5 mg/L) typically observed during September and October (Figure C-24). Analysis of the 2001−2004 dataset also indicates that median TN concentrations in the Klamath River from Iron Gate Dam to (RM 193.1) to Seiad Valley (RM 132.7) exceed 0.2 mg/L (Asarian and Kann 2006b). A review of median TN concentrations from 2012 to 2015 (Figure C-21) also shows TN consistently exceeding 0.2 mg/L downstream of Iron Gate Dam (RM 193.1), Seiad Valley (RM 132.7), and Happy Camp (RM 108.4) (Watercourse Engineering, Inc. 2013, 2014, 2015, 2016).

Ratios of TN to TP (TN:TP) measured in the Klamath River suggest the potential for the system to be nitrogen-limited with some periods of co-limitation by N and P; however, concentrations of both nutrients are high enough in the river from Iron Gate Dam (RM 193.1) to approximately Seiad Valley (RM 132.7) (and potentially farther downstream) that nutrients are not likely to be limiting primary productivity (e.g., periphyton growth) in this portion of the Klamath River (FERC 2007, HVTEPA 2008, Asarian et al. 2010). In addition, nitrogen-fixing species dominate the periphyton communities in the lower reaches of the Klamath River where inorganic nitrogen concentrations are low (Asarian et al. 2010, Asarian et al. 2015). Since these species can fix their own nitrogen from the atmosphere, nitrogen would not limit their growth (Asarian et al. 2015).

Data collected during 2001 to 2015 indicate nitrate concentrations also tend to decrease longitudinally in the Klamath River downstream from Iron Gate Dam (Asarian et al. 2010; Asarian and Kann 2013; Oliver et al. 2014; Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016). Although patterns in nutrient concentrations vary between years, nitrate typically increases between July and September, with measured concentrations downstream from Iron Gate Dam frequently greater than 0.25 mg/L (Asarian et al. 2010; Asarian and Kann 2013). In the fall, nitrate concentrations tend to increase again, occasionally reaching values of over 0.6 mg/L (Asarian et al. 2010, Asarian and Kann 2013). Mean 2000 to 2004 nitrate concentrations downstream from Iron Gate Dam were 0.15 to 0.44 mg/L between March and November, with the highest concentrations observed in early September (FERC 2007). Over the same time period, mean nitrate concentrations farther downstream near the confluence of the Shasta River (RM 179.5) had decreased to 0.02 to 0.36 mg/L, with peaks observed in early November (FERC 2007). Nitrate generally comprises less than 40 percent of the TN concentration throughout the lower Klamath River (Asarian et al. 2010). Nitrate concentrations at Seiad Valley (RM 132.7) from 2001 to 2011 consistently increase in the fall between August and November frequently exceeding 0.2 mg/L (Asarian and Kann 2013, Oliver et al. 2014).

As a result of the seasonal production of ammonia in anoxic hypolimnetic waters of the Lower Klamath Project reservoirs (Section C.3.1.1) and the high pH levels (greater than 7.5 pH units) measured seasonally downstream from Iron Gate Dam (YTEP 2005, North Coast Regional Board 2011), the North Coast Regional Board evaluated all available sampling data records as part of Klamath River TMDL development. The North Coast Regional Board analysis showed that for sampling events in which all three parameters (pH, ammonia, and water temperature) were collected simultaneously, no acute or chronic toxicity exceedances of the *Water Quality Control Plan for the North Coast Region* (Basin Plan) criteria for ammonia were indicated (North Coast Regional Board 2010). For the May to November sampling period in 2005 to 2008, ammonia concentrations in the Klamath River downstream from Iron Gate Dam were generally less than 0.3 mg/L and constituted less than 10 percent of the TN concentration (Asarian et al. 2010). Highest concentrations were measured during fall months downstream from Iron Gate Dam (RM 193.1), with late-fall ammonia concentrations generally increasing at this location and values increasing to above 0.2 mg/L during November 2006. For the period 2000 to 2004, mean ammonia levels of 0.13 mg/L were reported in Iron Gate Dam outflow (FERC 2007).

Although tributary dilution generally has a proportionally greater effect on nutrient concentration reductions in the Klamath River downstream from Iron Gate Dam, nutrient retention is an important component of overall nutrient dynamics in this reach (Asarian et al. 2010, Oliver et al. 2014). In a study of the June to October and July to September periods during 2005 to 2008, nutrient retention in the

reach from Iron Gate Dam to the Klamath River Estuary was calculated after accounting for tributary dilution (Asarian et al. 2010). For the study, positive retention values represented seasonal removal of nutrients from the water column through storage in phytoplankton/plant biomass or denitrification, and negative retention represented an internal source of nutrients from sediment release or phytoplankton regeneration and nitrogen fixation. Retention rates downstream from Iron Gate Dam were variable but generally positive for TP, although negative retention was observed during some years in the reach between Seiad Valley (RM 132.7) and the Salmon River (RM 66.3), as well as further downstream to Turwar (RM 5.6) (Asarian et al. 2010). In general, TP and orthophosphate retention increased with distance downstream from Iron Gate Dam while particulate phosphorus retention decreased (i.e., negative retention). Nutrient retention for TN was similarly positive, with instances of negative retention observed during 2005 between Iron Gate Dam (RM 193.1) and Seiad Valley (RM 132.7) (see Section C.3.2.2 for discussion of retention in lower reaches). Additionally, during 2005 to 2008, total inorganic nitrogen (TIN = nitrite + nitrate + ammonia) retention was consistently positive between Iron Gate Dam and as far downstream as the Trinity River confluence (RM 43.3). The Asarian et al. (2010) analysis indicates that large quantities of nitrogen and phosphorus were retained in the river across the roughly 130 miles from Iron Gate Dam to just downstream from the Salmon River at Orleans (RM 58.9). During July to September of 2007 to 2008, the incoming nutrient load at Iron Gate Dam was reduced by 24 percent for TP, 25 percent for orthophosphate, 21 percent for particulate phosphorus, 41 percent for TN, 93 percent for TIN, and 21 percent for organic nitrogen (Asarian et al. 2010). Oliver et al. (2014) report a pattern of decreasing TN loads downstream of Iron Gate Dam due to algal sedimentation or denitrification during August to November, increasing TN loading during December through April once discharge increased in the winter/spring period, and relatively similar TN loads across sites from downstream of Iron Gate Dam to Seiad Valley between May and July. Trends in TP loads indicate TP is less influenced by algal blooms than seasonal changes in discharge with TP loads generally increasing with distance downstream of Iron Gate Dam at higher winter/spring discharge rates (Oliver et al. 2014).

C.3.2.2 Salmon River to Estuary

Downstream from the confluence with the Salmon River (RM 66.3), nutrient concentrations continue to decrease in the Klamath River as compared with those measured farther upstream. Historical (1950 to 2001) TP data indicate median values of 0.06 to 0.07 mg/L in river between the Salmon River confluence and near the Klamath River Estuary, with generally low variability (Figure C-25). Orthophosphate levels and variability over the long-term record in the reach downstream from the Salmon River are similar to those in the reach downstream from Iron Gate Dam (see previous section). Data from 2001 to 2015 indicate that TP concentrations in this reach are generally 0.05 to 0.1 mg/L with TP concentrations approaching 0.2 mg/L or greater in some years at the furthest upstream site Orleans (RM 58.9) (Figures C-22, C-23, and C-14; Asarian et al.

2010; Asarian and Kann 2013; Oliver et al. 2014; Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016). Data from 2005-2008 shows peak values occurring in September and October (Figure C-23). Water quality monitoring by the HVTEPA from 2008 to 2012 at Saints Rest Bar (RM 44.9) in the Klamath River shows TP ranging from 0.026-0.127 mg/L while SRP ranges from approximately 0.005 to 0.07 mg/L. Both TP and SRP (i.e., orthophosphate) at Saints Rest Bar generally increase from June through October reaching the annual peak between August and October (HVTEPA 2013). Data from 2007 to 2014 collected by the Yurok Tribe Environmental Program provide more recent seasonal patterns in the TP and SRP concentrations from Weitchpec (RM 43.6) upstream of the confluence with the Trinity River to the Klamath River Estuary (Sinnott 2008, 2009a, 2009b, 2010b, 2011b, 2012b, Hanington and Torso 2013; Hanington and Stawasz 2014; Hanington and Cooper-Carouseli 2014). In 2014, both TP and SRP at sites downstream of the Trinity River are at a minimum around mid-May, increase until peaking in September/October, and decrease until December (Hanington and Cooper-Carouseli 2014). Downstream from the Trinity River, orthophosphate often accounts for less than 50 percent of TP, possibly due to dilution from the Trinity River (Asarian et al. 2010).

As with upstream reaches, historical (1951 to 2001) nitrogen data is available as TKN, nitrate, and ammonia. TKN median values downstream from the Salmon River for this period were 0.25 to 0.3 mg/L (PacifiCorp 2004b). Variability over the 1951 to 2001 record in this reach is dependent on sampling location, with the greatest variability for the most downstream site at Klamath Glen (RM 5.9). In the 1951 to 2001 dataset, high variability in nitrate concentrations is apparent throughout this reach, with some relatively high concentrations (greater than 3 mg/L) occurring at Orleans (RM 58.9) and Klamath Glen (RM 5.9) (PacifiCorp 2004b). Data from 2001 to 2015 indicate that TN concentrations in this reach are generally between 0.1 to 0.5 mg/L with TN concentrations frequently peaking above 0.5 mg/L between August and October at sites upstream of the Trinity River (Sinnott 2008, 2009a, 2009b, 2010b, 2011b, 2012b; Asarian and Kann 2013; Hanington and Torso 2013; Hanington and Stawasz 2014; Hanington and Cooper-Carouseli 2014; Watercourse Engineering, Inc 2012, 2013, 2014, 2015, 2016). However, TN concentrations substantially exceeded the typical range in some years like 2001. Data from 2005 to 2008 show the seasonal variations with TN increasing from May through November and peak concentrations (approximately 0.5 mg/L) typically observed during September and October (Figure C-24), which are at or above the Hoopa Valley Tribe numeric criterion of 0.2 mg/L TN. TN concentrations from 2008 to 2012 at Saints Rest Bar (RM 44.9) range from less than 0.1 mg/L to approximately 1.0 mg/L while nitrate plus nitrite ranges from less than 0.05 mg/L to approximately 0.28 mg/L. TN at Saints Rest Bar generally increases from June through October reaching the annual peak between September and October, but nitrate plus nitrite varies less until September when it increases and peaks between September and October (HVTEPA 2013). Downstream from the Trinity River confluence (RM 43.3), TN concentrations are typically less than 0.5 mg/L (YTEP 2005; Sinnott 2008,

2009a, 2009b, 2010b, 2011b, 2012b; Asarian and Kann 2013; Hanington and Torso 2013; Hanington and Stawasz 2014; Hanington and Cooper-Carouseli 2014), with general increases from spring to fall months. For the 2005 to 2008 dataset, TN increases were observed between September and October at Orleans (RM 58.9), upstream of the confluence with the Trinity River (approximately RM 43.3), and at Turwar (RM 5.6) (Figure C-24; Asarian et al. 2010). Similar patterns in TN concentrations were measured between 2009 and 2014 at sites between Orleans and Turwar (Sinnott 2008, 2009a, 2009b, 2010b, 2011b, 2012b; Asarian and Kann 2013; Hanington and Torso 2013; Hanington and Stawasz 2014; Hanington and Cooper-Carouseli 2014).

Nutrient retention rates in the Klamath River, from approximately the Salmon River confluence to the Trinity River, are variable for the period 2005 to 2008, but generally positive for TN and TP. However, from the Trinity River to the Klamath River Estuary, TN and TP nutrient retention rates are generally negative (Asarian et al. 2010). For example, during 2005 to 2008, total inorganic nitrogen (TIN = nitrite + nitrate + ammonia) retention was consistently negative between the Trinity River confluence and Turwar (RM 5.6) (Asarian et al. 2010). The Asarian et al. (2010) analysis suggests that while nitrogen and phosphorus are largely being removed from the river upstream of the Trinity River confluence (RM 43.3) during the June to October and July to September study periods, downstream from the confluence, nutrients are being added. Since retention is a load-based estimate and is inherently tied to flows, it is possible for nutrient loads to increase even while nutrient concentrations in the water decrease (in this case, only slightly).

C.3.2.3 Klamath River Estuary

Nutrient concentrations in the Klamath River Estuary are highly variable spatially and temporally and are greatly influenced by season, river flow, tidal prism, and location of the estuary mouth. In general, nutrient concentrations in the Klamath River Estuary are lower than in the Klamath River just upstream of the Trinity River confluence (RM 43.6) and comparable to the nearest river sampling station (RM 5.6) near Turwar (YTEP 2004, 2005; Sinnott 2008, 2009a, 2009b, 2010b, 2011b, 2012b; Hanington and Torso 2013; Hanington and Stawasz 2014; Hanington and Cooper-Carouseli 2014). One exception to that trend is ammonia which is consistently higher in the Klamath River Estuary than upstream locations with peaks occurring between August and December (YTEP 2004, 2005; Sinnott 2009a, 2009b, 2010b, 2011b, 2012b; Hanington and Torso 2013; Hanington and Stawasz 2014; Hanington and Cooper-Carouseli 2014). Inter-annual and seasonal variability are apparent in the contemporary data collected by the Yurok Tribe during 2006 to 2014 (Sinnott 2008, 2009a, 2009b, 2010b, 2011b, 2012b; Hanington and Torso 2013; Hanington and Stawasz 2014; Hanington and Cooper-Carouseli 2014). For example, measured concentrations of TP in the Klamath River Estuary are below 0.12 mg/L during the period June to October 2006 to 2014. Contemporary data (2006 to 2014) indicate that TP concentrations in the Klamath River Estuary generally range from approximately

0.02 to 0.08 mg/L with peak values generally occurring in September and October, although 2009 and 2010 data indicated that concentrations of TP can continue to increase into November and December, especially during elevated river flows (Sinnott 2008, 2009a, 2009b, 2010b, 2011b, 2012b; Hanington and Torso 2013; Hanington and Stawasz 2014; Hanington and Cooper-Carouseli 2014). During peak concentrations, values often exceed the Hoopa Valley Tribe's standard of 0.035 mg/L TP (HVTEPA 2008). During the same period, orthophosphate is consistently reported at less than 0.06 mg/L. Orthophosphate often accounts for more than 50 percent of TP from June through October.

Contemporary data (2006 to 2014) indicate that TN concentrations in the Klamath River Estuary were consistently below 0.7 mg/L, generally ranging from approximately 0.1 to 0.6 mg/L (Sinnott 2008, 2009a, 2009b, 2010b, 2011b, 2012b; Hanington and Torso 2013; Hanington and Stawasz 2014; Hanington and Cooper-Carouseli 2014). Concentrations increase from June to October with peak values occurring in September and October, although 2009, 2010, and 2011 data indicate that concentrations can continue to increase into November and December, especially during high river flows (Sinnott 2008, 2009a, 2009b, 2010b, 2011b, 2012b; Hanington and Torso 2013; Hanington and Stawasz 2014; Hanington and Cooper-Carouseli 2014). During peak concentrations, values often exceed the Hoopa Valley Tribe's standard of 0.2 mg/L TN (HVTEPA 2008). During June to October 2006 to 2014, measured values of nitrate plus nitrite in the Klamath River Estuary are near or below the reporting limit (0.01 mg/L) with concentrations ranging from 0.01 mg/L to 0.2 mg/L though nitrate plus nitrite concentrations are typically between 0.01 mg/L and 0.04 mg/L. Concentrations of nitrate plus nitrite in the Klamath River Estuary increase from June to October, with peak values during this period occurring in September and October. As with TN, recent data indicates that nitrate plus nitrite concentrations can continue to increase into November and December, especially during elevated river flows (Sinnott 2010b, 2011b). Measured values of ammonia in the Klamath River Estuary were low, with measurements consistently below 0.1 mg/L during the period June to October 2006 to 2014, generally ranging from 0.01 mg/L to approximately 0.04 mg/L, with peak values generally occurring in September. Many ammonia samples from the Klamath River Estuary return values near or below the reporting limit of 0.01 mg/L (YTEP 2004, 2005; Sinnott 2008, 2009a, 2009b, 2010b, 2011b, 2012b; Hanington and Torso 2013; Hanington and Stawasz 2014; Hanington and Cooper-Carouseli 2014). However, the Klamath River Estuary sampling site has more detectable concentrations of ammonia than any other sampling site within the Yurok Reservation. Nutrient retention has not been explicitly measured in the Klamath River Estuary, although measurements have been made just upstream of the Klamath River Estuary in the reach from the Trinity River confluence (RM 43.3) to Turwar (RM 5.6).

C.4 Dissolved Oxygen

C.4.1 Upper Klamath Basin

C.4.1.1 Keno Impoundment/Lake Ewauna

In the downstream Keno Impoundment/Lake Ewauna, dissolved oxygen reaches very low levels (less than 1 to 2 mg/L) during July through October as algae transported from Upper Klamath Lake settle out of the water and decay (see Figure 3.4-9). Decomposition of algae transported from Upper Klamath Lake appears to be the primary driver of low oxygen in the Keno Impoundment/Lake Ewauna. Dissolved oxygen concentrations measured in 2005 from the downstream end of Lake Ewauna to Keno Dam ranged from 7 to 8 mg/L in the early spring, and by late July concentrations were less than 2 mg/L throughout the water column (Deas and Vaughn 2006). During this same period, dissolved oxygen concentrations in Link River inflow were 7 to 8 mg/L, but apparently had little effect on the dissolved oxygen concentrations in the Keno Impoundment. Continuous dissolved oxygen data collected by Reclamation at Klamath River upstream of Keno Dam (USGS gage no. 11509370) for the period January 2006 through December 2018 exhibit seasonally low dissolved oxygen concentrations (less than 1 mg/L to 5 mg/L) from July through October.

C.4.1.2 Hydroelectric Reach

Dissolved oxygen concentrations in the Hydroelectric Reach vary on a seasonal and daily basis (e.g., FISHPRO 2000; PacifiCorp 2004b, 2008a; FERC 2007; Raymond 2008a, 2009a, 2010a; USFWS 2008; Kirk et al. 2010; Zedonis and Turner 2010; Asarian and Kann 2011; Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015). Historical (1950 to 2001) data collected during daytime at various times in the year show median dissolved oxygen concentrations of approximately 5 to 8 mg/L in the Upper Klamath River between J.C. Boyle Reservoir and Iron Gate Dam, with the lowest median values occurring at RM 201.8 and RM 193.1 corresponding to Copco No. 1 Reservoir and Iron Gate Reservoir, respectively (Figure C-27). The highest historical median dissolved oxygen concentrations in the Hydroelectric Reach occur from RM 229.8 to RM 201.8 downstream of J.C. Boyle and upstream of Copco No. 1 Reservoir. Historical water column oxygen demand data is also available for the Hydroelectric Reach from J.C. Boyle to Iron Gate reservoirs. The historical record indicates relatively low biological oxygen demand (BOD) in the Lower Klamath Project reservoirs (Figure C-28).

During summer months, the Lower Klamath Project reservoirs exhibit varying degrees of dissolved oxygen supersaturation in surface waters due to high rates of phytoplankton photosynthesis, especially large blue-green algae blooms, and hypolimnetic anoxia as dissolved oxygen is depleted in bottom waters during seasonal thermal stratification and microbial decomposition of dead phytoplankton. During daylight hours, phytoplankton produce dissolved oxygen (through photosynthesis), resulting in super-saturation of dissolved oxygen.

During nighttime hours, phytoplankton consume dissolved oxygen (through respiration) contributing to lower dissolved oxygen levels.

While reaeration in the reach between Keno Dam and J.C. Boyle Reservoir can increase dissolved oxygen concentrations in the river to near saturation levels, the high oxygen demand in water entering J.C. Boyle Reservoir and a vertical water temperature gradient driven by diurnal fluctuations in river water temperature that limit vertical mixing from July to mid-September can still reduce dissolved oxygen concentrations in the reservoir itself (Figure C-29; Raymond 2008a, 2009a, 2010a). Peaking operations from J.C. Boyle Dam seem to have a negligible effect on dissolved oxygen concentrations between J.C. Boyle and Copco No. 1 because the free-flowing river upstream of J.C. Boyle Reservoir and the high velocity of peaking flows provides sufficient aeration (PacifiCorp 2004b).

Dissolved oxygen concentrations in Copco No. 1 and Iron Gate reservoirs vary seasonally with thermal stratification that limits mixing of surface and bottom waters and results in decreasing dissolved oxygen concentrations with depth. Copco No. 1 and Iron Gate reservoirs thermally stratify beginning in April or May and do not mix again until October to December with Iron Gate achieving complete mixing approximately a month later than Copco No. 1 (FERC 2007; Asarian and Kann 2011). During the stratification time period, dissolved oxygen concentrations in Iron Gate and Copco No. 1 surface waters generally are at or above saturation likely due to photosynthesis by aquatic plants and phytoplankton growth, especially large blue-green algae blooms, concentrating near the reservoirs' surface (Asarian and Kann 2011). Dissolved oxygen concentrations in the hypolimnetic waters near the bottom of the reservoirs are much lower reaching minimum values near 0 mg/L by July (for example, see 2008 data shown in Figures C-30 and C-31). Low dissolved oxygen concentrations (less than 3 mg/L) extend further up in the water column and longer in the season in Iron Gate Reservoir than in Copco No. 1 Reservoir (Figure C-32; Asarian and Kann 2011).

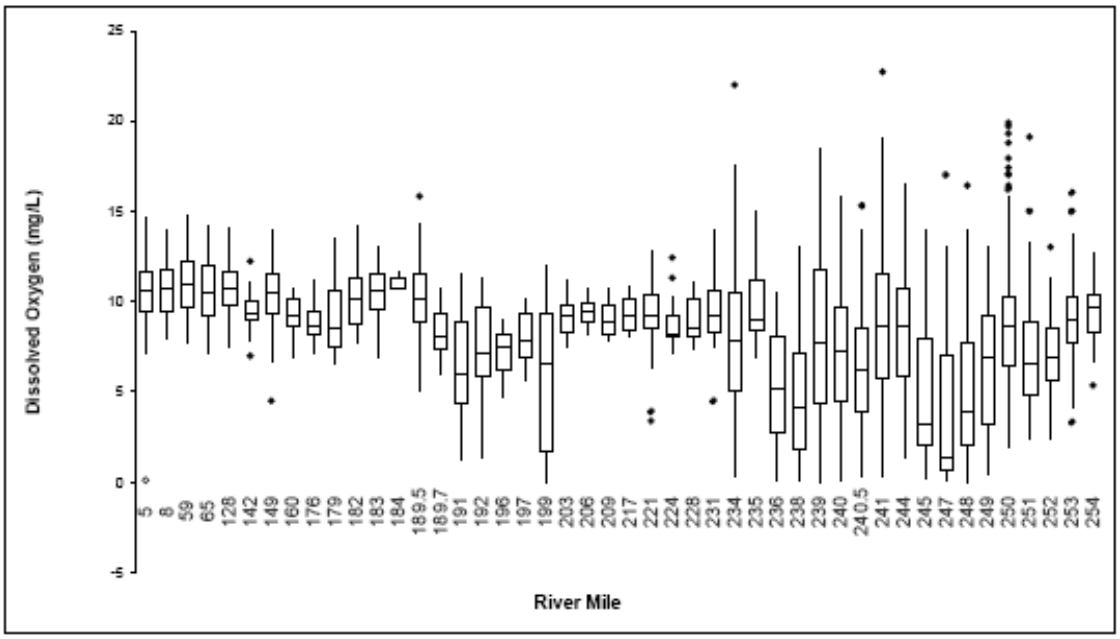

Figure C-27. Box and Whisker Plot of Historical Dissolved Oxygen Concentration Data Collected as Daytime Grab Samples from Various Sites in the Klamath River from Klamath River at Klamath Glen (RM 5.9) to Klamath River at Link River Dam (RM 259.7) between 1950 and 2001. Source: PacifiCorp 2004b.

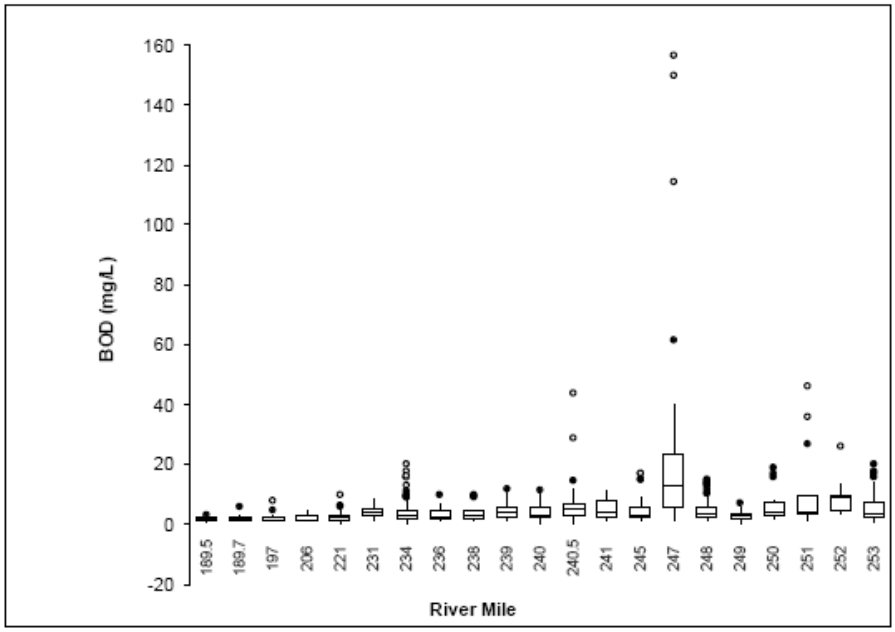

Figure C-28. Box and Whisker Plot of Historical BOD Data Collected from Riverine Sites in the Klamath River Between 1950 and 2001. J.C. Boyle Reservoir (RM 229.8 to RM 233.3), Copco No. 1 Reservoir (RM 201.8 to RM 208.3), Copco No. 2 Reservoir (RM 201.5 to RM 201.8), Iron Gate Reservoir (RM 193.1 to RM 200.0). Source: PacifiCorp 2004b.

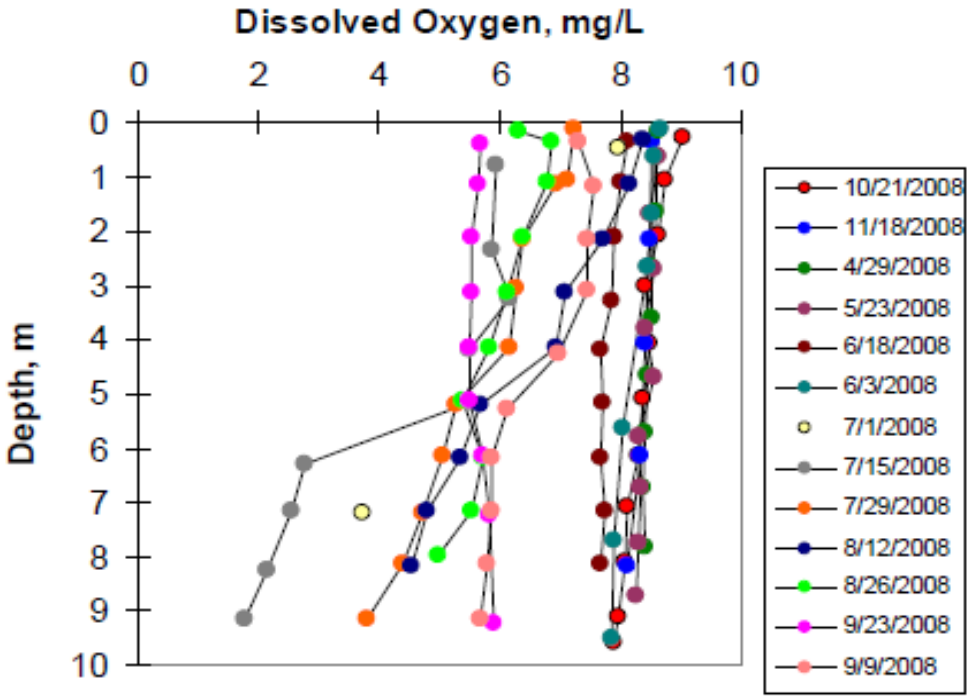

Figure C-29. Vertical Profiles of Dissolved Oxygen Concentration Measured in J.C. Boyle Reservoir Near the Dam in 2008. Source: Raymond 2009a.

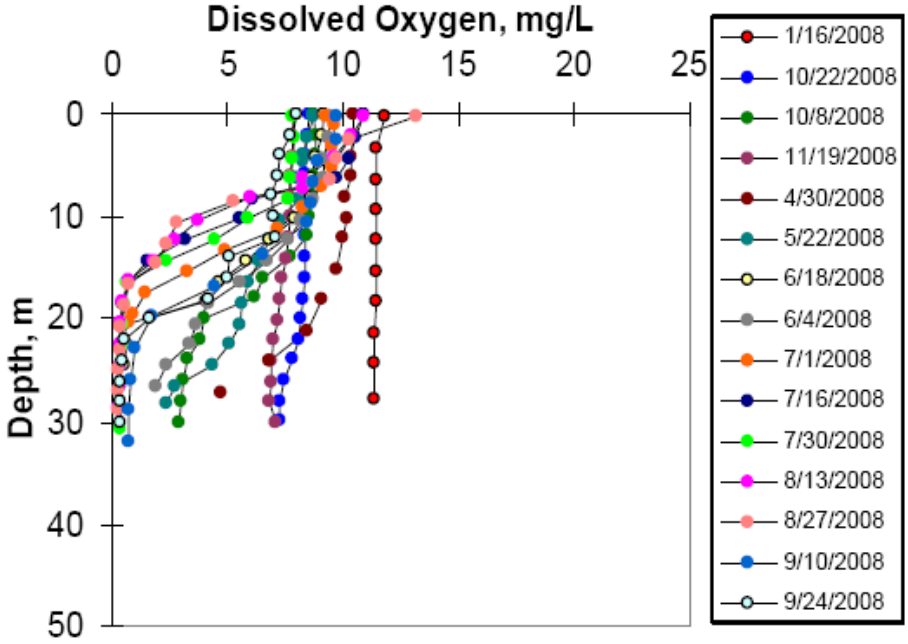

Figure C-30. Vertical Profiles of Dissolved Oxygen Concentration Measured in Copco No. 1 Reservoir Near the Dam in 2008. Source: Raymond 2009a.

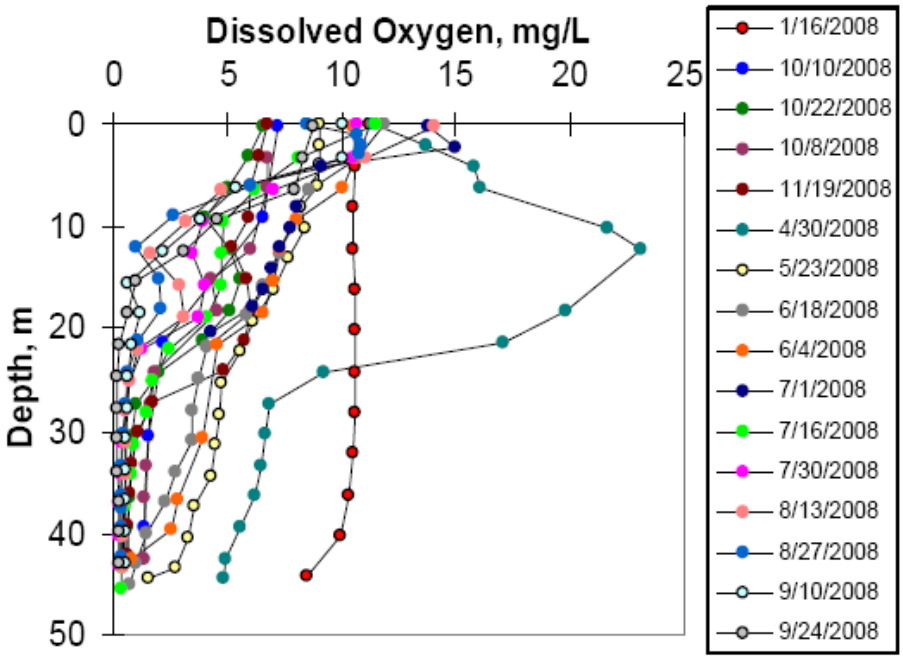

Figure C-31. Vertical Profiles of Dissolved Oxygen Concentration Measured in Iron Gate Reservoir Near the Dam (Bottom Plot) in 2008. Source: Raymond 2009a.

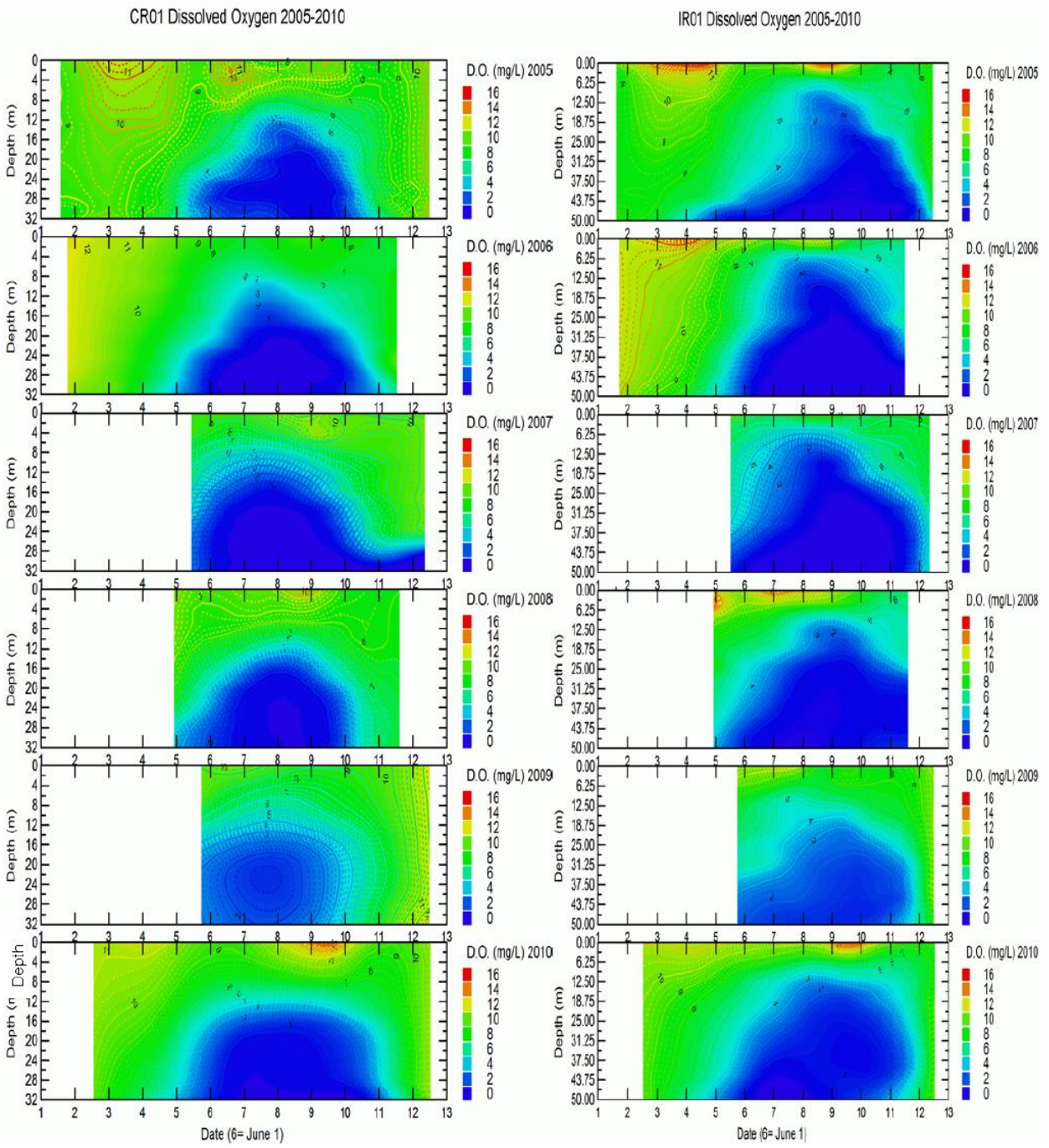

Figure C-32. Depth-time Distribution of Isopleths of Dissolved Oxygen Concentrations in Copco No. 1 Reservoir (CR01) and in Iron Gate Reservoir (IR01) from January 2005-December 2010. Source: Asarian and Kann 2011.

Substantial depression of dissolved oxygen concentrations with depth are reported in Iron Gate Reservoir as early as 1975 as part of the United States Environmental Protection Agency (USEPA) National Eutrophication Study (USEPA 1978). While the lowest dissolved oxygen concentrations in Copco No. 1 generally occur coincident with maximum water temperatures in July and August, the lowest dissolved oxygen concentrations (62 percent less than 8.0 mg/L and 11 percent less than 6.0 mg/L) and the lowest dissolved oxygen percent saturation (74 percent less than 90 percent saturation, 61 percent less than 85 percent saturation) occur in October at Iron Gate Reservoir. The lower dissolved oxygen concentrations and their occurrence later in the season at Iron Gate Reservoir may be associated with respiration of ongoing seasonal algae blooms in surface waters in this reservoir, as well as the decomposition of organic matter from upstream sources and the decomposition of cyanobacteria [blue-green algae] biomass as seasonal blooms decline and the breakdown of thermal stratification in the reservoir (Raymond 2009a, 2010a; Asarian and Kann 2013). Low dissolved oxygen concentrations in bottom waters generally persist longer in Iron Gate Reservoir than Copco No. 1 Reservoir since Copco No. 1 Reservoir experiences complete water-column mixing during approximately mid-October to early November, but Iron Gate Reservoir tends to mix approximately a month later, in late November to early December (see Figure C-32) (Raymond 2009a, 2010a; Asarian and Kann 2011).

Daily patterns in dissolved oxygen concentrations follow a 24-hour cycle with photosynthesis by aquatic plants and phytoplankton elevating dissolved oxygen concentrations during the day and respiration by those same organisms decreasing dissolved oxygen concentrations at night. The daily dissolved oxygen concentration range has a seasonal trend typically peaking between late July and early September. The magnitude of the 24-hour variations in dissolved oxygen concentration is muted in Iron Gate Reservoir compared to other sections of the river due to the reservoir thermal mass and the depth water is withdrawn from the reservoir (Asarian and Kann 2013).

In addition to the biological oxygen demand from aerobic organisms in the water column itself, there is also a sediment oxygen demand that also that influences dissolved oxygen concentrations in the water column. Sediment oxygen demand is the rate at which dissolved oxygen is removed from the water column by the decomposition of organic matter in streambed or lakebed sediments. In lakes, reservoirs, and rivers, sediment oxygen demand can affect the level of dissolved oxygen concentrations in the water column (Doyle and Lynch 2005). Sediment oxygen demand ranges from approximately 1.75 to 3.25 grams of oxygen per square meter per day (g O_2/m^2/day) in sediment cores from three locations in J.C. Boyle sampled in 2002. The sediment oxygen demand from Copco No. 1 and Iron Gate reservoirs ranges from approximately 1.0 to 2.0 g O_2/m^2/day (FERC 2007). A comparison of the total oxygen required to meet the sediment oxygen demand and the water column biological oxygen demand in the reservoirs indicates that the sediment oxygen demand in J.C. Boyle was much

less than water column biological oxygen demand and thus the sediments are not the largest influence on dissolved oxygen concentrations in J.C. Boyle Reservoir. Conversely, the sediment oxygen demand was greater than the water column biological oxygen demand in Copco No. 1 and Iron Gate reservoirs, indicating that sediment oxygen demand has a greater influence on water column dissolved oxygen concentrations in the two larger reservoirs (PacifiCorp 2004b).

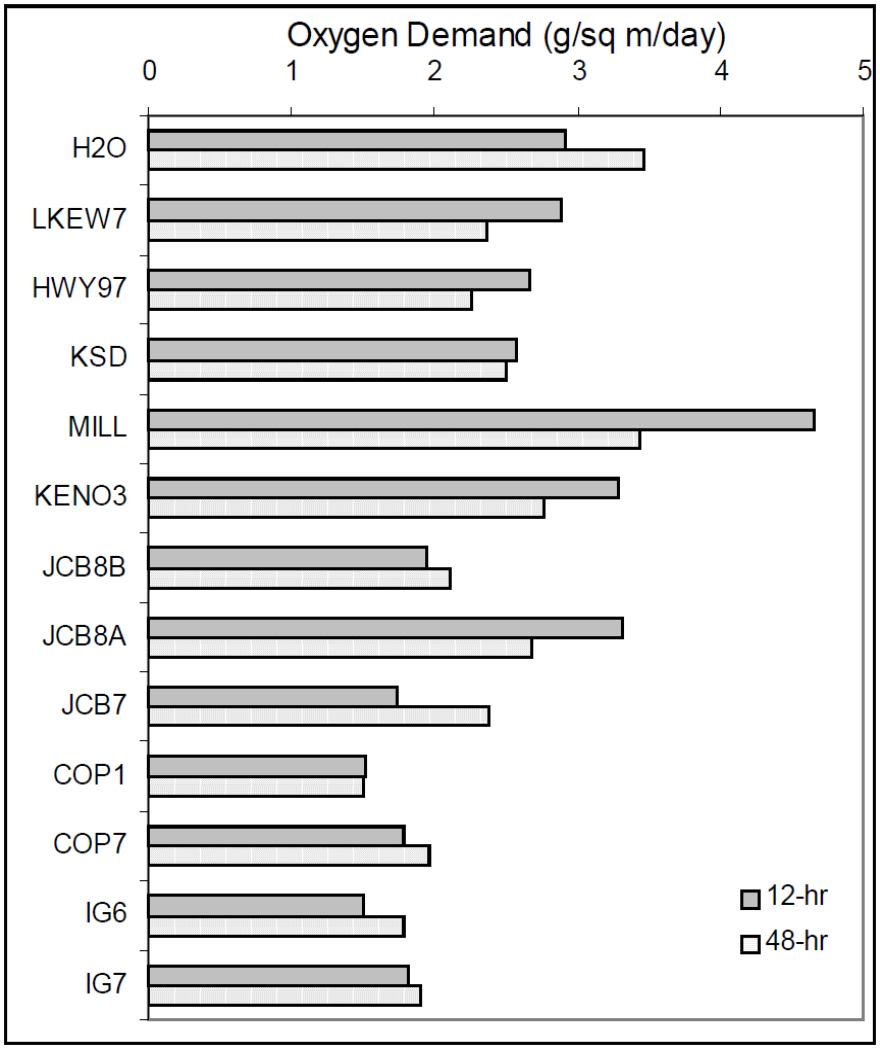

Figure C-33. Sediment Oxygen Demand from Sediment Cores at Multiple Locations within J.C. Boyle (JCB8B, JCB8A, JCB7), Copco No. 1 (COP1 and COP7), and Iron Gate (IG6 and IG7) Reservoirs. Source: PacifiCorp 2004b.

C.4.2 Mid- and Lower Klamath Basin

C.4.2.1 Iron Gate Dam to Salmon River

Historical (1950 to 2001) dissolved oxygen concentrations (reflecting day time grab sampling) in the Klamath River downstream of Iron Gate Dam are variable with dissolved oxygen concentrations approaching saturation values in Klamath River reaches that are free-flowing (PacifiCorp 2004b). Discharges occur from depths of approximately 12 meters in Iron Gate Reservoir, so downstream dissolved oxygen concentrations tend to reflect oxygen conditions of the reservoir's lower epilimnion (Section C.4.1.1) when the reservoir is stratified, with some increases in dissolved oxygen concentrations as the water is re-aerated upon discharge. In the fall, before and after reservoir turnover, low dissolved oxygen concentrations from the hypolimnion can be translated downstream. Dissolved oxygen concentration median values between 1950 and 2001 were 8.1 to 10.8 mg/L in the Klamath River between Iron Gate Dam and the confluence with the Salmon River, with the lowest median values and the greatest general variability in the first mile downstream from the dam (Figure C-27, PacifiCorp 2004b).

More recent data indicates dissolved oxygen concentrations approximately 1,000 feet downstream from Iron Gate Dam regularly fall below 8.0 mg/L and the current Basin Plan minimum dissolved oxygen criteria based on percent saturation (Figure C-34) (Karuk Tribe of California 2001, 2002, 2003, 2007, 2009, 2010a, 2010b, 2011, 2012, 2013; North Coast Regional Board 2010; Asarian and Kann 2011, 2013; Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019). Measured dissolved oxygen concentrations at the monitoring site approximately 1,000 feet downstream of Iron Gate Dam are the net result of daily dissolved oxygen variations in the water being discharged from Iron Gate Dam along with mechanical aeration in the Klamath River and photosynthesis and respiration by organisms between the location water is discharged from Iron Gate Dam and the monitoring site, but the magnitude of dissolved oxygen contributions from processes in the Klamath River between the reservoir discharge location and the monitoring site compared to the magnitude of contributions from the upstream reservoirs have not been quantified. Based on continuous Sonde data collected at multiple locations in the lower Klamath River during summer 2004 to 2006, roughly 45 to 65 percent of measurements approximately 1,000 feet downstream from Iron Gate Dam did not achieve the (previous) Basin Plan water quality objective of 8.0 mg/L (instantaneous minimum concentration). The Basin Plan water quality objective is now based on percent saturation. The percent of dissolved oxygen concentration measurements below 8.0 mg/L decreases with distance downstream, particularly in 2005 and 2006. Table C-2 summarizes the percent of dissolved oxygen concentrations in the Lower Klamath River below 8.0 mg/L during Summer 2004 to 2006.

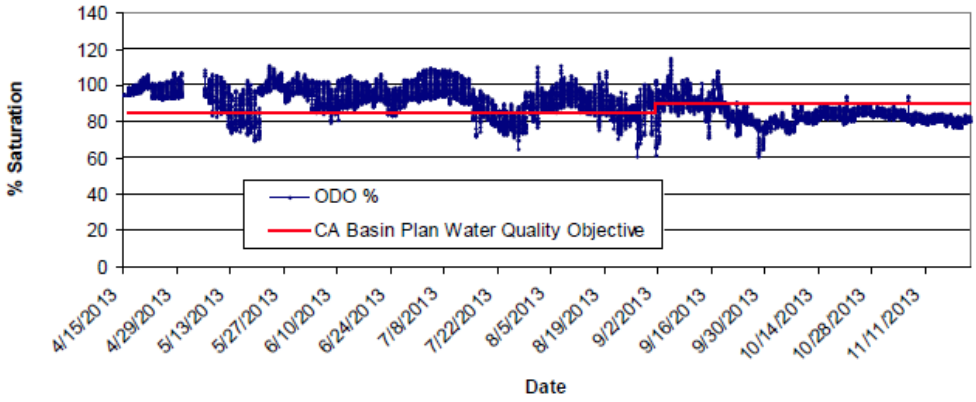

Figure C-34. Percent saturation dissolved oxygen readings recorded every 30-minutes for Klamath River below Iron Gate Dam (IG) in 2013. The red line indicates the Basin Plan Klamath River site-specific dissolved oxygen water quality objective from the Oregon-California state line to the mouth of the Scott River (greater than 90 percent saturation from October 1 to March 30 and greater than 85 percent saturation from April 1 to September 30. Source: Karuk Tribe of California (2013).

Continuous Sonde data collected between 2001 and 2017 show the range of daily average dissolved oxygen concentrations downstream from Iron Gate Dam (RM 193.1) between September through October and in November (Table C-3). Analysis of the longer dataset from 2001 to 2017 agrees with the 2004 to 2006 analysis results showing dissolved oxygen concentrations are less than 8.0 mg/L for June to October immediately downstream of Iron Gate Dam approximately 48 percent of the time. Asarian and Kann (2013) note that dissolved oxygen concentrations immediately downstream of Iron Gate Dam exceed water quality thresholds later in the year than other sites downstream of Iron Gate Dam. *In situ* continuous data collected during 2008 to 2017 by PacifiCorp in the Klamath River downstream from Iron Gate Dam also demonstrate the seasonal decreases in dissolved oxygen (measured as percent saturation and concentration) originating from the reservoirs, with the lowest average monthly values occurring in August (warmer water temperatures) through November (cooler water temperatures), depending on the year (Table C-4).

In 2008, PacifiCorp began implementation of turbine venting at Iron Gate Dam as KHSA Interim Measure 3, with the goal of improving dissolved oxygen concentrations immediately downstream from the dam during periods of reservoir stratification. Early testing results in 2008 indicated that dissolved oxygen concentrations immediately downstream from Iron Gate Dam could be increased by approximately 0.5 to 2 mg/L (approximately 7 to 20 percent dissolved oxygen saturation) through the mechanical introduction of oxygen as water passed through the turbines (Carlson and Foster 2008, PacifiCorp 2008a). In 2009, PacifiCorp installed a forced air blower to enhance aeration, which became fully

operational in 2010. The combination of turbine venting and the blower during the 2010 testing period increased dissolved oxygen immediately downstream of the dam from approximately 50 percent saturation to approximately 70 percent saturation. Further downstream, 2.5 river miles from the dam, the combination of turbine venting and the blower increased dissolved oxygen from approximately 65 percent saturation to approximately 80 percent saturation. By approximately six river miles downstream from the dam, natural river aeration increased dissolved oxygen concentrations sufficiently that there was no difference between periods with turbine venting plus blower operation and periods without (PacifiCorp 2011a). Currently, and on a year-round basis, PacifiCorp automatically operates the blower when dissolved oxygen levels drop below 87 percent saturation and the blower is automatically turned off when dissolved oxygen levels exceed 87 percent saturation.

Despite the improvements reported during 2008 and 2011, and as discussed in the previous paragraphs, dissolved oxygen immediately downstream of Iron Gate Dam has continued to exhibit percent saturation values below the Basin Plan Basin Plan minimum dissolved oxygen criteria of 85 percent saturation for the period April 1 through September 30, and below the minimum criterion of 90 percent saturation for the period October 1 to March 31, with the majority of measured low dissolved oxygen saturation values occurring from August through November (PacifiCorp 2013a, 2014a, 2015a, 2016b, 2017b; Karuk Tribe of California 2012, 2013). Data from 2017 indicate that when dissolved oxygen decreased to 70 percent saturation in September at the monitoring site approximately 1,000 feet downstream of Iron Gate Dam, reaeration to greater than the applicable Basin Plan minimum dissolved oxygen saturation criterion (i.e., 85 percent saturation) occurred within approximately 2 to 3 miles downstream of Iron Gate Dam (PacifiCorp 2018).

Table C-2. Percent of Dissolved Oxygen Concentrations below 8.0 mg/L in the Lower Klamath River during Summer 2004 to 2006.

Location	2004		2005		2006	
	n (1)	%	n (1)	%	n (1)	%
At Iron Gate Dam (RM 193.1)	2,706	64	4,498	45	5,391	61
Upstream of Shasta River (RM 179.5)	5,478	50	5,533	49	-	-
Upstream of Scott River (RM 145.1)	2,966	58	4,457	47	-	-
Seiad Valley (RM 132.7)	3,381	57	4,713	45	5,526	40
Orleans (RM 58.9)	57	37	4,533	23	5,349	15
Weitchpec (RM 43.6)	4,142	48	5,400	7	5,332	6
Downstream from Weitchpec (≈ RM 43.4)	5,500	16	3,529	11	5,293	4
Upstream of Trinity (RM 43.3)	-	-	5,535	5	5,739	3
Turwar (RM 5.6)	5,066	30	5,543	6	-	-

Source: Ward and Armstrong 2006; North Coast Regional Board 2010.

[1] Dissolved oxygen measurements were collected at 30-minute increments for a total of forty-eight daily measurements.

Key:

n=number of measurements

%=percent of measurements not achieving the Basin Plan previous water quality objective of 8.0 mg/L

Table C-3. Range of Observed Dissolved Oxygen Concentrations Downstream from Iron Gate Reservoir.

Year	General Range of Daily Average Dissolved Oxygen (mg/L) downstream from Iron Gate Dam (RM 193.1, near USGS Gage No. 11516530)		Source
	September–October	**November**	
2001	4–6[1]	7–8	Karuk Tribe of California 2003
2002	4–9[2]	-	Karuk Tribe of California 2003
2004	6–9.5	8–9	Zedonis and Turner 2010
2006	6.5–8	7–8	Karuk Tribe of California 2009
2007	7–9[2]	-	Karuk Tribe of California 2009
2008	6.5–8.5	-	Karuk Tribe of California 2009
2009	7.5–10	-	Karuk Tribe of California 2010a
2010	7–9.5	-	Karuk Tribe of California 2010b
2011	7–9.5	8–9.5	Karuk Tribe of California 2011
2012	6–9.5	7.5–8.5	Karuk Tribe of California 2012
2013	7–9	8.5–9.5	Karuk Tribe of California 2013
2014	6–13	8.5–11	PacifiCorp 2014a
2015	7–9	7–9	PacifiCorp 2015a
2016	6–9.5	8–9	PacifiCorp 2016b
2017	5–10	8–9.5	PacifiCorp 2017b

1 No September data reported
2 No October data reported

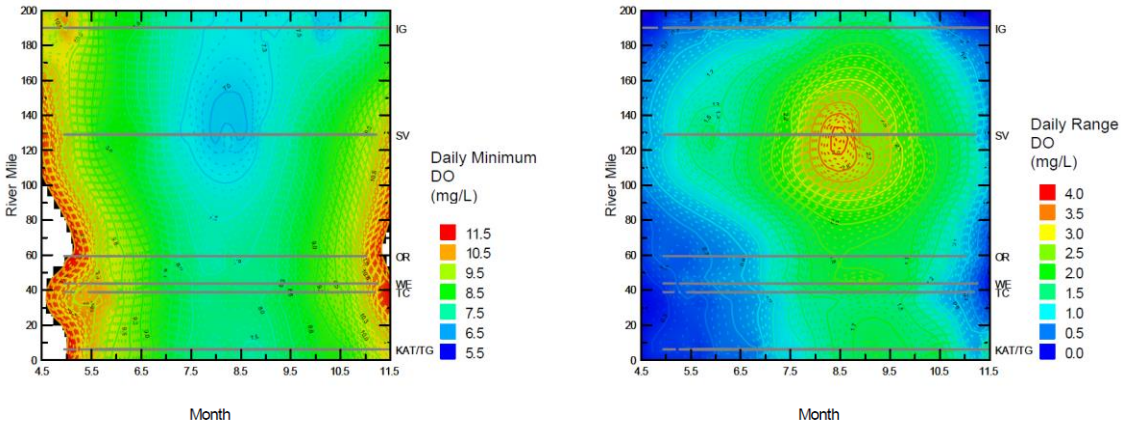

Figure C-35. Distribution of Isopleths Showing the 2001-2011 Average Daily Minimum Dissolved Oxygen (DO) Concentrations and Daily Range of Dissolved Oxygen (DO) Concentrations at Klamath River Sites Downstream of Iron Gate Dam from Around Mid-April (4.5) to Mid-November (11.5). Grey Lines Represent the Times Dissolved Oxygen Was Measured in the Klamath River Downstream of Iron Gate Dam (IG at RM 193.1), at Seiad Valley (SV at RM 132.7), at Orleans (OR at RM 58.9), at Weitchpec Upstream of the Trinity River (WE at RM 43.6), Upstream of Tully Creek (TC at RM 40.1), and at Turwar (KAT/TG at RM 5.6). Source: Asarian and Kann 2013.

It has been suggested that daily fluctuations of up to 3 mg/L measured in the Klamath River approximately 1,000 feet downstream from Iron Gate Dam (RM 193.1) (Karuk Tribe of California 2002, 2003; YTEP 2005; North Coast Regional Board 2010; Asarian and Kann 2011, 2013) are caused by daytime photosynthesis by phytoplankton, periphyton, and aquatic plants and nighttime algal and bacterial respiration. Low dissolved oxygen concentrations can also be often caused by bacterial aerobic decomposition of phytoplankton in the reservoir (Ward and Armstrong 2010). As previously discussed, the magnitude of dissolved oxygen contributions from these processes and mechanical aeration in the Klamath River between the reservoir discharge location and the monitoring site compared to the magnitude of contributions from the upstream reservoirs have not been quantified.

Table C-4. Average Monthly Water Temperature, Dissolved Oxygen Percent Saturation, and Dissolved Oxygen Concentration in the Klamath River Downstream from Iron Gate Dam (RM 193.1).

Month	Average Monthly Water Temperature (ºC)	Average Monthly Dissolved Oxygen (% Saturation)	Average Monthly Dissolved Oxygen (mg/L)
2008			
June	18.4	92.2	8.7
July	22.3	90.0	7.8
August	21.8	91.8	8.0
September	18.6	84.5	7.9
October	14.8	66.2	6.7
November	10.3	67.4	7.5
December	7.0	70.0	8.5
2009			
January	3.7	79.4	10.5
February	4.4	83.0	10.8
March	6.7	83.2	10.2
April	8.4	82.2	9.6
May	17.4	94.4	9.0
June	19.3	87.9	8.1
July	21.2	86.8	7.7
August	21.7	99.9	8.8
September	19.4	95.7	8.8
October	14.6	77.7	7.9
November	9.9	71.2	8.1
December	5.0	81.2	10.4
2010			
January	3.9	94.2	11.4
February	5.4	100.2	11.1
March	7.2	96.6	10.5
April	9.5	108.9	11.4
May	12.7	104.8	10.2
June	16.8	94.9	8.5
July	21.3	98.8	8.1
August	21.9	95.9	7.7
September	18.4	105.2	9.1
October	15.5	92.5	8.5
November	11.8	62.5	6.2

Month	Average Monthly Water Temperature (ºC)	Average Monthly Dissolved Oxygen (% Saturation)	Average Monthly Dissolved Oxygen (mg/L)
2011			
January	4.0	90.2	10.9
February	4.6	95.0	11.3
March	5.8	96.3	11.1
April	9.2	101.4	10.7
May	12.9	107.1	10.4
June	16.1	100.9	9.2
July	20.6	94.0	7.8
August	22.2	97.9	7.8
September	20.2	93.4	7.8
October	16.0	92.1	8.4
November	10.1	74.6	7.8
December	5.6	90.2	10.5
2012			
January	3.8	12.0	90.8
February	4.3	12.6	96.2
March	5.8	12.0	95.7
April	9.4	10.6	92.2
May	15.5	9.5	94.9
June	17.8	8.8	92.2
July	20.9	8.2	91.7
August	21.9	7.5	85.0
September	19.5	7.7	83.1
October	16.1	7.2	72.9
November	11.3	8.0	72.3
December	7.2	9.7	79.8
2013			
January	15.2	97.8	9.1
February	8.5	96.6	10.4
March	11.4	102.4	10.3
April	16.0	107.8	9.8
May	18.9	105.6	9.0
June	21.7	101.6	8.2
July	21.4	100.3	8.2
August	19.9	92.5	7.8
September	14.2	89.5	8.5
October	10.0	89.6	9.4
November	5.3	91.2	10.7
December	15.2	97.8	9.1

Month	Average Monthly Water Temperature (ºC)	Average Monthly Dissolved Oxygen (% Saturation)	Average Monthly Dissolved Oxygen (mg/L)
2014			
January	3.8	94.0	11.5
February	4.7	99.3	11.9
March	8.4	98.6	10.9
April	12.0	97.1	9.9
May	16.7	101.4	9.3
June	19.3	101.0	8.7
July	22.3	103.6	8.6
August	22.0	111.1	9.8
September	19.3	104.7	9.7
October	15.8	80.3	8.0
November	11.0	87.1	9.7
December	7.6	91.0	10.9
2015			
January	5.7	93.5	11.7
February	-	-	-
March	10.3	103.5	11.6
April	12.0	93.4	10.1
May	15.9	96.9	9.6
June	20.0	94.4	8.6
July	22.4	91.9	8.0
August	20.9	83.3	7.4
September	18.7	80.0	7.5
October	15.8	79.5	7.9
November	11.6	78.2	8.5
December	6.8	85.3	10.4
2016			
January	4.3	103.8	12.5
February	5.2	101.3	11.9
March	7.7	103.6	11.4
April	12.4	101.7	10.1
May	15.7	105.9	9.7
June	19.0	103.3	8.9
July	20.2	93.7	7.9
August	21.4	81.9	6.7
September	18.7	77.8	7.2
October	15.0	84.1	8.1
November	11.3	87.1	8.9
December	7.0	91.3	10.3

Month	Average Monthly Water Temperature (°C)	Average Monthly Dissolved Oxygen (% Saturation)	Average Monthly Dissolved Oxygen (mg/L)
2017			
January	2.9	90.3	12.2
February	4.3	97.8	12.7
March	7.2	102.7	12.4
April	10.2	106.1	11.2
May	14.7	94.2	9.6
June	19.4	97.5	8.5
July	21.9	89.3	7.8
August	22.3	79.2	6.9
September	19.9	74.0	6.7
October	14.3	73.4	7.5
November	10.5	78.8	8.8
December	6.6	84.6	10.4

Raw daily data from https://www.pacificorp.com/energy/hydro/klamath-river/water-quality.html (PacifiCorp 2008b, 2009a, 2010b, 2011b, 2012a, 2013a, 2014a, 2015a, 2016b, 2017b). Data obtained with YSI 6600 V2 or 6900 Multiprobe Datasondes (30-minute intervals).

Farther downstream in the mainstem Klamath River, near Seiad Valley (RM 132.7), dissolved oxygen concentrations tend to increase; however, values below 8.0 mg/L do still occur (i.e., 2001, 2002, 2006, 2007, 2010, 2011, 2012, 2013, 2014, and 2015 as reported in Karuk Tribe of California [2001, 2002, 2009, 2010b, 2011, 2012, 2013] and Watercourse Engineering, Inc. [2011a, 2011b, 2012, 2013, 2014, 2015, 2016]). Dissolved oxygen concentrations near Seiad Valley continue to exhibit variability, with mean daily values ranging from approximately 6.5 mg/L to supersaturated concentrations of approximately 11.5 mg/L from June through November 2001 to 2002 and 2006 to 2013 (Karuk Tribe of California 2001, 2002, 2003, 2007, 2009, 2010a, 2010b, 2011, 2012, 2013). Longitudinal variations in dissolved oxygen concentrations from Iron Gate Dam (RM 193.1) to Seiad Valley (RM 132.7) are most pronounced between mid-September and November when dissolved oxygen concentrations decrease immediately downstream of Iron Gate but increase at Seiad Valley (Karuk Tribe of California 2013). Dissolved oxygen concentrations at Seiad Valley between 2001 and 2011 are less than the 8.0 mg/L, 90 percent saturation, and 85 percent saturation water quality thresholds less frequently than immediately downstream of Iron Gate Dam, but still are less than these water quality thresholds more frequently than further downstream sites (Asarian and Kann 2013). Between July and September, dissolved oxygen concentrations at Seiad Valley are less than 8.0 mg/L for 29 to 51 percent of measurements, less than 90 percent saturation for 28 to 34 percent of measurements, and less than 85 percent

saturation for 10 to 18 percent of measurements (Asarian and Kann 2013). More contemporary data from 2012 to 2016 have dissolved oxygen concentration patterns similar to previous measurements with concentrations ranging from approximately 6.0 mg/L to (supersaturated concentrations of) approximately 12 mg/L from June through November and dissolved oxygen concentrations regularly less than 8.0 mg/L during that time period (Watercourse Engineering, Inc. 2013, 2014, 2015, 2016).

C.4.2.2 Salmon River to Estuary

Measured dissolved oxygen concentrations in the mainstem Klamath River downstream from the confluence with the Salmon River (RM 66.3) continue to increase relative to concentrations at upstream sites (Figure C-36). Despite this, values sometimes fall below 8.0 mg/L in this reach (e.g., at the Orleans gage [RM 58.9] during 2001, 2002, 2006, 2012, 2013 as reported in Karuk Tribe of California [2001, 2002, 2007, 2009, 2010a, 2010b, 2011, 2012, 2013], Ward and Armstrong 2006, North Coast Regional Board 2010). Dissolved oxygen concentrations near Orleans also exhibit variability, with mean daily values ranging from approximately 6.5 mg/L to supersaturated concentrations of 11.5 mg/L from June through November in 2001, 2002, and 2006 to 2013. Asarian and Kann (2013) report dissolved oxygen concentrations at Orleans are less than 8.0 mg/L for 16 percent of measurements, less than 90 percent saturation for 10 percent of measurements, and less than 85 percent saturation for only 1 percent of measurements between June and October from 2001 to 2011. Dissolved oxygen concentrations were most frequently less than the 8.0 mg/L, 90 percent saturation, and 85 percent saturation water quality thresholds during July and August when water temperature peaked (Asarian and Kann 2013). Extremely high mean daily dissolved oxygen concentrations (11 to 15.5 mg/L) (Sonde data) were reported for October 2006 at the Orleans gage (Karuk Tribe of California 2007, 2009). More contemporary grab sample data from 2012 to 2015 agree with previous measurements showing dissolved oxygen concentrations generally increase from Seiad Valley (RM 132.7) to Orleans (RM 58.9) with dissolved oxygen concentrations ranging from approximately 7.5 mg/L to supersaturated concentrations of approximately 11.5 mg/L between June and November with the minimum concentrations occurring in July or August (Figure C-36; Watercourse Engineering, Inc. 2013, 2014, 2015, 2016).

Dissolved oxygen concentrations in the mainstem Klamath River upstream of the confluence with the Trinity River (RM 43.3) ranged from approximately 5.5 to 10.3 mg/L in 2004, with the lowest concentration of dissolved oxygen occurring in September and the highest dissolved oxygen concentration occurring in October. Dissolved oxygen concentrations below 8.0 mg/L (the Basin Plan minimum dissolved oxygen criterion prior to 2010) occurred for extended periods of time in mid-August (8/13 to 8/22) and early September (8/30 to 9/8) (YTEP 2005). In 2009 at this location, dissolved oxygen concentrations ranged from approximately 7.1 to 11.8 mg/L, with minimum dissolved oxygen concentrations dropping below 8.0 mg/L (the Basin Plan minimum dissolved oxygen criterion

prior to 2010) for an extended period of time from mid-July to early August, and again from late August to early September (Sinnott 2010a). In 2010, dissolved oxygen concentrations ranged from 7.9 to 12.1 mg/L (Sinnott 2011a), with minimum dissolved oxygen concentrations remaining above the 2010 amended Basin Plan minimum dissolved oxygen concentration criteria based on percent saturation (e.g., 7.0, 6.9, and 7.8 mg/L for July, August, and September, respectively, see Section 3.2, Table 3.2-5). A synthesis of dissolved oxygen concentration data from 2001 to 2011 at Weitchpec (RM 43.6) on the mainstem Klamath River upstream of the confluence with the Trinity River indicates dissolved oxygen concentrations are below 8.0 mg/L most frequently between July and August, but the dissolved oxygen percent saturation is most frequently below 90 percent or 85 percent in August and September (Asarian and Kann 2013). On average, between June and October from 2001 to 2011, dissolved oxygen concentrations at Weitchpec (RM 43.6) are less than 8.0 mg/L for 16 percent of measurements, less than 90 percent saturation for 12 percent of measurements, and less than 85 percent saturation for only 5 percent of measurements. While only based on discrete dissolved oxygen concentration measurements during water quality grab samples, dissolved oxygen concentrations at Weitchpec (RM 43.6) from 2011 to 2015 are similar to previous measurements with concentrations ranging from approximately 8.0 mg/L to supersaturated concentrations of approximately 11.5 mg/L between June and November (Figure C-36; Sinnott 2010a, 2011a, 2012a; Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015; Hanington 2013; Hanington and Ellien 2014).

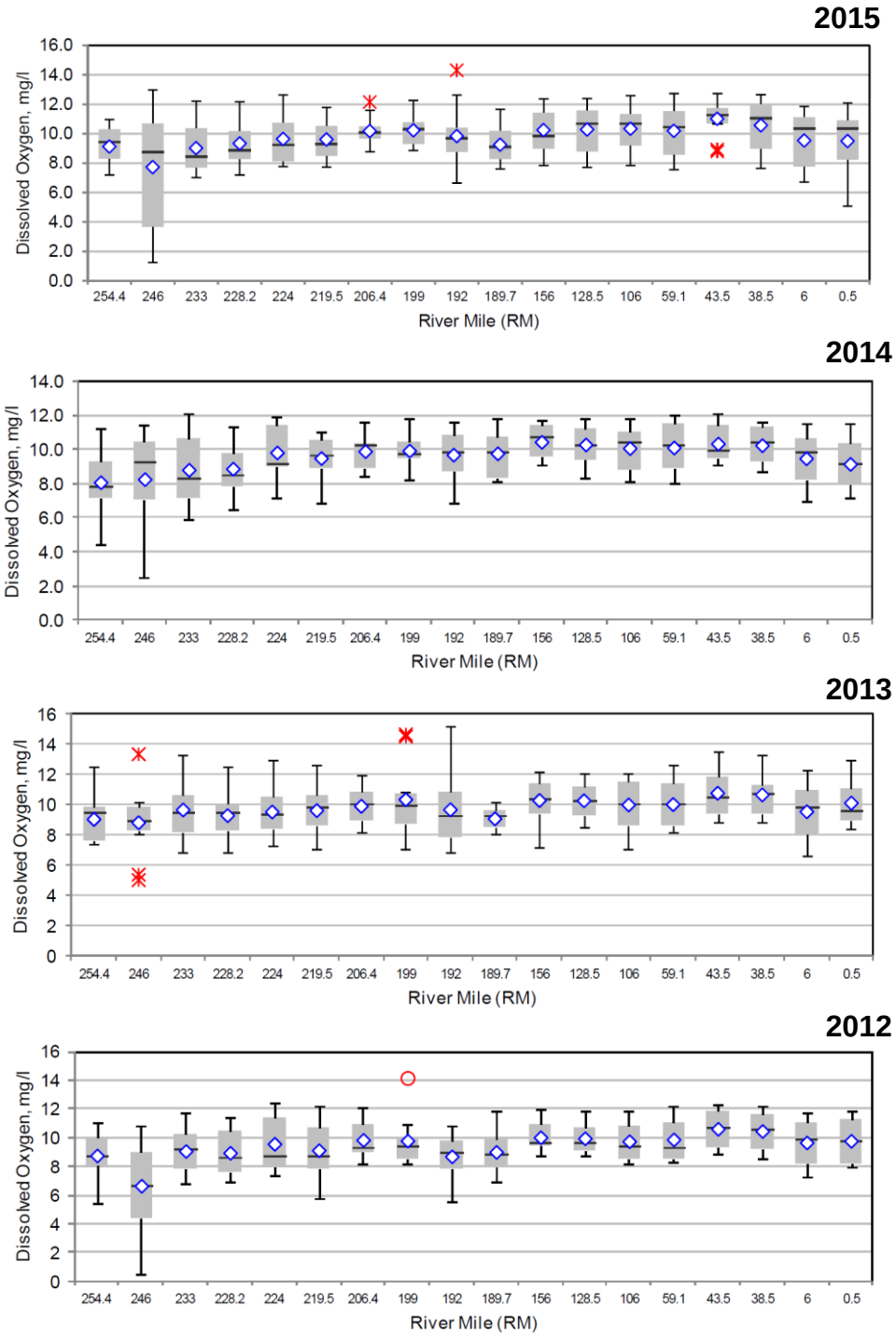

Figure C-36. Klamath River dissolved oxygen concentration trends from measurements made between February and December with median (-), mean (◊), outlier (*), and extreme outliers (○) identified. River miles specified are based on those accurate at the time of the reports and differ slightly from 2018 river mile designations (Table 3.2-1). Source: Watercourse Engineering, Inc. 2013, 2014, 2015, 2016.

Dissolved oxygen concentrations tend to decrease downstream from the confluence of the Trinity River with the Klamath River (Sinnott 2010a, 2011a, 2012a; Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015; Asarian and Kann 2013; Hanington 2013; Hanington and Ellien 2014). At the confluence with the Trinity River (RM 43.3) and at the Turwar gage (RM 5.6), daily minimum dissolved oxygen concentrations at the Trinity River and Turwar sites during May through November are consistently observed to occur late-night or early in the morning, likely due to respiration by aquatic vegetation (YTEP 2004, 2005; Sinnott 2010a, 2011a). At Turwar (RM 5.6) in 2004, minimum dissolved oxygen concentrations dropped below 8.0 mg/L (the Basin Plan minimum dissolved oxygen criterion prior to 2010) between late July and late August (YTEP 2005); dissolved oxygen concentrations ranging 5.9 to 10.1 mg/L were observed in August and September. In 2009, dissolved oxygen concentrations at Turwar ranged from 7.3 to 11.7 mg/L, with minimum dissolved oxygen concentrations dropping below 8.0 mg/L for an extended period of time from mid-July to early August (Sinnott 2010a). In 2010, dissolved oxygen concentrations ranged from 7.8 to 11.8 mg/L, with minimum values remaining above 2010 amended Basin Plan minimum dissolved oxygen concentration criteria based on percent saturation (e.g., 7.0, 6.9, and 7.8 mg/L for July, August, and September, respectively, see Section 3.2, Table 3.2-5). Dissolved oxygen concentration data from 2001 to 2011 downstream of the Trinity River (RM 43.3) and at Turwar (RM 5.6) show dissolved oxygen concentrations are the lowest and most frequently below the 8.0 mg/L, 90 percent saturation, and 85 percent saturation water quality thresholds during July and August (Asarian and Kann 2013). Turwar (RM 5.6) consistently has lower dissolved oxygen concentrations and is more frequently below the 90 percent or the 85 percent saturation levels than the site immediately downstream of the confluence with the Trinity River (RM 43.3) (Asarian and Kann 2013). Dissolved oxygen concentrations downstream of the confluence with the Trinity River (RM 43.3) to Turwar (RM 5.6) from 2011 to 2015 are similar to previous measurements in that reach. During that period, dissolved oxygen concentrations range from approximately 6.5 mg/L to supersaturated concentrations of approximately 11.5 mg/L between June and November with lower dissolved oxygen concentrations occurring more frequently at Turwar and higher dissolved oxygen concentrations occurring more frequently immediately downstream of the confluence with the Trinity River (Figure C-36; Sinnott 2010a, 2011a, 2012a; Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015; Hanington 2013; Hanington and Ellien 2014; Hanington and Cooper Carouseli 2014).

C.4.2.3 Klamath River Estuary

Dissolved oxygen concentrations within the Klamath River Estuary are highly variable spatially and temporally and are greatly influenced by season, river flow, vertical water column stratification (thermal and/or chemical), and location of the estuary mouth, the latter changing due to periodic sand bar movement. Dissolved oxygen concentrations have been monitored in the Klamath River Estuary by CDFG (Wallace 1998) and most recently by the Yurok Tribe Fisheries

(Hiner 2006) and Environmental Programs (YTEP 2005) with support from the North Coast Regional Water Quality Control Board. Concentrations in the deeper, main channel of the estuary are generally greater than approximately 6.0 to 7.0 mg/L throughout the year (Hiner 2006; YTEP 2004, 2005).

Lower dissolved oxygen concentrations (ranging 2.5 to 5.5 mg/L) have been measured near the bottom of deep pools or in heavily vegetated side channels (Wallace 1998). Low dissolved oxygen concentrations (less than 1.0 mg/L to approximately 5.0 mg/L) have been observed during summer months in the relatively shallow, heavily vegetated south slough (Wallace 1998; Hiner 2006). The low levels of dissolved oxygen observed in the slough are likely due to high rates of growth and subsequent decomposition of phytoplankton and aquatic plants, which are not abundant elsewhere in the Klamath River Estuary.

Dissolved oxygen concentrations become progressively more variable and generally lower nearer the estuary bottom and the estuary mouth, with concentrations frequently below 6.0 mg/L during summer months (YTEP 2004, 2005; Hiner 2006). Low dissolved oxygen has also been observed during late summer months when a sand berm forms across the river mouth, forcing the river to flow south diagonally between two sand spits. This berm prevents ocean water from entering the Klamath River Estuary, creating 'lagoon-like' conditions until higher flows breech the berm (Wallace 1998; Hiner 2006). These conditions were documented in 1994 and 2001; in 2001, a decrease in dissolved oxygen concentrations was measured related to sand berm formation, with especially marked decreases in dissolved oxygen concentrations in the south slough (Hiner 2006).

Additional monitoring by the Yurok Tribe Environmental Program from 2009 to 2015 detail more recent dissolved oxygen concentration trends near the surface in the lower Klamath River Estuary (RM 0.5). During that time period, dissolved oxygen concentrations usually range from approximately 7 mg/L to (supersaturated concentrations of) approximately 11 mg/L between June and November, with a particularly low value of 5.08 mg/L recorded on June 10, 2015 (Sinnott 2010a, 2011a, 2012a; Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016; Hanington 2013; Hanington and Ellien 2014; Hanington and Cooper Carouseli 2014). The dissolved oxygen percent saturation between 2009 and 2014 ranges from approximately 83 percent to 106 percent, with the percent saturation in 2014 exhibiting almost that entire range and broad seasonal variability (Figure C-37; Sinnott 2010a, 2011a, 2012a; Hanington 2013; Hanington and Ellien 2014; Hanington and Cooper Carouseli 2014).

Eilers and Raymond (2005) report sediment oxygen demand from a sediment core taken in the Klamath River Estuary in 2004. The raw sediment oxygen demand in the first 24-hours is 3.21 g O_2/m^2/day while the corrected sediment oxygen demand is 2.06 g O_2/m^2/day. The long-term rate of sediment oxygen

demand is approximately 0.5 g O_2/m^2/day after 600 hours of incubation which is attributed to the high proportion of sand in the estuary sediment core (Eilers and Raymond 2005).

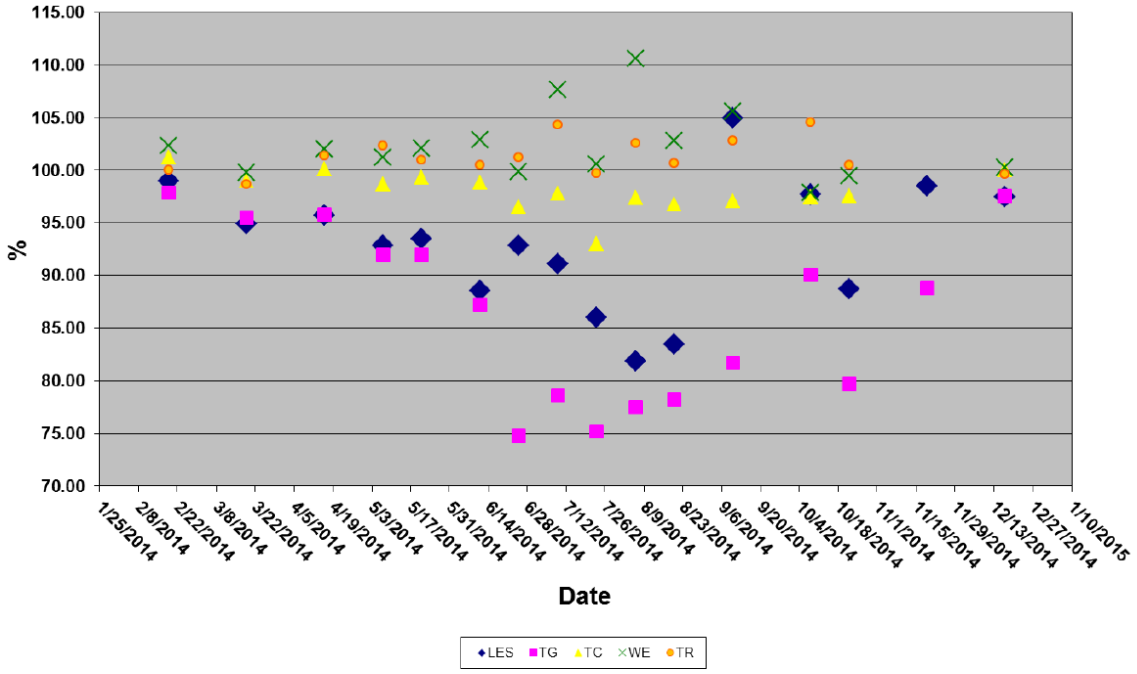

Figure C-37. Percent Saturation of Dissolved Oxygen During Grab Samples at the Lower Estuary Surface (LES [RM 0]), the Klamath River at Turwar Boat Ramp (TG [RM 6]), the Klamath River Upstream of Tully Creek (TC [RM 40.1]), the Klamath River at Weitchpec (Upstream of Trinity River) (WE [RM 43.6]), and the Trinity River Upstream the Confluence with the Klamath River (TR). Source: Hanington and Cooper-Carouseli 2014.

C.5 pH

C.5.1 Upper Klamath Basin

C.5.1.1 Hydroelectric Reach

Based upon monitoring conducted by PacifiCorp, pH in the Hydroelectric Reach is seasonally variable, with levels near neutral (7.5 to 8.0 standard units [s.u.]) during the winter and increasing in the spring and summer (7.7 to 8.1 s.u.). Peak values (8.0 to 9.2 s.u.) are recorded during May and September (Raymond 2010a). Longitudinally, pH ranges from 7.3 to 9.2 s.u. in this reach, with the lowest values recorded downstream from J.C. Boyle Reservoir and the highest values in Copco and Iron Gate reservoirs (Raymond 2008a, 2009a, 2010a). In 2009, springtime pH levels at J.C. Boyle Reservoir were typically 8.5 s.u., decreasing during the summer and fall to 7.6 to 7.9 s.u. (Watercourse

Engineering, Inc. 2011). As part of monthly sampling events between March and November from 2000 to 2005 and June through November 2007, pH was measured at Klamath River sites along within Iron Gate and Copco reservoirs (Figure C-38; PacifiCorp 2008c). Summer pH values tend to fluctuate the most at all sites with the largest variations and highest pH values occurring primarily between September and November upstream of Copco No. 1 Reservoir and between August and October downstream of Copco No. 1 Reservoir (PacifiCorp 2008c).

Depth profiles of pH in the Copco and Iron Gate reservoirs show pH generally decreasing with depth in both reservoirs (Table C-5; PacifiCorp 2008c). At depths less than 8 meters (the epilimnion), pH is greater than 8.5 s.u. in approximately 30 percent of samples (144 of 494) collected in Copco Reservoir and 20 percent of samples (25 of 485[109]) collected in Iron Gate Reservoir, while pH less than 7.0 s.u. occurred in less than 2 percent (6 of 494) of the samples. At depth greater than 20 meters (the hypolimnion), pH is greater than 8.5 s.u. in less than 1 percent of samples (1 of 391 in Copco No. 1 and 0 of 613 in Iron Gate) collected in both reservoirs, but approximately 17 percent of samples (68 of 391) collected in Copco Reservoir and 22 percent of samples (135 of 613) collected in Iron Gate Reservoir record pH values less than 7.0 s.u. (PacifiCorp 2008c). The distribution of pH values in both reservoirs is attributed to a phytoplankton response to nutrient inputs from upstream sources with photosynthesis in the upper reservoir waters (the epilimnion) resulting in higher pH levels (PacifiCorp 2008c; Raymond 2008a). Subsequent analysis of pH data from 2005 to 2010 concurs with previous results that high pH near the surface during summer stratification is likely due to higher phytoplankton biomass and productivity from buoyant cyanobacteria [blue-green algae] near reservoir surfaces (Asarian and Kann 2011). Monthly water quality grab samples collected in Copco and Iron Gate reservoirs at three depths (near the surface [epilimnion], thermocline [metalimnion], and near the bottom [hypolimnion]) show similar pH trends in both reservoirs between 2011 and 2015 with pH usually between approximately 7.0 and 9.0 s.u., but ranging from 5.3 to 9.9 s.u. in Copco No. 1 Reservoir and 5.4 to 10.0 s.u. in Iron Gate Reservoir during 2013 (Watercourse Engineering, Inc. 2012, 2013, 2014, 2015, 2016).

[109] In PacifiCorp (2008c) Table 5.2-11, reproduced here as Table C-5, the number of samples with pH greater than 8.5 is listed as 25 of 485 total samples, but the percent of samples with pH greater than 8.5 is listed as 19.6 percent. The inconsistency between the number of samples with pH greater than 8.5 and the percent of samples with pH greater than 8.5 cannot be resolved with the available information in PacifiCorp (2008), so both are presented here for completeness and transparency

Table C-5. Frequency of pH values in the Klamath River above or below threshold values from 2000 to 2007.

Location	Summary of pH values				
	N	N > 8.5	% > 8.5	N < 7.0	% < 7.0
Klamath River above Shovel Creek	72	7	9.7	1	1.4
Copco Reservoir	1202	148	12.3	84	7.0
Copco Reservoir < 8 m	494	144	29.1	6	1.2
Copco Reservoir > 18 m	391	1	0.3	68	17.4
Iron Gate Reservoir	1470	116	7.9	189	41.9
Iron Gate Reservoir < 8 m	485	25	19.6	8	1.6
Iron Gate Reservoir > 20 m	613	0	0.0	135	22.0
Below Iron Gate Dam	71	3	4.2	4	5.6
Klamath River at I-5	30	7	23.3	2	6.7
Klamath River near Shasta River	7	6	85.7	0	0.0

Source: PacifiCorp 2008c.

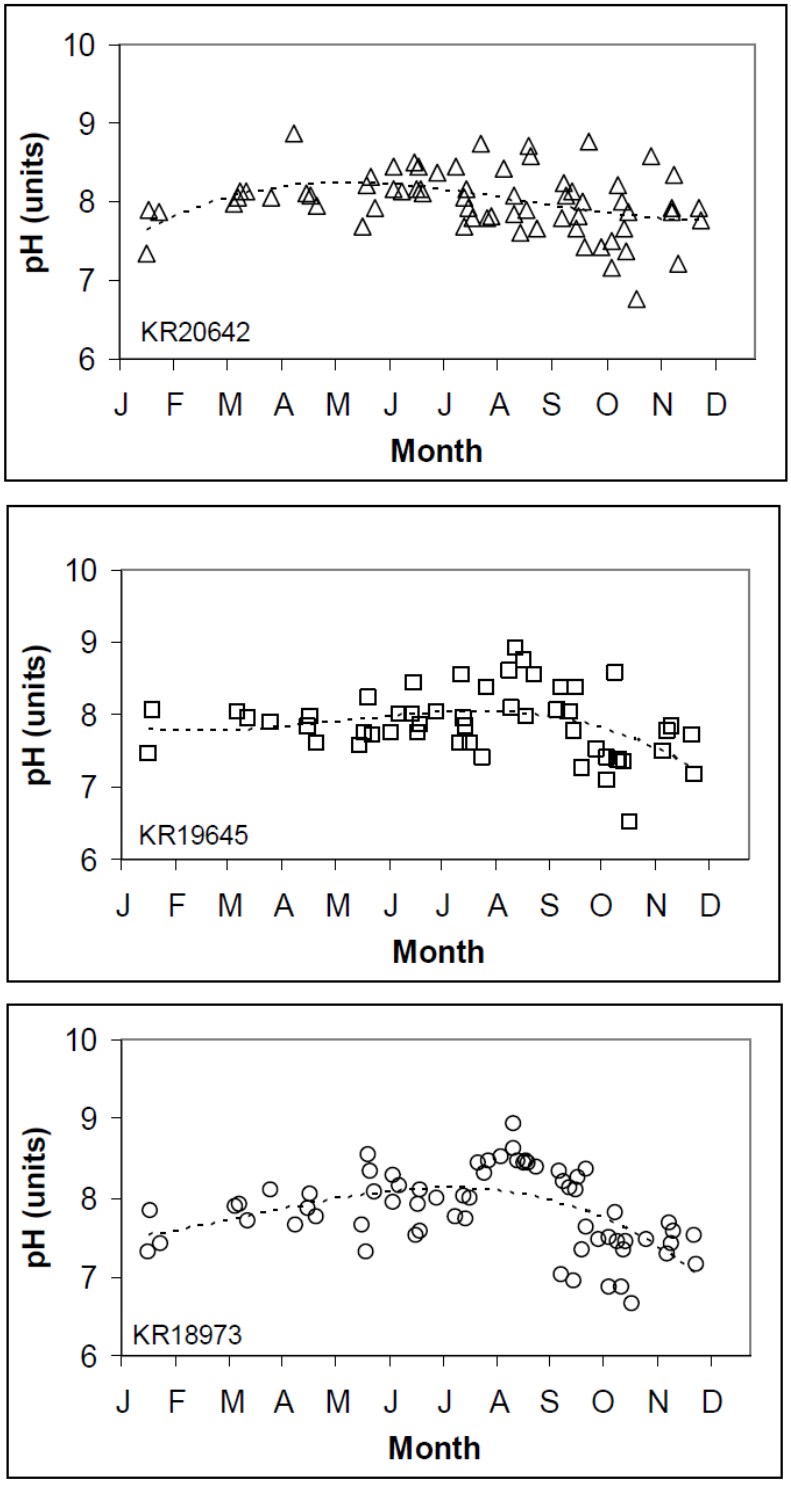

Figure C-38. Seasonal variations in pH values measured in the Klamath River upstream of Copco Reservoir near Shovel Creek (KR20642), downstream of Copco No. 2 powerhouse (KR19645), and downstream of Iron Gate Dam (KR18973). Source: PacifiCorp 2008c.

C.5.2 Mid- and Lower Klamath Basin

C.5.2.1 Iron Gate Dam to Salmon River

Downstream of Iron Gate Dam (RM 193.1) to Salmon River (RM 66.3) pH varies both longitudinally and temporally with the highest seasonal values generally occurring during late-summer and early fall months (August to September) depending on the location in the Klamath River (Figure C-39; Asarian and Kann 2013). The Basin Plan pH maximum of 8.5 s.u. is regularly exceeded in the Klamath River downstream from Iron Gate Dam (FISHPRO 2000; Karuk Tribe of California 2002, 2003, 2007, 2009, 2010a, 2010b, 2011, 2012, 2013; YTEP 2004, 2005; FERC 2007; USFWS 2008; North Coast Regional Board 2010, 2011; Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016; Asarian and Kann 2013). During April through October 2000 to 2009, incidences of pH *below* the minimum Basin Plan limit of 7.0 s.u. were also observed immediately downstream from Iron Gate Dam (RM 193.1), but pH below 7.0 s.u. was not recorded after 2009 (Karuk Tribe of California 2002, 2003, 2009, 2010a, 2010b, 2011, 2012, 2013; PacifiCorp 2004b; Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016). The Klamath River is a weakly buffered system (i.e., has typically low alkalinity below 100 mg/L as calcium carbonate [$CaCO_3$]), so it is susceptible to photosynthesis-driven daily swings in pH. Observed exceedances of pH water quality objectives usually occur during later afternoon or early evening, following the period of maximum photosynthesis (North Coast Regional Board 2010; Asarian and Kann 2013). Hourly pH variations measured in the Klamath River downstream of its confluence with the Shasta River during a 48-hour period between July 28 to 30, 1997 show the daily change in pH ranging from approximately 0.8 to 1.5 s.u. (Deas and Orlob 1999). A synthesis of pH measurements from 2001 to 2011 shows the daily range (i.e., daily maximum minus daily minimum) of pH generally peaks between late July and early September corresponding to daily cycles of photosynthesis and respiration (Figure C-38; Asarian and Kann 2013).

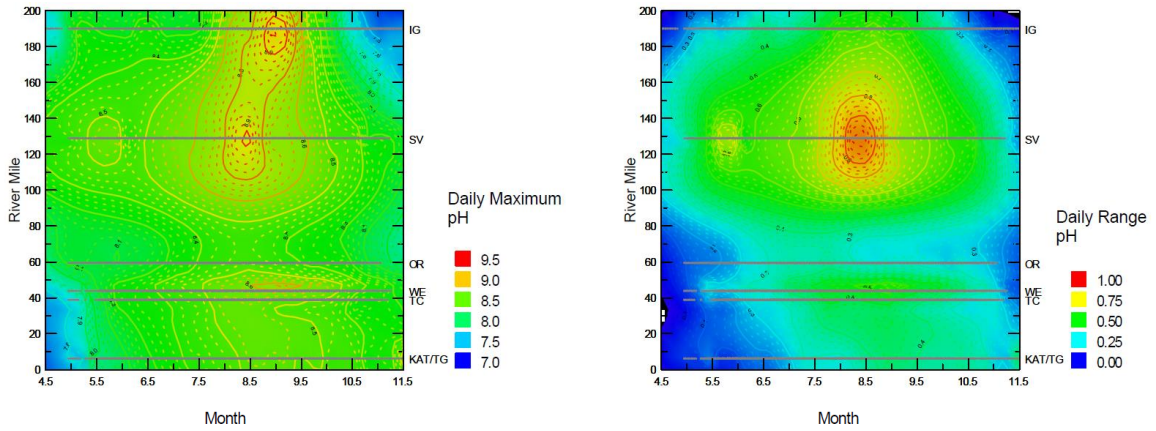

Figure C-39. Distribution of Isopleths Showing the 2001-2011 Average Daily Maximum pH and Daily Range of pH at Klamath River Sites Downstream of Iron Gate Dam from Around Mid-April (4.5) to Mid-November (11.5). Grey Lines Represent the Times the Dissolved Oxygen Concentration Was Measured in the Klamath River Downstream of Iron Gate Dam (IG at RM 193.1), at Seiad Valley (SV at RM 132.7), at Orleans (OR at RM 58.9), at Weitchpec Upstream of the Trinity River (WE at RM 43.6), Upstream of Tully Creek (TC at RM 40.1), and at Turwar (KAT/TG at RM 5.6). Source: Asarian and Kann 2013.

The most extreme pH exceedances typically occur from Iron Gate Dam (RM 193.1) to approximately Seiad Valley (RM 132.7) with pH values generally increasing from Iron Gate Dam to the Klamath River upstream of Shasta River (RM 179.5) then decreasing with distance downstream (Figure C-40; FERC 2007; Karuk Tribe of California 2007, 2009, 2010a, 2010b, 2011, 2012, 2013; Asarian and Kann 2013). During May to October 2005, the greatest number of pH exceedances in this reach occur just upstream of the mainstem confluence with the Shasta River (RM 179.5) (Figure C-41). In 2007, daily maximum pH values downstream from Iron Gate Dam (RM 193.1) were 8.2 to 9.6 s.u. with the highest documented pH occurring in September (Figure C-42); near Seiad Valley (RM 132.7), maximum pH values were slightly lower, at 8.1 to 9.4 s.u. with the highest documented pH occurring in mid-August (Figure C-43; Karuk Tribe of California 2007). A synthesis of all the data from June through October 2001 to 2011 shows these trends are consistent over time with pH greater than 8.5 s.u. in 23 percent of measurements downstream of Iron Gate Dam, 35 percent of measurements upstream from the Shasta River, and 26 percent of measurements at Seiad Valley. Measurements of pH greater than 8.5 s.u. are most frequent in August and September for most mainstem locations, but they are most frequent in July and August in the Klamath River upstream of Shasta River. Measurements of pH greater than 9.0 s.u. are most frequent at Iron Gate Dam (9 percent for September), upstream from Shasta River (8 percent for August), and Seiad Valley (6 percent for August), but measurements of pH

greater than 9.0 s.u. are rare (less than 0.1 percent) at mainstem locations downstream of Seiad Valley. High daily maximum pH values at Iron Gate Dam are correlated with high chlorophyll-*a* concentrations from upstream algal blooms rather than large 24-hour cycles (Asarian and Kann 2013).

Trends in pH from 2011 to 2015 are generally similar to previous findings with pH initially increasing with distance downstream of Iron Gate Dam before then decreasing with distance downstream to Salmon River, but there is substantial variability in the pH both seasonally and during individual days (Watercourse Engineering, Inc. 2012, 2013, 2014, 2015, 2016). Measurements of pH in 2015 demonstrate typical patterns with the seasonal range in pH being greater immediately downstream of Iron Gate Dam, but the daily range in pH being greater at Seiad Valley (Figure C-44; Watercourse Engineering, Inc. 2016). Downstream of Iron Gate Dam, pH ranges from approximately 7.5 to 9.5 s.u., while pH ranges from approximately 7.5 to 9.0 s.u. at Seiad Valley.

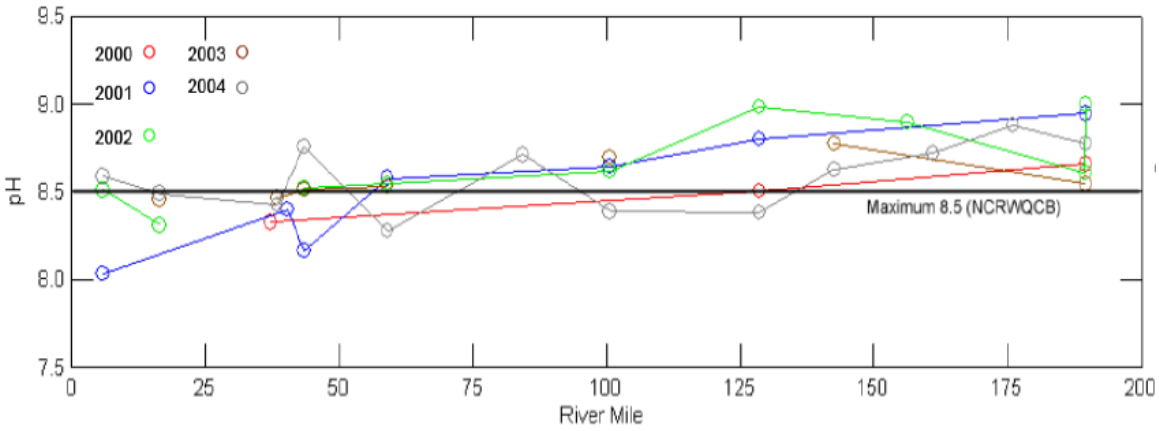

Figure C-40. Average August Daily Maximum pH Values for Locations along the Mainstem Klamath River Downstream from Iron Gate Dam for the Years 2000 to 2004 using Data Collected by USFWS, USGS, and the Karuk Tribe of California and Yurok Tribe. Source: Kier Associates 2006 as cited in FERC 2007.

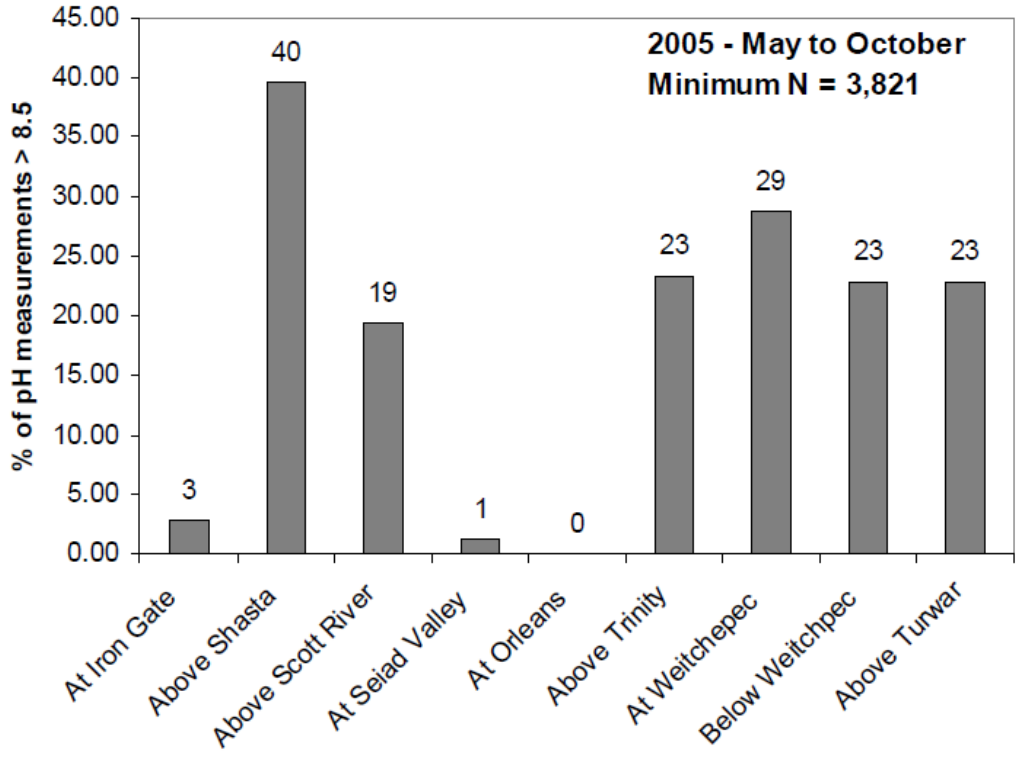

Figure C-41. Percent of pH Measurements in the Lower Klamath River Exceeding the Basin Plan Water Quality Objective of 8.5 s.u. during 2005. Source: North Coast Regional Board 2010.

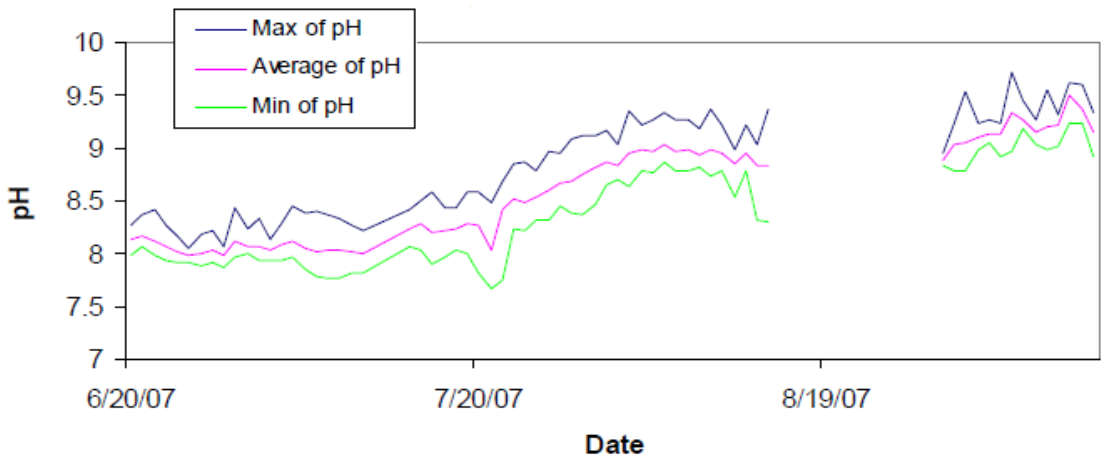

Figure C-42. Daily Maximum, Mean, and Minimum pH in the Klamath River Downstream from Iron Gate Dam (RM 193.1) from June to October 2007. Source: Karuk Tribe of California 2007.

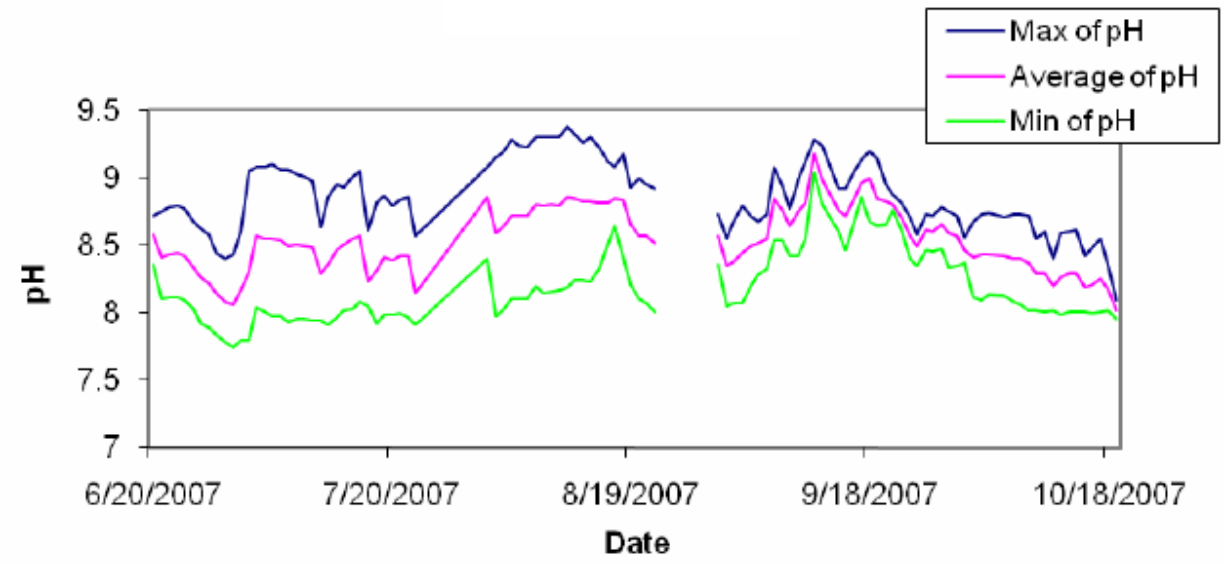

Figure C-43. Daily Maximum, Mean, and Minimum pH in the Klamath River near Seiad (≈RM 132.7) from June to October 2007. Source: Karuk Tribe of California 2007**.**

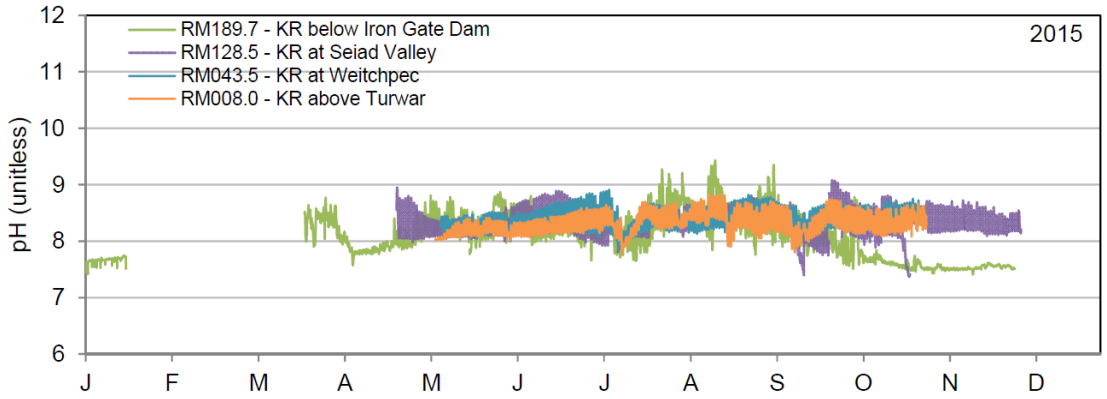

Figure C-44. Continuous pH Data from 2015 in the Klamath River Downstream of Iron Gate Dam (RM 193.1), at of Seiad Valley (RM 132.7), at Weitchpec (RM 43.6), and Upstream of Turwar (RM 5.6). Source: Watercourse Engineering, Inc. 2016.

C.5.2.2 Salmon River to Estuary

The Basin Plan pH maximum of 8.5 s.u. is also regularly exceeded in the lower Klamath River between the Salmon River (RM 66.3) and Turwar Creek (RM 5.6) during summer months with most of the exceedances occurring downstream of the Trinity River (Figures C-39 and C-41; FISHPRO 2000; Karuk Tribe of

California 2002, 2003, 2009, 2010a, 2010b, 2011, 2012, 2013; YTEP 2004, 2005; USFWS 2008; North Coast Regional Board 2010, 2011; Sinnott 2010a, 2011a, 2012a; Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016; Asarian and Kann 2013 Hanington 2013; Hanington and Ellien 2014; Hanington and Cooper Carouseli 2014). Water quality monitoring by the Karuk Tribe includes pH data from Orleans (RM 58.9), which is just downstream from the mainstem confluence with the Salmon River (see also Section C.5.2.1). Daily maximum pH values at Orleans were 7.9 to 8.9 s.u. from June through October 2007, with the highest pH occurring in mid-September (Figure C-45; Karuk Tribe of California 2007). Analysis of data from 2001 to 2011 by Asarian and Kann (2013) shows similar trends, yet pH at Orleans most frequently exceeds 8.5 s.u. during August (19 percent) rather than September (12 percent). More contemporary data from 2012 and 2013 further indicate that the maximum pH and frequency of exceeding 8.5 s.u. varies between August and September, depending on the year, with pH peaking in August in 2012 and peaking in September in 2013 (Karuk Tribe of California 2012, 2013).

In the mainstem river between the confluence with the Trinity River and the Klamath River Estuary, annual water pH monitoring has been conducted by the YTEP since 2002 (YTEP 2004, 2005; Sinnott 2010a, 2011a, 2012a; Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016; Asarian and Kann 2013; Hanington 2013; Hanington and Ellien 2014; Hanington and Cooper Carouseli 2014). The pH trends downstream of Weitchpec (RM 43.6) to Turwar (RM 5.6) vary seasonally with a general decreasing trend during the earlier part of the year then during September through October the pH decreases from the Klamath River at Weitchpec (RM 43.6) to the Klamath River upstream of Tully Creek (RM 40.1) then increases from upstream of Tully Creek downstream to Turwar (Figure C-39; Asarian and Kann 2013). The timing of peak pH and highest frequency of exceeding 8.5 s.u. varies between July and September depending on the year. Between 2001 and 2011, the pH most frequently exceeds 8.5 s.u. in September at Weitchpec (36 percent) and at Turwar (24 percent), while it most frequently exceeds 8.5 s.u. in the Klamath River upstream of Tully Creek (RM 40.1) in August (23 percent) (Asarian and Kann 2013). However, during 2009 monitoring, peak pH values were documented from July through September with the highest daily maximums recorded in early July. The highest pH values were documented at the most upstream location (i.e., just over 9.0 s.u. at Klamath River at Weitchpec [RM 43.6]), while both sample locations farther downstream were approximately 8.8 s.u. (Klamath River upstream of Tully Creek [RM 40.1] and upstream of Turwar Boat Ramp [RM 6]) (Figure C-46; Sinnott 2010a). More recent pH monitoring from 2012 and 2013 also show the variability in timing of pH peaks with pH at Weitchpec (RM 43.6) peaking at 8.7 s.u. in October in 2012 and 8.8 s.u. in July in 2013. The pH recorded upstream of the Turwar Boat Ramp (RM 6) is more consistent with pH peaking at approximately 8.7 s.u. during August in both 2012 and 2013 (Hanington 2013; Hanington and Ellien 2014).

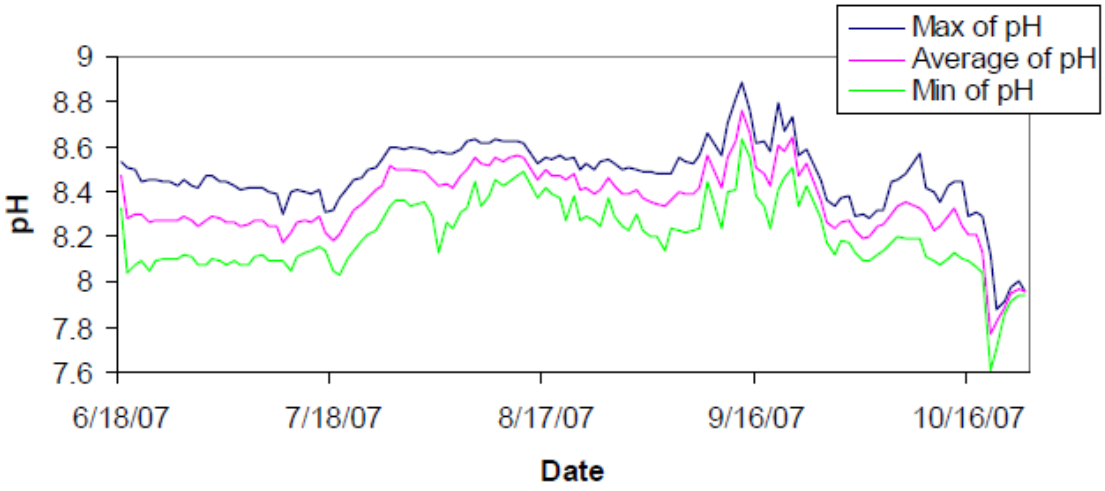

Figure C-45. Daily Maximum, Mean, and Minimum pH on the Klamath River near Orleans (RM 58.9) from June to October 2007. Source: Karuk Tribe of California 2007.

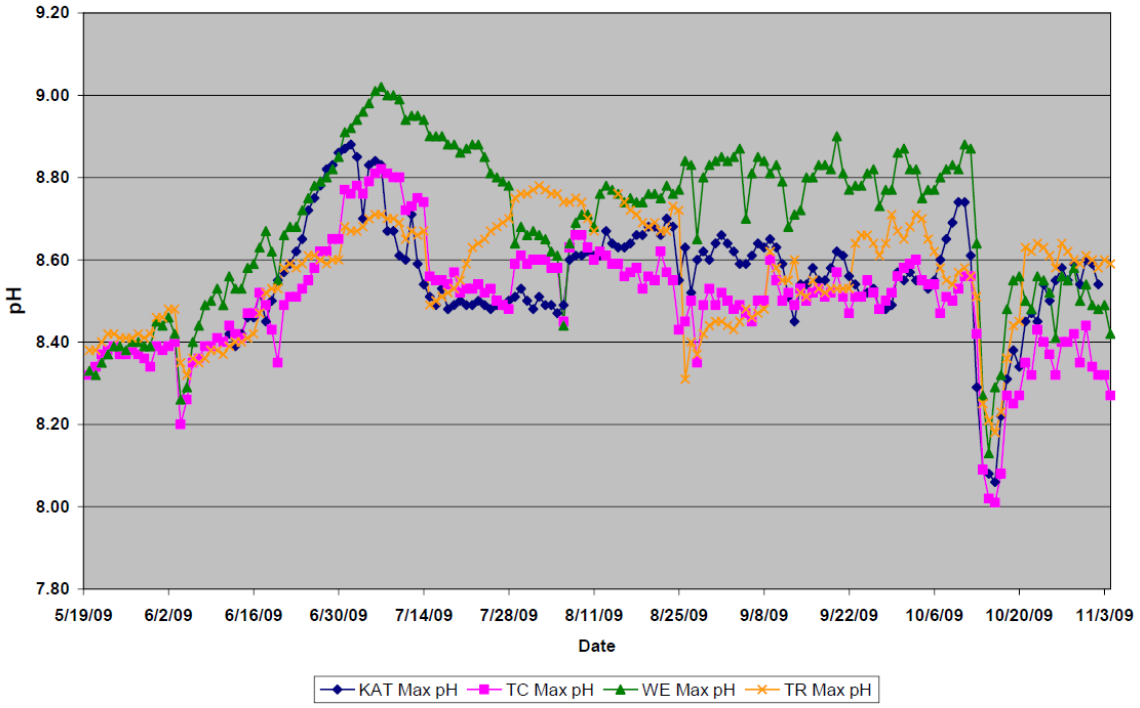

Figure C-46. Daily Maximum pH in the Klamath River at Weitchpec (RM 43.6 [WE]), Upstream of Tully Creek (RM 40.1 [TC]), and Upstream of Turwar Boat Ramp (RM 6 [KAT]), as well as in the Trinity River (RM 43.3 [TR]) near the Confluence with the Klamath River (RM 0.5 [TR]). Source**:** Sinnott 2010a.

C.5.2.3 Klamath River Estuary

pH within the Klamath River Estuary is variable spatially and temporally and is influenced by season, river flow, vertical stratification (thermal and/or salinity), and location of the estuary mouth, the latter changing due to periodic sand bar movement. The Basin Plan pH maximum of 8.5 s.u. is regularly exceeded in the Klamath River Estuary though pH measured during monthly grab samples near the surface of the lower estuary from 2009 to 2015 only show pH exceeding 8.5 s.u. in February 2011 and August 2013 (YTEP 2005; Sinnott 2010a, 2011a, 2012a; Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016; Hanington and Torso 2013; Hanington and Stawasz 2014; Hanington and Cooper Carouseli 2014). Based on Yurok Tribe water quality data, pH in the Klamath Estuary typically ranges from approximately 6.9 to 9.0 s.u. though values below 7.0 s.u. are occasionally measured, with peak values generally occurring during the summer months (YTEP 2005; Sinnott 2010a, 2011a, 2012a; Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016, 2017; Hanington and Torso 2013; Hanington and Stawasz 2014; Hanington and Cooper Carouseli 2014). Daily variations in pH are typically on the order of 0.5 s.u., and fluctuations tend to be somewhat larger in the late summer and early fall. The Environmental Fluid Dynamics Code estuary model component used in the California Klamath River TMDL development as well as observed data show very low phytoplankton and chlorophyll-*a* concentrations in the Klamath River Estuary (YTEP 2005), suggesting that local photosynthesis and biological respiration are not significant enough to cause large daily fluctuations of pH, as seen in upstream reaches. When large daily fluctuations are observed, they are likely caused by an upstream daily signal that is subsequently transported into the Klamath River Estuary.

C.6 Algal Toxins and Chlorophyll-*a*

C.6.1 Upper Klamath Basin

C.6.1.1 Hydroelectric Reach

Seasonal phytoplankton blooms (also called algal blooms) in the Hydroelectric Reach have been recorded historically, with chlorophyll-*a* concentrations in Iron Gate Reservoir ranging from 0.3 micrograms per liter (ug/L) to 21.6 ug/L during March, July, and October 1975 (USEPA 1978). The blue-green algae species *Aphanizomenon sp.* and *Oscillatoria sp.* were identified in the July and/or October 1975 Iron Gate Reservoir survey, with the potentially microcystin and anatoxin-a producing *Oscillatoria sp*. as the most abundant of the five phytoplankton species identified in the October algal bloom. However, no *Microcystis aeruginosa* or *Anabaena flos-aquae* were identified during the three sampling dates in 1975 (USEPA 1978). Over the past decade, algal toxins and chlorophyll-*a* have become routinely monitored water quality parameters in the Hydroelectric Reach. PacifiCorp's chlorophyll-*a* monitoring data for the river upstream of J.C. Boyle Reservoir to immediately downstream from Iron Gate Dam from 2002 through 2009 (May to October) indicates that annual mean

values above 10.0 ug/L are typical of the dataset and there is generally greater apparent variability upstream of J.C. Boyle Reservoir as compared with just downstream from Iron Gate Reservoir (PacifiCorp 2004a, 2004b; Raymond 2008a, 2009a, 2010a). Chlorophyll-*a* concentrations have a wider range with higher peak values in reservoirs compared to the free-flowing portion of the Klamath River (Raymond 2008a; Asarian and Kann 2011).

A broader longitudinal analysis of measured chlorophyll-*a* concentrations was conducted using monitoring data compiled during 2005 to 2007 (May to September) from the Yurok Tribe, Karuk Tribe of California, North Coast Regional Board, and PacifiCorp (North Coast Regional Board 2010). Results at numerous locations from the lower Klamath River Estuary (RM 0 to 3.9) to J.C. Boyle Dam (RM 229.8) demonstrate that median chlorophyll-*a* concentrations within Copco No. 1 and Iron Gate reservoirs are 2 to 10 times greater (note the logarithmic scale in Figure C-47) than those documented in free-flowing locations in the mainstem river, with median concentrations greater than 10.0 ug/L exhibited in the reservoirs and median concentrations less than 10.0 ug/L exhibited at river locations (North Coast Regional Board 2010). Analysis of chlorophyll-*a* measurements from June to October 2005 to 2010 show similar trends with chlorophyll-*a* higher in Copco No. 1 and Iron Gate reservoirs than in river locations upstream, between, and downstream of the reservoirs (Figure C-48; Asarian and Kann 2011). Chlorophyll-*a* concentrations upstream of Copco No. 1 Reservoir ("Abv Shovel" location in Figure C-47; "KRACorig" location in Figure C-48) are lower than those measured downstream within the reservoir suggesting chlorophyll-*a* concentrations in the reservoirs are due to algal blooms originating in the reservoirs. Chlorophyll-*a* concentrations are generally higher in Copco No. 1 Reservoir than Iron Gate Reservoir though annual variability does result in Iron Gate Reservoir having higher median chlorophyll-*a* concentrations during some years (Asarian and Kann 2011). In the Copco No. 1 and Iron Gate reservoirs, median chlorophyll-*a* concentrations are highest near the surface than decrease with depth (Figure C-48). Chlorophyll-*a* data indicates concentrations at a 5 m depth are elevated compared to inflow values from upstream with chlorophyll-*a* in Copco No. 1 (and Iron Gate to a lesser extent) exceeding 10.0 ug/L for much of August to September in 2005 to 2007 (Asarian and Kann 2011). Peak chlorophyll-*a* concentrations indicating periods of algal blooms are generally larger in Copco No. 1 than Iron Gate with some exceptions (Asarian and Kann 2011).

Longitudinal KHSA Interim Measure 15 chlorophyll-*a* data from May through October over a longer period from 2000 to 2017 also show relatively similar chlorophyll-*a* trends as the May to September 2005 to 2007 and June to October 2005 to 2010 datasets, but the 2000 to 2017 data show a larger range of chlorophyll-a concentrations in J.C. Boyle Reservoir than the previous datasets (Figure C-48-A). In the May to September 2005 to 2007 dataset, chlorophyll-a in J.C. Boyle Reservoir is generally lower than chlorophyll-a measured in Klamath River monitoring sites upstream of Copco No. 1 (Figure C-47). However, in the

May to October 2000 to 2017 dataset, chlorophyll-a in J.C. Boyle Reservoir would occasionally exceed chlorophyll-a measured at some monitoring sites between Copco No. 1 Reservoir and J.C. Boyle Dam and chlorophyll-a in the Klamath River upstream of the J.C. Boyle Powerhouse is typically lower. Additionally, the average chlorophyll-a concentrations at several Klamath River monitoring sites (e.g., Klamath River downstream of Iron Gate Dam) in the May to October 2000 to 2017 dataset are similar or slightly higher than those measured in the upper 10 meters of Copco No. 1 and Iron Gate reservoirs.

Seasonal chlorophyll-*a* patterns in the Hydroelectric Reach indicate that relatively high concentrations can occur during spring diatom blooms (e.g., approximately 30.0 to 40.0 ug/L for Copco No. 1 and Iron Gate reservoirs in March 2000 to 2003), followed by a period of relatively low concentrations after the blooms die (e.g., less than 10 mg/L for Copco No. 1 and Iron Gate reservoirs in April to July 2000 to 2003). In some years (e.g., 2009 and 2010), the intense spring blooms have included the blue-green algae *Anabaena* spp. with sufficient density to require health advisory posting of the reservoirs. A second increase occurs during August and September when dense blooms dominated by both *Aphanizomenon flos-aquae* and *Microcystis aeruginosa* are typical (e.g., approximately 30.0 to 58.0 ug/L for Copco No. 1 and Iron Gate reservoirs 2000 to 2003) (FERC 2007). Asarian and Kann (2011) found similar seasonal chlorophyll-*a* trends in 2005 to 2010 data with peak values occurring from March to April and August to September. Chlorophyll-*a* concentrations from November to April were lower downstream of Iron Gate Dam than upstream of Copco due to settling of diatoms from upstream (Asarian and Kann 2011).

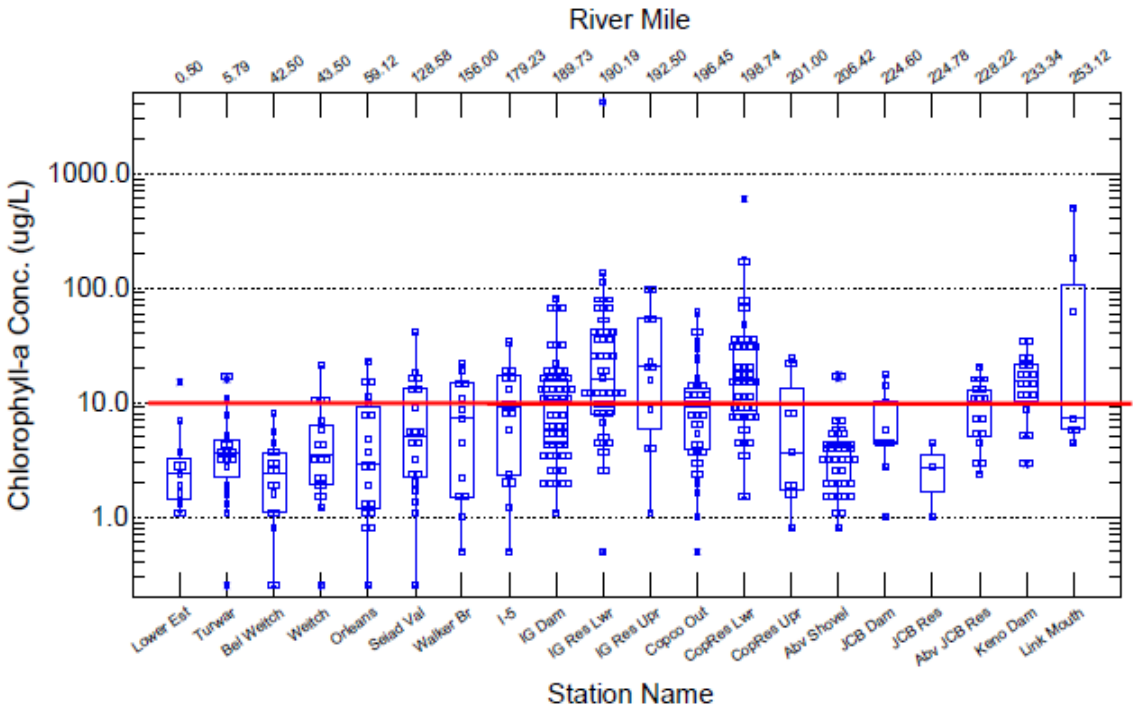

Figure C-47. Longitudinal Analysis of Summer (May through September) Chlorophyll-*a* Concentrations from 2005 to 2007 Along the Klamath River. Note the Logarithmic Scale. River miles specified for Klamath River features are based on those accurate at the time of the report and differ slightly from 2018 river mile designations (Table 3.2-1). Data from the Yurok Tribe, Karuk Tribe of California, North Coast Regional Water Quality Control Board, and PacifiCorp. Source: North Coast Regional Board 2010.

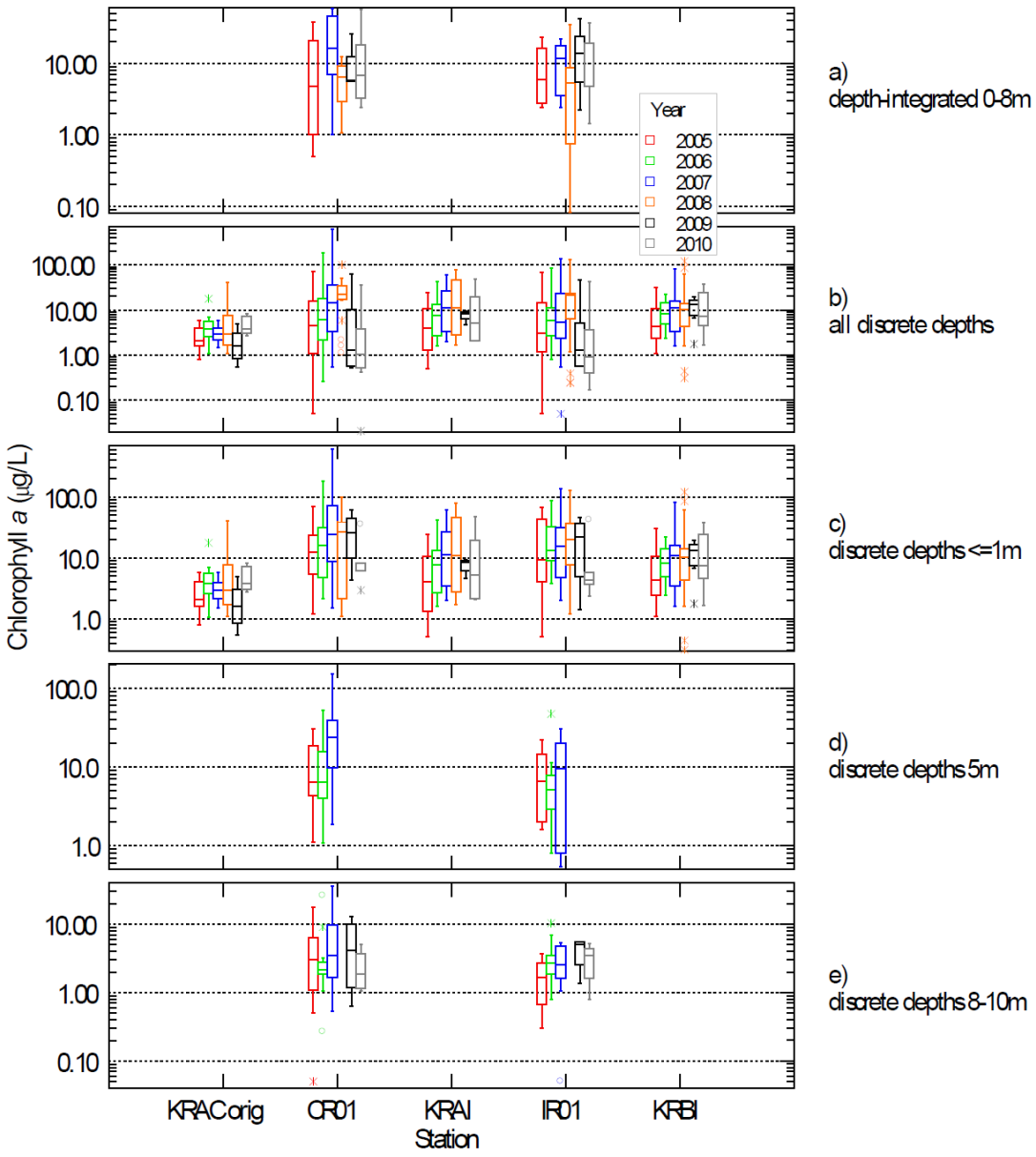

Figure C-48. Longitudinal and Vertical Chlorophyll-*a* Concentrations June to October 2005 to 2010 at the Klamath River Upstream of Copco (KRACorig), Copco Reservoir Before the Dam (CR01), Klamath River Upstream of Iron Gate (KRAI), Iron Gate Reservoir Before the Dam (IR01), and Klamath River Downstream of Iron Gate Dam (KRBI). Source: Asarian and Kann 2011.

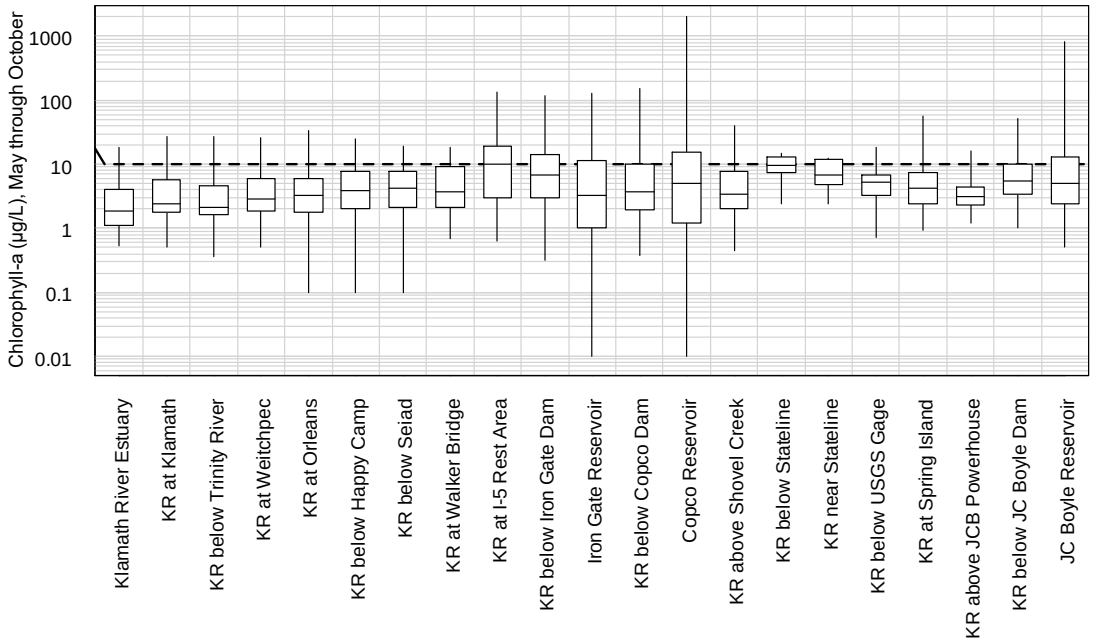

Figure C-48-A. Longitudinal Analysis of Summer Through Fall (May to October) KHSA Interim Measure 15 (IM15) Chlorophyll-*a* Concentrations from 2000 to 2017 Along the Klamath River and in the Upper 10 Meters of the Lower Klamath Project Reservoirs. Whiskers Extend From Minimum to Maximum Value, Boxes Extend From the First to the Third Quartile, and the Horizontal Line Indicates the Median of the Dataset at Each Site. Note the Logarithmic Scale. The Dashed Horizontal Line is the Chlorophyll-a Klamath River TMDL Target (i.e., 10 ug/L). Chlorophyll-*a* Data From Stations That Shifted Locations Between Years Are Plotted Together (e.g., KR at Walker Bridge). Source: PacifiCorp 2003, 2004d, 2005c, 2007, 2008d, 2009b, 2010c, 2011c, 2012b, 2013b, 2014b, 2015b, 2016c, 2017c.

Algal toxins, also referred to as cyanotoxins, can be produced by some species of blue-green algae, which are also called cyanobacteria, especially during large seasonal blooms in reservoir or lake environments. Cyanotoxins (e.g., cyclic peptide toxins such as microcystin that act on the liver, alkaloid toxins such as anatoxin-a and saxitoxin that act on the nervous system) can cause irritation, sickness, or in extreme cases, death to exposed organisms, including humans (Chorus and Bartram 1999). Species capable of producing microcystin include *Microcystis aeruginosa*, while species in the genus *Anabaena* can produce anatoxin-a and saxitoxin. More complete listings of specific toxins produced by genera of blue-green algae worldwide are provided in Lopez et al. (2008) and ODEQ (2011). The California Cyanobacteria and Harmful Algal Bloom (CCHAB) Network, a multi-agency workgroup formerly called the Statewide Blue-Green

Algae Working Group, has developed guidance for responding to harmful algal blooms (HABs), cyanotoxin [algal toxin] threshold levels for protection of human health, and posting and de-posting cyanotoxin [algal toxin] triggers in recreational waters (State Water Board et al. 2010, updated 2016). The State Water Resources Control Board (State Water Board), the California Department of Public Health (CDPH), and the California Environmental Protection Agency (CalEPA) Office of Environmental Health and Hazard Assessment (OEHHA) Caution Action trigger threshold for the protection of human health in recreational waters was previously 8 ug/L of microcystin, but it is 0.8 ug/L of microcystin in the 2016 update (State Water Board et al. 2010, updated 2016).

Species present in the Klamath River capable of producing microcystin include *Microcystis aeruginosa* and *Anabaena flos-aquae*[110], while species present in the Klamath River in the genus *Anabaena* can produce anatoxin-a and saxitoxin. The potentially microcystin and anatoxin-*a* producing *Oscillatoria sp.* was identified in the October 1975 survey of an algal bloom in Iron Gate Reservoir (USEPA 1978), but based on more recent data this algal species exhibits generally low abundance in the reservoirs and the Klamath River (Raymond 2008b, 2009b, 2010b; Asarian et al. 2014, 2015; Genzoli and Kann 2017). Microcystin-producing species in the genera *Gloeotrichia* and *Planktothrix* along with other algal toxin-producing species in the genera *Limnothrix* and *Pseudanabaena* also have been detected in the Klamath River, but these species have never been found to dominate the algal community (Kann and Asarian 2006; Genzoli and Kann 2017; E&S Environmental Chemistry, Inc. 2018a, 2018b). More complete listings of specific toxins produced by genera of blue-green algae worldwide are provided in Lopez et al. (2008) and ODEQ (2011).

Microcystin concentrations are generally low from J.C. Boyle to Copco No. 1 reservoirs, higher between Copco No. 1 and Iron Gate reservoirs, then decrease with distance downstream from Iron Gate Dam (Kann 2006; Jacoby and Kann 2007; Kann 2007a, b, c, d; Kann and Corum 2007, 2009; CH2M Hill 2008; Kann et al. 2010a; Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016; Otten et al. 2015; Genzoli and Kann 2017). High chlorophyll-*a* concentrations have been shown to correlate with the toxigenic blue-green algae blooms dominated by *Anabaena* spp. and *Microcystis aeruginosa* and sharp increases in microcystin levels above WHO numeric targets (Kann and Corum 2009) and the State Water Board, the CDPH, and CalEPA OEHHA public health thresholds (State Water Board et al. 2010, updated 2016). Data collected from

[110] While *Anabaena flos-aquae* are capable of producing microcystin (Lopez et al. 2008), it is widely assumed that detected concentrations of microcystin are due to *Microcystis aeruginosa* rather than *Anabaena flos-aquae* due to the lower abundance of *Anabaena flos-aquae* compared to *Microcystis aeruginosa*. The relative proportion of microcystin contributions from *Anabaena flos-aquae* versus *Microcystis aeruginosa* has not been documented for the Klamath Basin.

2005 through 2009 indicate high levels of microcystin in Copco No. 1 and Iron Gate reservoirs, with measured concentrations exceeding the current State Water Board, CDPH, and CalEPA OEHHA public health threshold of 0.8 ug/L for microcystin by over 10,000 times in Copco No. 1 Reservoir in 2006, 2007, 2008, and 2009 and by over 1,000 times in Iron Gate Reservoir in 2006 and 2009 (Figure C-49; Jacoby and Kann 2007; Kann 2007a, b, c, d; Kann and Corum 2007, 2009; Kann et al. 2010a).

Microcystin measured during May to December 2009 exhibited extremely high concentrations (1,000 to 73,000 ug/L) during algal blooms occurring in July, August, and September in Copco No. 1 Reservoir in Mallard Cove and Copco Cove, and in Iron Gate Reservoir at Jay Williams. The highest microcystin concentration (73,000 ug/L) was measured on September 28, 2009 at Mallard Cove in Copco No. 1 Reservoir. Microcystin concentrations in Iron Gate Reservoir at Jay Williams peaked in October at 3,200 ug/L (Watercourse Engineering, Inc. 2011a). More contemporary measurements of microcystin in the Copco No. 1 and Iron Gate reservoirs during May to December 2015 exhibit very high concentrations consistent with previous findings (Watercourse Engineering, Inc. 2016). In Copco No. 1 Reservoir at Mallard Cove and Copco Cove, microcystin increases in June to July 2015 until peaking at 12,000 to 16,000 ug/L during algal blooms while microcystin concentrations also increase to between 200 to 370 ug/L in August, September, and October. In Iron Gate Reservoir at Jay Williams, microcystin concentrations in 2015 peaked at 770 ug/L in September, while microcystin in Iron Gate Reservoir at Camp Creek reached a maximum of 64 ug/L (Watercourse Engineering, Inc. 2016).

In 2015, PacifiCorp installed a powerhouse intake barrier/thermal curtain in Iron Gate Reservoir under IM 11 with the primary purpose of isolating surface waters that have high concentrations of blue-green algae (cyanobacteria) and potentially limiting the release of Iron Gate Reservoir water containing extensive summer and fall blue-green algae blooms downstream to the Middle and Lower Klamath River. The curtain also provides a potential secondary benefit of isolating warmer, less dense near-surface waters while withdrawing cooler, denser, and deeper waters from the reservoir for release to the Klamath River downstream (PacifiCorp 2016a, 2017a, 2018). Water quality measurements during 2015 and 2016 when the intake barrier/thermal curtain was in use indicate that the curtain reduces entrainment of blue-green algae into the Iron Gate Powerhouse intake and subsequent release downstream into the Klamath River (PacifiCorp 2016a, 2017a). Chlorophyll-*a* concentrations downstream of Iron Gate Dam during 2015 and 2016 when the intake barrier/thermal curtain was in use also showed a decrease compared to chlorophyll-a concentrations in Iron Gate Reservoir, with chlorophyll-a concentrations consistently below 10 ug/L (i.e., Klamath TMDLs phytoplankton chlorophyll-a target) even when chlorophyll-a concentrations in the reservoir were greater than 10 ug/L (PacifiCorp 2016a, 2017a). Microcystin concentrations downstream of Iron Gate Dam during 2015 and 2016 when the intake barrier/thermal curtain was in use typically showed a decrease compared

to microcystin concentrations in Iron Gate Reservoir, but microcystin concentrations in the Klamath River downstream of Iron Gate Dam still occasionally exceeded microcystin posting limits during 2015 (e.g., 6 ug/L for CCHAB Warning TEIR I; Table 3.2-10) even when the intake barrier/thermal curtain deployed (PacifiCorp 2016a, 2017a). However, water quality monitoring data from 2017 and 2018 downstream of Iron Gate Dam show multiple exceedances of the Klamath TMDLs phytoplankton chlorophyll-a target (i.e., 10 ug/L) and multiple microcystin posting limits (e.g., 6 ug/L for CCHAB Warning TEIR I; Table 3.2-10) (Watercourse Engineering, Inc. 2018, 2019). An analysis of the intake barrier/thermal curtain performance during 2017 or 2018 has not been published and PacifiCorp continues to test and refine the intake barrier/thermal curtain design and operations, but available data do not indicate that this measure would prevent releases from Iron Gate Dam that would exceed water quality standards (Table 3.2-4) or consistently achieve the Klamath TMDLs phytoplankton chlorophyll-*a* target of 10 ug/L for Copco No. 1 and Iron Gate reservoirs during the May to October growth season (North Coast Regional Board 2010). Additionally, potential reductions in the entrainment of blue-green algae, chlorophyll-a concentrations, and microcystin concentrations downstream of Iron Gate Dam from operation of the intake barrier/thermal curtain would be potentially limited by the need to access water with higher dissolved oxygen concentrations to comply with dissolved oxygen standards, with the curtain completely rolled up during portions of 2017 to maximize dissolved oxygen concentrations for aquatic life (PacifiCorp 2018).

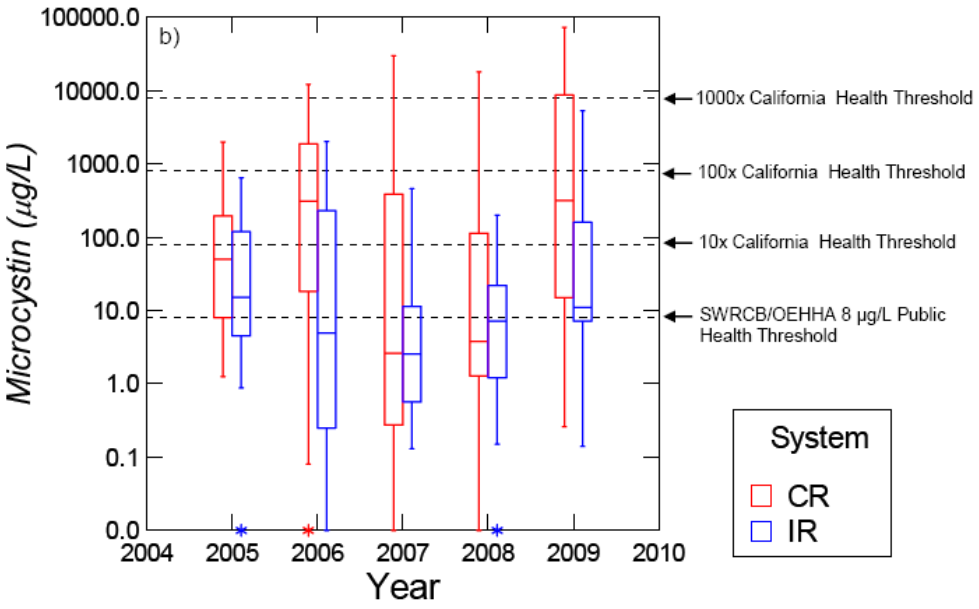

Figure C-49. Inter-annual Comparison of Microcystin Concentration for Copco No. 1 Reservoir (Red Square) and Iron Gate Reservoir (Blue Square) during July through October 2005 to 2009. Note: the SWRCB [State Water Board]/[CalEPA] OEHHA Public Health Threshold for microcystin was 8 ug/L in 2010, but it was revised to 0.8 ug/L in 2016. Source: Kann et al. 2010a.

Otten et al. (2015) report the longitudinal and temporal variations in microcystin levels from upstream of Copco No. 1 to Turwar along with genetic analysis of *Microcystis aeruginosa* in Copco No. 1 Reservoir, Iron Gate Reservoir, and multiple Klamath River sites downstream of Iron Gate Dam indicate Iron Gate Reservoir is the principal source of *Microcystis aeruginosa* cells contributing to microcystin concentrations downstream of Iron Gate Dam. Overall, microcystin concentrations are generally low from J.C. Boyle Reservoir to Copco No. 1 Reservoir, higher between Copco No. 1 Reservoir and Iron Gate Reservoir, and then generally decrease with distance downstream from Iron Gate Reservoir (Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016, 2017; Genzoli and Kann 2017; Otten 2017). The consistently low microcystin levels above Copco No. 1 along with phycological (conditions associated with algae), genetic, and toxin analyses that identify different population dynamics in Copco No. 1 and Iron Gate reservoirs indicate microcystin in the Copco No. 1 and Iron Gate reservoirs is due to local *Microcystis aeruginosa* populations (Otten et al. 2015). In 2012, Copco No. 1 microcystin concentrations peak in August then decline while Iron Gate Reservoir microcystin concentrations peak in September with the temporal differences in peak microcystin occurring because depth differences between the reservoirs cause thermal stratification in Iron Gate Reservoir approximately two weeks later than Copco No. 1 Reservoir. The timing of peak microcystin levels in Iron Gate Reservoir corresponds to the

highest microcystin concentrations in the Klamath River downstream of Iron Gate Dam consistent with Iron Gate Reservoir being the source of downstream *Microcystis aeruginosa* cells. This evidence indicates that *Microcystis aeruginosa* populations from Iron Gate Reservoir contribute to *Microcystis aeruginosa* public health exceedances in the Klamath River downstream of Iron Gate Reservoir (see Section 3.4.2.3 *[Phytoplankton and Periphyton] Hydroelectric Reach*). Genetic analysis of the *Microcystis aeruginosa* populations showed Copco No. 1 Reservoir populations were dominated by one genetic type the entire year, but the populations in Iron Gate Reservoir and immediately downstream of Iron Gate Dam had a simultaneous switch in the dominant genetic type in late August that was also detected in the further downstream populations. The simultaneous timing of the genetic change in Iron Gate Reservoir and downstream *Microcystis aeruginosa* populations, but no corresponding genetic change in Copco No. 1 Reservoir provides direct evidence that downstream populations are originating in Iron Gate Reservoir rather than Copco No. 1 (Otten et al. 2015).

In 2007, a *Microcystis aeruginosa* bloom prompted a Yurok Tribe health advisory along multiple affected reaches in the Klamath River (Kann 2007a, b, c, d); data from July through September 2007 also indicate microcystin bioaccumulation in fish and mussel tissue samples collected in the Klamath River and Iron Gate and Copco No. 1 reservoirs (Kann 2008a; see Section 3.3.3.3 for more information on algal toxins in fish and mussel tissue). Additional public health advisories were issued in 2009 and 2010 in Copco No. 1 and Iron Gate reservoirs, as well as downstream locations in the Klamath River (including locations on the Yurok Reservation), for microcystin levels in ambient and/or freshwater mussel tissue (Fetcho 2010, Kann et al. 2010a, Kann et al. 2010b). Data from 2008 and 2009 did not show microcystin bioaccumulation in the tissue and liver samples from fish collected from Copco No. 1 and Iron Gate reservoirs (CH2M Hill 2009b, PacifiCorp 2010a). In 2010, the Lower Klamath Project reservoirs were posted to protect public health due to elevated blue-green algae cell counts and algal toxin (i.e., microcystin) concentrations. In 2013, 2014, and 2016, public health advisories were posted for both Copco No. 1 and Iron Gate reservoirs when algal toxin levels or blue-green algae cell concentrations exceeded one or more public health advisory threshold (North Coast Regional Board 2013, 2014, 2016). Copco No. 1 Reservoir also had a public health advisory posted in July 2017 when microcystin concentrations exceeded both the “caution action trigger” threshold (0.8 ug/L) and the “warning, Tier 1” threshold (6 ug/L) (North Coast Regional Board 2017) with microcystin concentrations reaching 380,000 ug/L in Copco No. 1 Reservoir in August 2017 (E&S Environmental Chemistry, Inc. 2017).

As part of an evaluation of the relationship between *Microcystis aeruginosa* cell density and microcystin concentration, Kann et al. (2010a) compared the 2009 measured values to the 2010 WHO guidelines for a low probability of adverse health effect (20,000 cells/mL *Microcystis aeruginosa*, or 4 ug/L microcystin) and

the 2010 State Water Board/ [CalEPA] OEHHA guidelines for protection against a moderate probability of adverse effects (40,000 cells/mL *Microcystis aeruginosa*, or 8 ug/L microcystin). These results showed that the more conservative guideline of 20,000 cells/mL *Microcystis aeruginosa* decreases the frequency of exceeding the 8 ug/L 2010 State Water Board/ [CalEPA] OEHHA guideline value for microcystin, and it is more protective of public health (Kann and Corum 2009; Kann 2014). Overall, the 2005 to 2012 results clearly illustrate that the majority of exceedances to all guidelines and thresholds occurred in the reservoirs in the Hydroelectric Reach (as compared with downstream riverine sites), with the highest overall levels measured in Copco No. 1 Reservoir (Figure C-50; Kann and Corum 2009; Kann and Bowman 2012; Kann 2014; Watercourse Engineering, Inc. 2016). Concentrations of microcystin toxin in Iron Gate and Copco No. 1 reservoirs are typically 1 to 3 orders of magnitude greater relative to the Klamath River downstream of Iron Gate Dam (Raymond 2008a; Kann et al. 2010a; Kann and Bowman 2012; Kann 2014; Watercourse Engineering, Inc. 2016). Overall, the available data indicate that while river exceedances to the 2010 microcystin water quality guidelines do occur, they are far less in number than exceedances in Copco No. 1 and Iron Gate reservoirs (Figure C-50; see also Raymond 2008a; Kann et al. 2010a; Kann and Bowman 2012; Kann 2014; Watercourse Engineering, Inc. 2016).

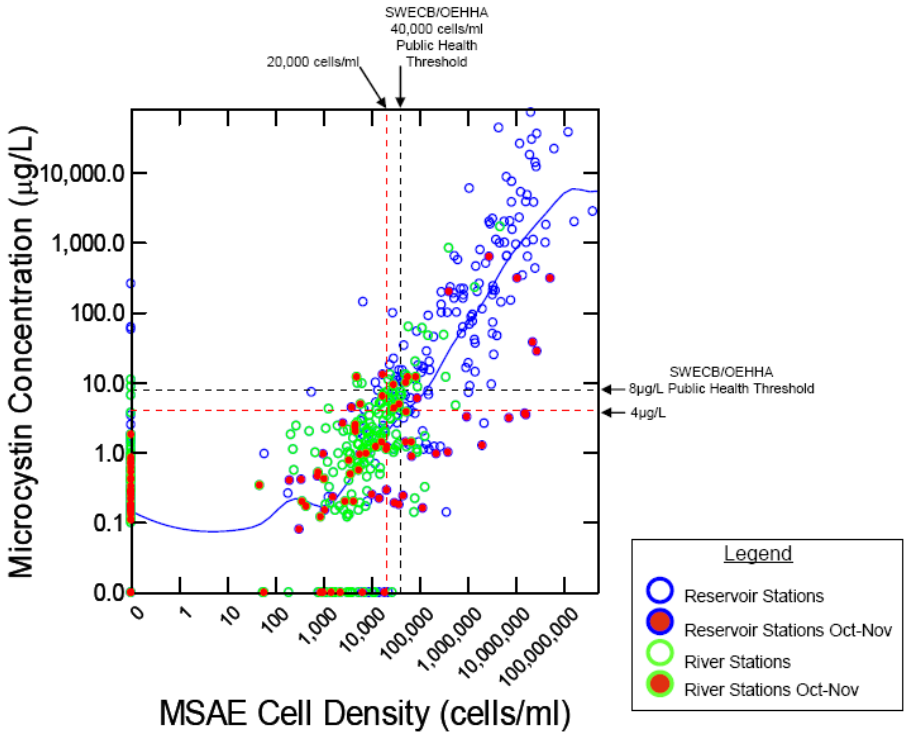

Figure C-50. Relationship between *Microcystis aeruginosa* Cell Density and Microcystin Toxin Concentration for Copco No. 1 and Iron Gate Reservoirs and Klamath River Stations 2005 to 2009. Note: the SWRCB [State Water Board]/[CalEPA] OEHHA Public Health Threshold for microcystin was 8 ug/L in 2010, but it was revised to 0.8 ug/L in 2016. Similarly, the SWRCB [State Water Board]/[CalEPA] OEHHA Public Health Threshold for Microcystis aeruginosa Cell Density was 40,000 cells/mL in 2010, but it was revised to 4,000 cells/mL of any toxin producing blue-green algae in 2016. Source: Kann et al. 2010a.

Anatoxin-a has been detected in the Klamath River system, although the timing, distribution, and sources of anatoxin-a production in the Klamath River are not well understood. Anatoxin-a can be produced by number of blue-green algae [cyanobacteria] genera, including *Anabaena*[111], *Aphanizomenon, Cylindrospermopsis, Planktothrix, Oscillatoria*, and *Phormidium* (Chorus and Bartram 1999; Quiblier et al. 2013; USEPA 2014; Bouma-Gregson et al. 2018).

[111] Cyanobacteria in the genus *Anabaena* have been recently recategorized, with all planktonic species in the genus *Anabaena* renamed *Dolichospermum* and all benthic species remaining in the genus *Anabaena*. For example, the phytoplankton *Anabaena flos-aquae* was recently renamed *Dolichospermum flos-aquae.* However, this EIR continues to use the *Anabaena* name for both planktonic and benthic species since it was more frequently used in the literature cited and it is still commonly used in descriptions of this species.

In the Klamath River, anatoxin-a production is generally assumed to be due to *Anabaena flos-aquae*, but toxin production by some strains of *Anabaena flos-aquae* appears to be sporadic, and the circumstances which prompt toxin production are unknown. While toxin-producing phytoplankton are more well-studied, periphyton can also produce toxins, including anatoxin-a (Heath et al. 2011; Quiblier et al. 2013). In many California rivers and streams not impounded by dams, periphyton are assumed to be the primary sources of anatoxin-a (Fetscher et al. 2015), including species in the genera *Anabaena* and *Phormidium* in tributaries of the Eel River located south of the Klamath River (Asarian and Higgins 2018; Bouma-Gregson et al. 2018). The relative proportion of anatoxin-a contributions from phytoplankton versus periphyton in the Klamath Basin has not been documented.

In the Klamath River system, anatoxin-a was detected in Iron Gate Reservoir on September 3, 2005 in testing by the California Department of Health Services (Kann 2007b; Kann 2008b), while monitoring conducted for the Karuk Tribe during 2005, 2006, 2007, and 2008 in Copco No. 1 or Iron Gate reservoirs did not detect anatoxin-a (Kann and Corum 2006, 2007, 2009; Kann 2007d). While concentrations of *Anabaena flos-aquae* cells have continued to be monitored, anatoxin-a concentrations are not available for Lower Klamath Project reservoir sites in recent years.

C.6.2 Mid- and Lower Klamath Basin

C.6.2.1 Iron Gate Dam to Salmon River

As noted above (Section C.6.1.1), 2005 to 2007 data indicate that during May through September median chlorophyll-*a* concentrations decrease longitudinally with distance downstream from Iron Gate Dam (Figure C-47) to the Klamath River confluence with the Salmon River (RM 66.3), but concentrations remain greater than those measured just upstream of Copco No. 1 Reservoir. This suggests that algal blooms occurring in the reservoirs were being transported to the downstream river reaches. Ward and Armstrong (2010) report the 2001 to 2005 mean chlorophyll-*a* concentrations ranged from approximately 0.5 to 3.5 ug/L, with concentrations generally decreasing with distance downstream from Iron Gate Dam though variability is observed (Figure C-41). During 2001 to 2005, the highest annual mean value (approximately 5.0 ug/L) occurs in 2005 at the confluence with the Shasta River (RM 179.5). In 2009, the Karuk Tribe collected chlorophyll-*a* and pheophytin-*a* (an additional photosynthetic pigment) data from the Klamath River downstream from Iron Gate Dam; chlorophyll-*a* values were approximately 1.0 to 35.0 ug/L and were variable depending on location. Generally speaking, relatively greater values were observed at upstream locations near Iron Gate Dam (RM 193.1) and Walker Bridge sites, but the peak value was observed farther downstream of the confluence with the Salmon River (RM 66.3) at Orleans (RM 58.9) (Karuk Tribe of California 2010a). Analysis of the chlorophyll-*a* data from 2001 to 2011 by Asarian and Kann (2013) summarizes the June to October annual variability and range of chlorophyll-*a*

concentrations downstream of Iron Gate Dam (Figure C-52). The highest values occur in 2007 and 2008 with chlorophyll-*a* concentrations greater than 100 ug/L downstream of Iron Gate Dam, yet most measurements were less than 50 ug/L. Chlorophyll-*a* concentrations have a seasonal variation with concentrations in Seiad Valley (RM 132.7) decreasing in May/June, then increasing from July until peaking in late August/early September, and finally declining from September to October (Asarian and Kann 2013). Monthly/bi-weekly monitoring data from 2012 to 2015 show similar trends with chlorophyll-*a* concentrations generally decreasing from downstream of Iron Gate Dam (RM 193.1) to the Klamath River downstream of Seiad Valley (RM 132.7), but chlorophyll-*a* concentrations occasionally remained approximately the same or increased between Iron Gate Dam and Seiad Valley (Watercourse Engineering, Inc. 2013, 2014, 2015, 2016). In June to October 2015, chlorophyll-*a* concentrations range from approximately 1.3 to 9.5 ug/L downstream of Iron Gate Dam (RM 193.1), while chlorophyll-*a* concentrations range from approximately 1.3 to 9.6 ug/L downstream of Seiad Valley (RM 132.7) (Watercourse Engineering, Inc. 2016).

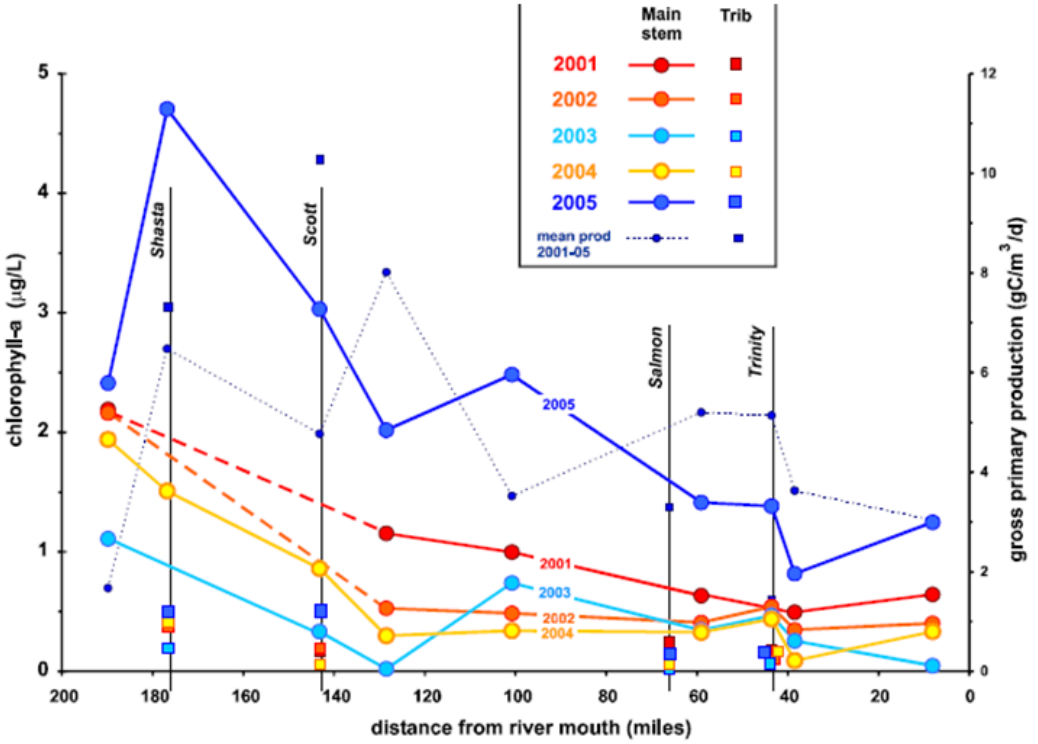

Figure C-51. Annual Mean Values of Chlorophyll-*a* in the Klamath River Downstream from Iron Gate Dam during June to September 2001 to 2005. River miles specified for Klamath River features are based on those accurate in 2010 and differ slightly from 2018 river mile designations (Table 3.2-1). Source: Ward and Armstrong 2010.

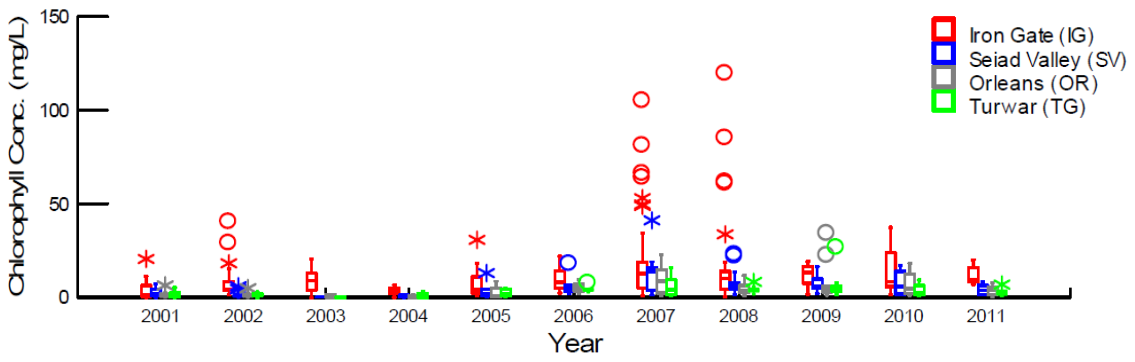

Figure C-52. Chlorophyll-*a* in the Klamath River Downstream from Iron Gate Dam during June to October 2001 to 2011. Source: Asarian and Kann 2013.

In 2008, the Karuk Tribe collected blue-green algae concentrations (cells/mL) using optical phycocyanin probes to allow more timely assessment of public health threats from toxigenic blue-green algae species. Data from downstream from Iron Gate Dam measured during June to October indicated peak values (greater than 25,000 cells/mL) in July and early-to-mid September (Karuk Tribe of California 2009). At the Klamath River monitoring sites Iron Gate (RM 193.1) and Seiad Valley (RM 132.7), phycocyanin data from 2007 to 2014 is typically low from May through early July, increases to a peak in early to mid-September, and decreases until reaching low levels again by the end of October to early November (Asarian and Kann 2013). Phycocyanin concentrations generally coincide with chlorophyll-*a* concentrations for the portion of the Klamath River at Seiad Valley. Blue-green algae concentrations (cells/mL) were also collected by the Karuk Tribe in 2016 at sites downstream of Iron Gate Dam to the confluence with the Salmon River with peak values (greater than 30,000 cells/mL) occurring in July (Watercourse Engineering, Inc. 2016).

Although concentrations of both *Microcystis aeruginosa* and microcystin in the Klamath River downstream from the Hydroelectric Reach are lower relative to the reservoirs (Figures C-53 and C-54), WHO guidelines for exposure to microcystin (i.e., less than 4.0 ug/L) have been exceeded downstream from Iron Gate Dam on numerous occasions (Kann 2004; Kann and Corum 2009; Kann et al. 2010a; Fetcho 2010; Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016; KTWQC 2016), including late-summer/early-fall *Microcystis aeruginosa* blooms in September 2007, 2009, 2010, 2011, 2012, 2013, and 2016 from Iron Gate Dam (RM 193.1) to the mouth of the Klamath River (RM 0.0). Health Advisories were posted along the Iron Gate Dam to Shasta River reach of the Klamath River in 2009 and 2010, due to elevated *Microcystis aeruginosa* cell counts and/or microcystin concentrations in river water. During 2009, mean microcystin concentrations immediately downstream from Iron Gate Dam (RM

193.1) were approximately 2.0 ug/L, with mean values decreasing to less than 1.0 ug/L at sites further downstream to approximately Orleans (RM 58.9) (Watercourse Engineering, Inc. 2011a). However, two measurements exceeded 7.0 ug/L at stations located at RM 156 and 128.5 (Watercourse Engineering, Inc. 2011a). Baseline grab sample water quality monitoring between 2012 and 2015 demonstrate the range of annual variability in longitudinal microcystin concentration trends (Figure C-54). Additional public health sampling, separate from the baseline monitoring, in 2015 show microcystin concentrations peaking in late July to early August between 2.9 and 5.6 ug/L (Watercourse Engineering, Inc. 2016). Microcystin concentrations collected in 2012 and 2013 document how microcystin concentrations vary over a 24-hour period and the potential influence of grab sampling time on microcystin measurements. On September 17 to 18, 2013, microcystin downstream of Iron Gate Dam ranges from approximately 8.0 to 16.0 ug/L with minimum values occurring around noon and the peak occurring at midnight (Kann 2014).

Available data indicate that algal blooms, especially those involving *Microcystis aeruginosa,* in Iron Gate and Copco No. 1 reservoirs have been responsible for the public health exceedances in the lower river (Kann 2006; Kann and Corum 2009). The highest microcystin concentrations in the Klamath River downstream of Iron Gate Dam coincide with peak microcystin levels in Iron Gate Reservoir. This is consistent with the reservoir being the source of downstream *Microcystis* cells causing elevated microcystin concentrations. A simultaneous genetic change in Iron Gate Reservoir and downstream *Microcystis aeruginosa* populations, but no corresponding genetic change in Copco No. 1 Reservoir provides further evidence that downstream populations are originating in Iron Gate Reservoir rather than Copco No. 1 (Otten et al. 2015). While cyanobacteria [blue-green algae] that potentially produce algal toxins have been observed in calm, slow-moving habitats along shorelines and protected coves and backwaters during low-flow periods in the Middle and Lower Klamath River under existing conditions (Fetcho 2008; Raymond 2008b; Kann and Corum 2009; Kann et al. 2010a; Genzoli and Kann 2016, 2017), Otten et al. (2015) found no evidence of endemic *Microcystis aeruginosa* populations that would produce algal toxins (i.e., microcystin) in the flowing regions of the Klamath River upstream or downstream of Copco No. 1 and Iron Gate reservoirs. Longitudinal decreases in *Microcystis aeruginosa* cell density and microcystin concentrations in open-channel and shoreline samples from the Klamath River downstream of Iron Gate Dam (RM 193.1) to upstream of the Klamath River Estuary suggest that water velocity and constant mixing in the river are not supportive of blue-green algae reproduction and algal toxin production, although microcystin concentrations between downstream of Iron Gate Dam and Orleans (RM 58.9) in July through October can exceed established public health thresholds (e.g., 0.8 ug/L) (Otten et al. 2015; Genzoli and Kann 2017). For example, microcystin concentrations in the Klamath River during the period 2010 to 2015 from Orleans (RM 58.9) to Klamath (RM 5.9) range from less than 1.0 ug/L to approximately 12.0 ug/L, with the highest concentrations usually occurring at Weitchpec (RM

43.6) and decreasing with distance downstream (Gibson 2016), although microcystin is occasionally higher at Orleans (RM 58.9) than Weitchpec (RM 43.6).

Additionally, microcystin can also bioaccumulate in aquatic biota. During July through September 2007, 85 percent of fish and mussel tissue samples collected from yearling fall-run Chinook salmon in Iron Gate Hatchery, yellow perch in Copco No. 1 and Iron Gate reservoirs, and mussels at Klamath River locations downstream of Iron Gate Dam exhibited microcystin bioaccumulation, with the total microcystin congeners ranging from less than detection levels to 2,803 ng/g, reported as wet weight (Kann 2008a). Microcystin congeners were detected in yellow perch fillet and liver samples, but microcystin congeners were only detected in Chinook liver samples (Kann 2008a). Microcystin bioaccumulation was not detected in muscle tissue or liver samples collected during October 2007 from eleven adult Chinook salmon and eight adult steelhead captured at eight locations in the Klamath River downstream of Iron Gate Dam (CH2M Hill 2009a). While microcystin bioaccumulation was detected in mussel samples between July and September 2007, microcystin bioaccumulation was not detected in mussel tissue samples collected in November 2007, suggesting that depuration (i.e., biological purging of algal toxins from living tissue) occurred after *Microcystis aeruginosa* cell densities and microcystin concentrations declined in late October (Kann 2008a). In contrast to the 2007 fish data, microcystin bioaccumulation was not detected in any samples collected during 2008 from resident fish or mussels in the vicinity of Copco No. 1 and Iron Gate reservoirs (CH2M Hill 2009b). Microcystin was not detected in any of the 272 muscle tissue samples (i.e., 166 yellow perch samples, 30 crappie samples, and 76 rainbow trout samples) collected during four seasonal sampling events in 2008 (i.e., May to June, July, September, and November) from 257 resident fish (duplicate tissue samples were obtained from 15 fish) captured in Copco No. 1 and Iron Gate reservoirs and in the river upstream of Copco No. 1 Reservoir or downstream of Iron Gate Dam or in any of the 14 mussel tissue samples from upstream of Copco No. 1 Reservoir and downstream of Iron Gate Reservoir (CH2M Hill 2009b). Fish livers were not tested for microcystin during 2008. Microcystin was not detected in muscle tissue or liver samples collected during two sample events in 2009 (i.e., August and September) from 43 yellow perch captured in Copco No. 1 and Iron Gate reservoirs (PacifiCorp 2010a). However, microcystin was detected in tissue samples of freshwater mussels in the Klamath River from monthly sampling events in 2009 from July to October and December (Kann et al. 2010b). Microcystin bioaccumulation also was measured during 2010 in muscle tissue and liver samples from 20 Chinook salmon, 25 steelhead, and 3 coho salmon collected at five locations downstream of Iron Gate Dam from September through November. Microcystin was detected in 3 of 7 Chinook livers collected in September 2010 near Happy Camp, in 1 of 7 Chinook livers collected in October near Happy Camp, and in 1 of 15 steelhead livers collected in October near Weitchpec, with no microcystin detected in any other fish tissue sample. Other measured algal toxins (i.e., anatoxin-a, domoic acid, or okadaic acid) were

not detected in any Klamath River fish samples (Kann et al. 2013). Estuarine and marine nearshore effects (e.g., sea otter deaths) from blue-green algae exposure have been reported in other California waters; however, none have been documented to date for the Klamath River Estuary or marine nearshore (Miller et al. 2010).

The levels of microcystin bioaccumulation measured in fish and mussel tissue samples collected during July through September 2007 (i.e., less than detection levels to 2,803 ng/g, reported as wet weight) exceeded the public health guidelines defined by Ibelings and Chorus (2007) (i.e., Acute Tolerable Intake: 1,900 ng/g for an adult, 250 ng/g for a child; Seasonal Tolerable Daily Intake: 300 ng/g for an adult, 40 ng/g for a child; Lifetime Tolerable Daily Intake: 30 ng/g for an adult, 4 ng/g for a child, all as wet weight), indicating ingestion of the fish or mussels would potentially pose a health hazard to humans (Kann 2008a). While microcystin levels were less than the method detection limit for all salmonid muscle tissue and liver samples in October 2007, the method detection limit for these microcystin bioaccumulation tests on salmonids (i.e., 100 to 240 ng/g, reported as dry weight) overlapped with or was greater than the Lifetime Tolerable Daily Intake public health guideline (i.e., 120 ng/g dry weight for an adult and 16 ng/g dry weight for a child) defined by Ibelings and Chorus (2007). Thus, there was a potential chronic (i.e., long-term) health hazard to humans for the October 2007 salmonid samples if microcystin concentrations in the salmonid muscle tissue were between the method detection limit and the Tolerable Daily Intake (CH2M Hill 2009a). Public health advisories were issued in 2009 and 2010 in the Klamath River from the Salmon River confluence to the Klamath River Estuary (including locations on the Yurok Reservation) for elevated microcystin levels in ambient and/or freshwater mussel tissue samples (Fetcho 2010; Kann et al. 2010a; Kann et al. 2010b). During 2010, there was no detectable risk to human health from microcystin bioaccumulation in salmonid fillets because the microcystin concentration in salmonid fillets was less than acute, seasonal, and Lifetime Tolerable Daily Intake public health guidelines. During September 2010, microcystin concentrations measured in salmonid livers were less than the public health guideline values. However, during October 2010, microcystin concentrations measured in salmonid livers were greater than multiple public health guideline values (e.g., Klasing and Brodberg 2008; Butler et al. 2012; Mulvenna et al. 2012; Ibelings and Chorus 2007). Although fish livers are not typically consumed, these fish potentially posed a human health hazard due to the high microcystin concentrations (i.e., 121.20 to 152.40 ng/g) measured in the livers (Kann et al. 2013).

Overall, there was no acute or seasonal public health concern identified with eating salmonid fillets based upon the 2007 and 2010 data since microcystin was only detected in salmonid liver samples and salmonid liver is not typically eaten. However, there is potential for a chronic health hazard to humans from microcystin bioaccumulation in salmonids since the method detection limit during 2007 was greater than the Lifetime Tolerable Daily Intake, precluding the

assessment of the lifetime public health risk. The method detection limit during 2010 was less than the Lifetime Tolerable Daily Intake and no microcystin was detected in 2010 salmonid fillet samples, so there was not a detectable chronic health hazard to humans in 2010 from microcystin bioaccumulation in salmonid fillets. (see also Section 3.3.3.3).

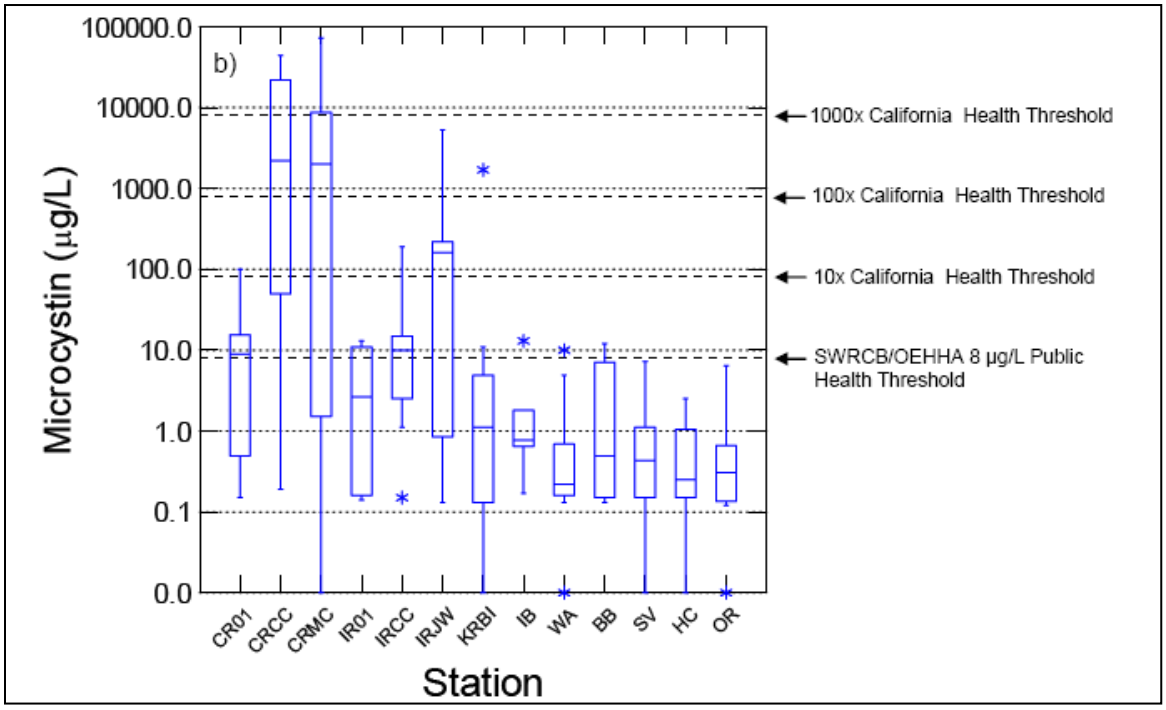

Figure C-53. Microcystin Concentration in Klamath River from Copco No. 1 (CR01) to Orleans (RM 58.9) during June to November 2009. WA=Walker Bridge, SV=Seiad Valley (RM 132.7), OR=Orleans (RM 58.9). Note: the SWRCB [State Water Board]/[CalEPA] OEHHA Public Health Threshold for microcystin was 8 ug/L in 2010, but it was revised to 0.8 ug/L in 2016. Source: Kann et al. 2010a.

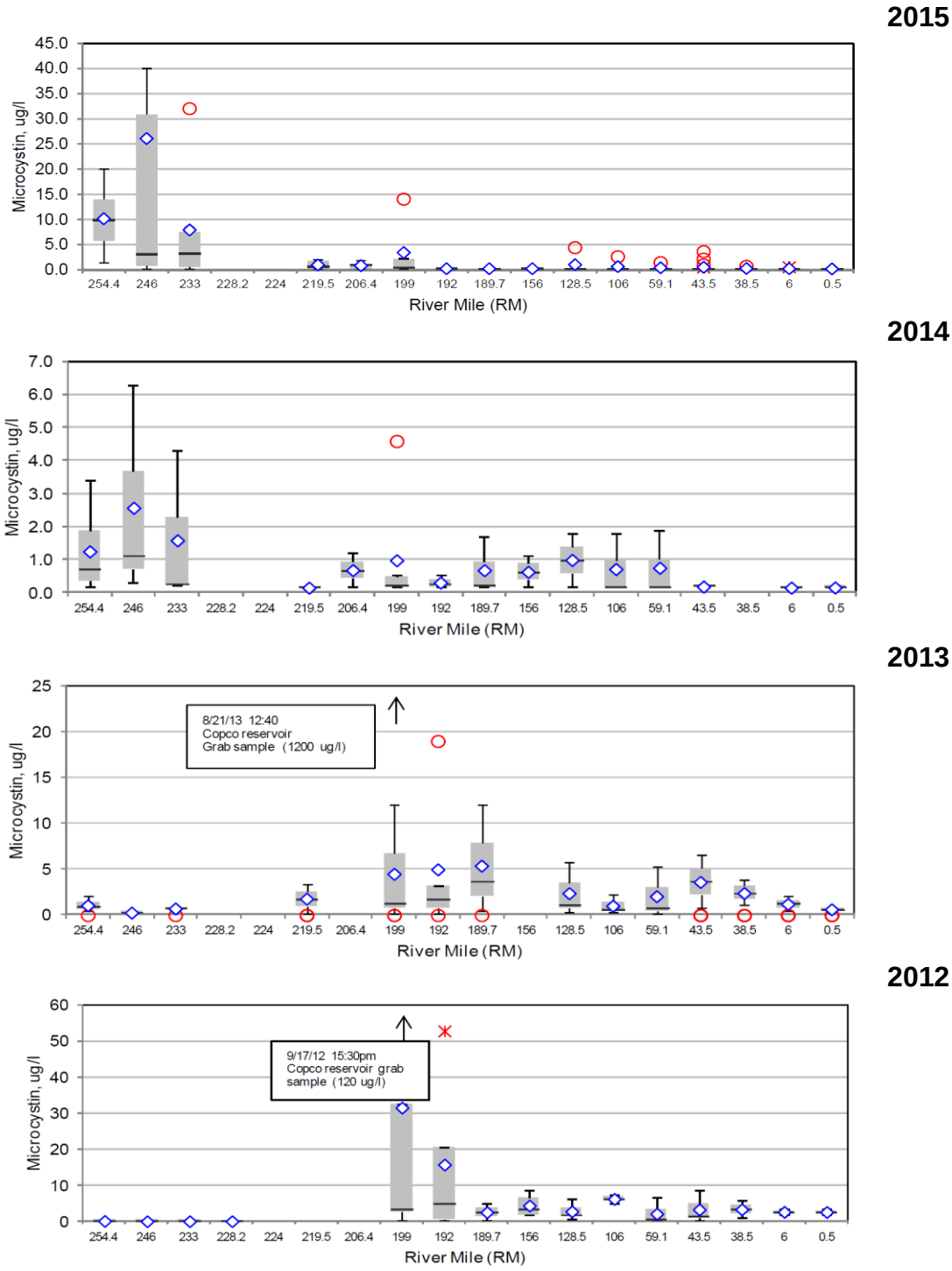

Figure C-54. Klamath River Microcystin Concentration trends from measurements made between February and December with median (-), mean (◊), outlier (*), and extreme outliers (○) identified. River miles specified are based on those accurate at the time of the reports and differ slightly from 2018 river mile designations (Table 3.2-1). Source: Watercourse Engineering, Inc. 2013, 2014, 2015, 2016.

C.6.2.2 Salmon River to Estuary

Downstream from the confluence with the Salmon River (RM 66.3), chlorophyll-*a* and algal toxin concentrations exhibit variability and are generally lower than those measured farther upstream. Water quality monitoring from 2008 to 2012 at Saints Rest Bar (RM 44.9) in the Klamath River shows chlorophyll-*a* usually ranging from approximately 1.0 to 15.0 ug/L, but occasional higher peaks with one peak reaching 44.9 ug/L in August 2011 (HVTEPA 2013). The Yurok Tribe monitors chlorophyll-*a*, pheophytin-*a*, and blue-green algae concentrations (cells/mL) annually, and use optical phycocyanin probes to allow more timely assessment of public health threats from toxigenic blue-green algae species on the Yurok Reservation (YTEP 2005; Fetcho 2006, 2007, 2008, 2009, 2011; Sinnott 2008, 2009a, 2009b, 2010b, 2011b, 2012b; Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016; Hanington and Torso 2013; Hanington and Stawasz 2014; Hanington and Cooper Carouseli 2014; Gibson 2016). Chlorophyll-*a* 2001 to 2005 data from Ward and Armstrong (2010) show small relative increases in chlorophyll-*a* with distance downstream, from near the Trinity River confluence (RM 43.3) to Turwar (RM 5.6), (Figure C-51), suggesting that phytoplankton productivity may increase slightly as water moves toward the Klamath River Estuary. Chlorophyll-*a* data measured from Weitchpec (RM 43.6) to the Klamath River Estuary during 2003 to 2004 did not show that trend though with concentrations, where detectable, generally decreasing in the downstream direction and below 5.0 ug/L (YTEP 2004, 2005). During 2006 to 2010 from May to October, chlorophyll-*a* concentrations frequently show an increase in chlorophyll-*a* with distance downstream from the confluence with the Trinity River (RM 43.3) to the Turwar Boat Ramp (RM 6) consistent with the findings of Ward and Armstrong (2010) (Sinnott 2008, 2009a, 2009b, 2010b, 2011b). Between May and July chlorophyll-*a* is typically less than 5.0 ug/L, but it increases during August to October with peak concentrations of 24.0 to 27.0 ug/L in 2009 (Sinnott 2008, 2009a, 2009b, 2010b, 2011b). Longitudinal chlorophyll-*a* concentrations from 2011 to 2014 are variable from the confluence with the Trinity River (RM 43.3) to the Turwar Boat Ramp (RM 6) with concentrations seasonally increasing or decreasing with distance downstream (Sinnott 2012b; Hanington and Torso 2013; Hanington and Stawasz 2014; Hanington and Cooper Carouseli 2014). In 2011 to 2014, chlorophyll-*a* is less than 6.0 ug/L from May to July then increases to approximately 10.0 to 15.0 ug/L during August to October before decreasing to below 3.0 ug/L in December (Sinnott 2012b; Hanington and Torso 2013; Hanington and Stawasz 2014; Hanington and Cooper Carouseli 2014). The peak values between 2006 and 2014 usually occur at Weitchpec (RM 43.6) from late August to mid-October and varying by year (6.7 ug/L in 2008 and 26.0 ug/L in 2009), but there is one exception in November 2013 when chlorophyll-*a* at Weitchpec reaches 27.0 ug/L.

During 2009, mean microcystin concentrations from Orleans (RM 58.9) to Klamath River at Klamath (RM 5.9) were less than 1.0 ug/L, well below the 2010 State Water Board/ [CalEPA] OEHHA guideline value for microcystin (8 ug/L), but greater than the 2016 State Water Board/ [CalEPA] OEHHA guideline for

microcystin (0.8 ug/L) (Watercourse Engineering, Inc. 2011a). Individual microcystin measurements generally remained less than 1.0 ug/L as well, with the exception of a sample collected in late-September at Orleans (RM 58.9) for which the microcystin concentration was 6.4 ug/L (Watercourse Engineering, Inc. 2011a). Microcystin at Saints Rest Bar (RM 44.9) in 2010 to 2012 usually ranges from below 0.15 ug/L (the detection limit) to 5.6 ug/L, but microcystin in September 2012 reaches a peak of 19.0 ug/L (HVTEPA 2013). Microcystin concentrations from 2010 to 2015 range from less than 1.0 ug/L to approximately 12.0 ug/L with concentrations usually highest at Weitchpec (RM 43.6) then decreasing with distance downstream (Gibson 2016) though microcystin was occasionally higher at Orleans (RM 58.9) than Weitchpec (RM 43.6) in some years (Figure C-54). Microcystin concentrations peak between July and September around the same time the maximum concentration of *Microcystis aeruginosa* are measured, but Gibson (2016) notes microcystin is present at high levels in some samples even when *Microcystis aeruginosa* are not. While peak microcystin in the Klamath River at Weitchpec exceeds 8.0 ug/L in 2010, 2012, and 2013, microcystin concentrations downstream of Weitchpec, are less than 8.0 ug/L for all years between 2010 and 2015 (Gibson 2016). Microcystin exceeded 0.8 ug/L at Weitchpec at least once every year between 2010 to 2015, but microcystin exceeded 0.8 ug/L only once every year in 2010 through 2013 in the Klamath River at the Turwar Boat Ramp (RM 6). While microcystin levels in fish tissue samples are usually below detection level or trace (0.17 micrograms per gram [ug/g]), 0.54 ug/g microcystin was measured in a half pounder steelhead liver collected in the Klamath River at Weitchpec in 2005 (Kann 2006).

In the Klamath River upstream of Tully Creek (RM 38.8) and at Turwar (RM 5.8), phycocyanin, a pigment produced by blue-green algae, is typically low from May through early July, but it increases more gradually and peaks in late-September before decreasing to low levels again at the end of October. Phycocyanin generally decreases in the downstream direction from Iron Gate Dam to Orleans, but there is an increase in phycocyanin at Weitchpec before again decreasing in the downstream direction to Turwar. The longitudinal decrease in phycocyanin was most pronounced between Iron Gate Dam and Seiad Valley and Seiad Valley and Orleans (Genzoli and Kann 2016).

As described for the Klamath River from Iron Gate Dam to the Salmon River (Section C.6.2.1), there have been numerous exceedances of public health guidelines in the Klamath River from the Salmon River confluence to the Klamath River Estuary, particularly in 2010. Public health advisories were issued in 2009 and 2010 in this reach (including locations on the Yurok Reservation) for elevated microcystin levels in ambient and/or freshwater mussel tissue samples (Fetcho 2010; Kann et al. 2010a; Kann et al. 2010b). In addition, substantial bioaccumulation (exceeding public health guidelines) of microcystin in freshwater mussels has been shown in this reach (Kann 2008a, Kann et al. 2010b). In 2014 and 2015, public health advisories were posted when microcystin concentrations

exceeded the 0.8 ug/L Recommended Threshold for Recreational Waters and blue-green algae cell concentrations were elevated (YTEP 2014, 2015).

Anatoxin-a was not detected above the reporting limit in water samples collected during 2008 and 2009 at Lower Klamath River monitoring sites (Fetcho 2009, 2011). In recent years, anatoxin-a has been measured in the Klamath River downstream of Iron Gate Reservoir on several occasions, typically in the lower reaches including at monitoring sites near Weitchpec and Orleans (Otten 2017). Concentrations of *Anabaena flos-aquae* cells have continued to be monitored in recent years, but anatoxin-a concentrations are not available for Klamath River monitoring sites.

C.6.2.3 Klamath River Estuary

Chlorophyll-*a* and algal toxin levels in the Klamath River Estuary are generally similar to those measured at stations just upstream. During 2006 to 2014, chlorophyll-*a* concentrations in the Klamath River Estuary were less than 5.0 ug/L from May to July (except for one measurement of 9.9 ug/L in July 2012), then ranged from 0.5 to 15.0 ug/L from August to October (Sinnott 2008, 2009a, 2009b, 2010b, 2011b, 2012b; Hanington and Torso 2013; Hanington and Stawasz 2014; Hanington and Cooper Carouseli 2014). Peak concentrations of chlorophyll-*a* during 2006 to 2014 occurred during late-July to mid-October and varied by year (2.4 ug/L in 2006, 15.0 ug/L in 2007).

Algal toxin concentrations in the Klamath River Estuary are generally below 4.0 ug/L, corresponding to relatively low concentrations of *Microcystis aeruginosa* with several exceptions (Fetcho 2006, 2007, 2008, 2009, 2011; Watercourse Engineering, Inc. 2011a, 2011b, 2012, 2013, 2014, 2015, 2016; Gibson 2016). In September 2007 and 2010 the Yurok Tribe issued advisories because *Microcystis aeruginosa* concentrations exceeded 40,000 cells/mL. In 2010 and 2011 measured microcystin concentrations exceeded 4.0 ug/L between September and October (Gibson 2016). Microcystin in the Klamath River Estuary (RM 0.5) exceeded 0.8 ug/L at least once every year in 2010 through 2012, but it did not exceed 0.8 ug/L in 2013 through 2015 (Gibson 2016). In one additional instance, in September 2005, concentrations exceeded the WHO guideline for low risk recreational use (20,000 cells/mL). These elevated levels of *Microcystis aeruginosa* corresponded with elevated levels measured farther upstream in Copco No. 1 and Iron Gate reservoirs (Kann and Corum 2006). Lastly, there is emerging evidence that algal toxins flushing from coastal rivers into Monterey Bay, California were responsible for numerous sea otter deaths in 2007 (Miller et al. 2010). While it is not known if conditions in Monterey Bay are similar to those in the Klamath River marine nearshore environment, there may be potential for microcystin to adversely impact marine organisms when large blooms are transported through the Klamath River Estuary and into the Pacific Ocean.

C.7 Inorganic and Organic Contaminants

C.7.1 Upper Klamath Basin

C.7.1.1 Hydroelectric Reach

Water Column Contaminants

Existing water quality data are available from the California Surface Water Ambient Monitoring Program (SWAMP), which collected water quality data, including inorganic and organic contaminant data, from 2001 through 2005 at eight monitoring sites from the Oregon-California state line (RM 214.1) to Klamath River at Klamath Glen (RM 5.9) (North Coast Regional Board 2008). Results from the state line site indicated that for the majority of inorganic constituents, excluding nutrients (i.e., arsenic, cadmium, chloride, chromium, copper, lead, mercury, nickel, selenium, silver, sulfate, and zinc), concentrations were in compliance with water quality objectives at the time of sampling. Nutrients are discussed above in Section C.3.1. Aluminum concentrations (50.7 to 99.2 ug/L) exceeded the USEPA continuous concentration for freshwater aquatic life protection (87 ug/L) on two of four site visits (50 percent exceedance rate), and exceeded the USEPA secondary Maximum Contaminant Level (MCL) for drinking water (50 ug/L) on all four site visits (100 percent exceedance rate) (North Coast Regional Board 2008). Grab samples were analyzed for 100 pesticides, pesticide constituents, isomers, or metabolites; 50 polychlorinated biphenyls (PCBs) congeners; and 6 phenolic compounds. Results indicated no PCBs detections, but one detection of dichlorodiphenyldichloroethylene (1,1-bis-(4-chlorophenyl)-2,2-dichloroethene or DDE) (25 percent of samples) and one detection of trans-nonachlor (25 percent of samples) were found (North Coast Regional Board 2008).

Sediment Contaminants

To investigate the potential for toxicity of the sediments trapped behind the Lower Klamath Project reservoirs, Shannon & Wilson, Inc. (2006) collected 25 cores from J.C. Boyle, Copco No. 1, and Iron Gate reservoirs during 2006 and analyzed them for contaminants including acid volatile sulfides, metals, pesticides, chlorinated acid herbicides, PCBs, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), cyanide, and dioxins. The locations of the sediment cores were distributed throughout each reservoir, including locations on the historical Klamath River channel (on-thalweg) and the surrounding submerged terraces or near tributary mouths (off-thalweg) along the edge of the historical Klamath River. Four locations on-thalweg were sampled in J.C. Boyle Reservoir, with maximum core depths ranging from 0.3 feet at the upstream end of the reservoir to 13.2 feet near the dam. Twelve locations (7 on-thalweg, 5 off-thalweg) were sampled in Copco No. 1 Reservoir, with maximum core depths ranging from 1.5 feet at the upstream end of the reservoir to 12.1 feet near the middle of the reservoir. Nine locations (5 on-thalweg, 4 off-thalweg) were sampled in Iron Gate Reservoir, with maximum core depths ranging from 0.7 feet at the upstream end of the reservoir to 7.8 feet within the Slide Creek/Camp Creek arm of the reservoir. During sediment core drilling, the

sediments were evaluated to distinguish recent reservoir-deposited sediment from pre-reservoir sediment with drilling logs noting the depth of different sediment horizons. Interval composite/depth interval sediment samples were generated from the sediment cores, including both the reservoir-deposited and pre-reservoir sediments, with the number of interval samples depending on the total depth of the sediment core. No herbicides or PCBs were found above U.S. Army Corps of Engineers (USACE) Puget Sound Dredged Disposal Analysis Program (PSDDA) screening levels and only one sample exceeded applicable PSDDA screening levels for VOCs ethyl benzenes and total xylenes (Shannon & Wilson, Inc. 2006). While cyanide was detected in two of three sediment cores, it was not found in toxic free cyanide form (HCN or CN^-), and it is not likely to be bioavailable or result in adverse effects on fish and other aquatic biota.

Dioxin, a known carcinogen, was measured in three samples from J.C. Boyle, Copco No. 1, and Iron Gate reservoirs. Dioxin is a collective term for a group of seventeen chemically-related dioxin and furan compounds: 2,3,7,8-TCDD, 1,2,3,7,8-PeCDD, 1,2,3,4,7,8-HxCDD, 1,2,3,6,7,8-HxCDD, 1,2,3,7,8,9-HxCDD, 1,2,3,4,6,7,8-HpCDD, OCDD, 2,3,7,8-TCDF, 1,2,3,7,8-PeCDF, 2,3,4,7,8-PeCDF, 1,2,3,4,7,8-HxCDF, 1,2,3,6,7,8-HxCDF, 2,3,4,6,7,8-HxCDF, 1,2,3,7,8,9-HxCDF, 1,2,3,4,6,7,8-HpCDF, 1,2,3,4,7,8,9-HpCDF, OCDF. Long-term exposure to dioxin in humans is linked to impairment of the immune system, the developing nervous system, the endocrine system and reproductive functions. The various dioxin and furan compounds have different relative toxicities, so a Toxic Equivalent Quotient (TEQ) is calculated by multiplying the measured concentrations of the individual compounds by its toxicity relative to 2,3,7,8-tetrachlorodibenzodioxin (2,3,7,8-TCDD) (i.e., its Toxicity Equivalent Factor) and summing the Toxicity Equivalent Factor weighted concentrations for each compound into one number that can be used to assess overall dioxin toxicity. A Toxic Equivalent Quotient (TEQ) is equal to a Toxic Equivalent Concentration and the two terms are used interchangeably in the literature, so they are both abbreviated as TEQ in this report. In the 2006 reservoir samples, measured levels were 2.48 to 4.83 pg/g TEQ (picograms per gram or parts per trillion [ppt] expressed as Toxic Equivalent Concentrations [TEQ] relative to 2,3,7,8 tetrachlorodibenzodioxin toxicity) and did not exceed USACE (1,000 pg/g TEQ), proposed freshwater sediment Apparent Effects Threshold for benthic fauna (8.8 pg/g TEQ), International Joint Commission for Great Lakes Science Advisory Board (10 pg/g TEQ), PSDDA bioaccumulation (15 pg/g TEQ), or U.S. Environmental Protection Agency fish and wildlife guidelines (2.5 to 210 pg/g TEQ) screening levels (Shannon & Wilson, Inc. 2006). More comprehensive reviews of dioxin guidelines and sediment studies from watersheds outside of the Klamath basin were conducted by Dillon (2008) and USEPA (2010), the latter presenting an estimate of background dioxin concentrations (2 to 5 ppt TEQ) for non-source-impacted sediments throughout the U.S. and specifically in the western U.S. (USEPA 2010). Based on the information presented in (USEPA 2010), in addition to being within the range of natural background, Klamath dioxin sediment levels reported by Shannon & Wilson, Inc. (2006) are one to three

orders of magnitude below risk-based USEPA (1,000 pg/g dry weight [DW], TEQ) preliminary remediation goals in residential soils, and Washington Department of Ecology (11 pg/g DW TEQ) for residential soil clean-up levels (USEPA 2010). They are also generally an order of magnitude below USEPA effects-based ecological receptors thresholds (60 to 100 pg/g DW TEQ for fish; 2.5 to 25 pg/g DW TEQ for mammals; 21 to 210 pg/g DW TEQ for birds).

While the existing sediment data (Shannon & Wilson, Inc. 2006) did not indicate a high risk of sediment toxicity, it was not sufficient to evaluate all analytes of interest. Thus, as part of the Secretarial Determination studies, a sediment evaluation was undertaken during 2009 to 2011 to provide a more comprehensive data set to further guide decisionmakers in an evaluation of potential impacts from dam removal. The United States Bureau of Reclamation (USBR) and USFWS plan expanded the number of sediment cores and the analyte suite examined, including chemicals likely to bioaccumulate, and included biological and elutriate tests (USBR 2010). In 2009 to 2011 evaluation, establishment of toxicity and/or bioaccumulative potential for sediment contaminants relied upon thresholds developed through regional and state efforts such as the 2009 Sediment Evaluation Framework (SEF) for the Pacific Northwest Oregon and ODEQ bioaccumulation screening level values (SLVs). Sediment cores were collected during 2009 to 2010 at 37 sites on the historical Klamath River channel (on-thalweg) and the surrounding submerged terraces or near tributary mouths along the edge of the historical Klamath River (off-thalweg), distributed throughout J.C. Boyle Reservoir (Figure 2.6-4), Copco No. 1 Reservoir (Figure 2.6-5), Iron Gate Reservoir (Figure 2.6-6), and the Klamath River Estuary (**Figure**) (USBR 2010, 2011). Twelve sites (7 on-thalweg, 5 off-thalweg) were sampled in J.C. Boyle Reservoir, with maximum core depths ranging from 0.3 feet near the middle of the reservoir to 18.7 feet near the dam. Twelve sites (7 on-thalweg, 5 off-thalweg) were sampled in Copco No. 1 Reservoir, with maximum core depths ranging from 1.2 feet on an off-thalweg site downstream of the Beaver Creek arm of the reservoir to 9.7 feet on an off-thalweg location upstream of the Beaver Creek arm of the reservoir. Thirteen sites (8 on-thalweg, 5 off-thalweg) were sampled in Iron Gate Reservoir, with maximum core depths ranging from 0.5 feet at the upstream end of the reservoir to 7.7 feet within the Jenny Creek arm of the reservoir. At each site, cores were inspected by on-site geologists to verify that the reservoir-deposited/pre-reservoir sediment contact had been reached for each core. Sediment cores were used to either create whole core composite sediment samples or interval composite/depth interval composite sediment samples for laboratory analysis of potential contaminants with samples representing both the reservoir-deposited and pre-reservoir sediments. Area composite samples were also generated from sediment cores for the Klamath River Estuary. A total of 77 sediment samples were created to analyze sediment conditions in J.C. Boyle Reservoir (26 sediment samples), Copco No. 1 Reservoir (25 sediment samples), Iron Gate Reservoir (24 sediment samples), and the Klamath River Estuary (2 sediment samples) from the 37 sediment cores (USBR 2011).

A total of 501 analytes were quantified across the samples, including metals, poly-aromatic hydrocarbons (PAHs), PCBs, pesticides/herbicides, phthalates, VOCs, SVOCs, dioxins, furans, and polybrominated diphenyl ethers (PBDEs) (i.e., flame retardants). The chemical composition of sediment and elutriate[112] sediment samples were analyzed, and bioassays were conducted on the sediment and elutriate sediment samples using fish and invertebrate national benchmark toxicity species. Using results of these analyses, the following five exposure pathways were evaluated under Level 2A and 2B of the SEF using multiple lines of evidence: (CDM 2011):

- Pathway 1 – Proposed Project - Short-term water column exposure for aquatic biota from sediments flushed downstream (suspended sediments, not a bioaccumulation issue).
- Pathway 2 – Proposed Project - Long-term sediment exposure for riparian biota and humans from reservoir terrace deposits and river bank deposits (terrestrial exposures).
- Pathway 3 – Proposed Project - Long-term sediment exposure for aquatic biota and humans from river bed deposits (aquatic exposures).
- Pathway 4 – Proposed Project - Long-term sediment exposure for aquatic biota from estuary and marine near shore deposits.
- Pathway 5 – No Project Alternative - Long-term sediment exposure for aquatic biota and humans (via fish consumption) to reservoir sediments.

Results indicate that sediment in all three reservoirs exceeded freshwater ecological screening levels (SLs) for nickel, iron, and 2,3,4,7,8-Pentachlorodibenzofuran (PECDF) (Table C-6). Sediment in J.C. Boyle Reservoir also exceeded freshwater ecological SLs for 4,4'-Dichlorodiphenyltrichloroethane (DDT), 4,4'-Dichlorodiphenyldichloroethane (DDD), 4,4'-dichlorodiphenyldichloroethylene (DDE), dieldrin, and 2,3,7,8-Tetrachlorodibenzodioxin (TCDD) (Table C-6). Several pesticides and semi-volatile organic compounds (SVOCs) were not detected in the reservoir sediments, but the reporting limits were above the freshwater SLs. Human health SLs were only exceeded for arsenic and nickel, pentachlorophenol (in the case of J.C. Boyle Reservoir), and some legacy pesticides (e.g., 4,4'-DDT, 4,4'-DDD, 4,4'-DDE, dieldrin, see Table C-7). Several dioxin-like compounds were detected and exceeded the ODEQ Bioaccumulation SLVs (Table C-7). Several pesticides and SVOCs were not detected, but the reporting limits were above the

[112] Elutriate sediment samples are created from reservoir composite sediment samples mixed with reservoir water (e.g., one part sediment to four parts water). In general, elutriate tests are a standard approach that analyze the chemical composition of the overlying water of the elutriate sediment samples to estimate potential chemical concentrations that may be released into the water from reservoir sediments during suspension. Standard elutriate tests do not reflect the full dilution of re-suspended sediments that would occur during dam removal.

human health SLs (Table C-7). Marine ecological SLs were only exceeded for dieldrin and 2,3,4,7,8-PECDF in J.C. Boyle Reservoir (see Table C-8). Several organic compounds were not detected, but the reporting limits were above the available marine SLs (Table C-8). Analytes that were not detected but had reporting limits above freshwater or marine SLs were listed as chemicals of potential concern (COPCs) and analyzed in macroinvertebrate and/or fish tissue bioaccumulation tests to evaluate any effects from those chemicals potentially being in the sediment. No consistent pattern of elevated chemical composition was observed across discrete sampling locations within a reservoir, but sediment in J.C. Boyle Reservoir does have marginally higher iron concentrations and more detected COPCs as compared to Copco No. 1 and Iron Gate Reservoir and Klamath River Estuary sediments (CDM 2011). Also, J.C. Boyle reservoir has more COPCs based on comparison to CalEPA, National Oceanic and Atmospheric Administration (NOAA), U.S. Fish and Wildlife Service (USFWS), USEPA, and ODEQ freshwater ecological and human health SLs.

Analysis of the 2009 to 2010 USBR collected sediment core results (USBR 2010, 2011) from J.C. Boyle, Copco No. 1, and Iron Gate reservoirs and the Klamath River Estuary indicate that total chromium and total nickel concentrations are higher in estuary sediments than in Lower Klamath Project reservoir sediments, but total arsenic, total copper, and total lead concentrations are higher in reservoir sediments than estuary sediments (Eagles-Smith and Johnson 2012). Total arsenic concentrations in the reservoir sediments samples range from 4.3 to 15 milligrams per kilogram, dry weight (mg/kg) in J.C. Boyle Reservoir, 6.3 to 13 mg/kg in Copco No. 1 Reservoir, and 7.4 to 10 mg/kg in Iron Gate Reservoir. Peak total copper concentrations in Lower Klamath Project reservoir sediments (9.8 to 38 mg/kg) are greater than total copper concentrations in Klamath River Estuary sediments (19 to 26 mg/kg) (Eagles-Smith and Johnson 2012). Total lead concentrations in reservoir sediments range from 2.8 to 25 mg/kg in J.C. Boyle Reservoir, 6.4 to 10 mg/kg in Copco No. 1 Reservoir, and 5.1 to 11 mg/kg in Iron Gate Reservoir (USBR 2011).

Comparison of the measured total arsenic, total copper, and total lead concentrations with the relevant human-health screening levels show that only total arsenic concentrations exceed USEPA total carcinogenic residential screening levels (0.39 mg/kg), USEPA total non-carcinogenic residential screening levels (22 mg/kg), and CalEPA California Human Health residential (0.07 mg/kg) and commercial (0.24 mg/kg) screening levels. Peak total copper concentrations are approximately two to three orders of magnitude less than USEPA total non-carcinogenic residential screening levels (3,100 mg/kg) and CalEPA California Human Health residential (3,000 mg/kg) and commercial (38,000 mg/kg) screening levels. Total lead concentrations are consistently less than USEPA total non-carcinogen residential screening levels (400 mg/kg) and CalEPA California Human Health residential (80 mg/kg) and commercial (320 mg/kg) screening levels (CDM 2011). There are no USEPA total carcinogenic residential screening levels for copper or lead.

Comparison of the measured total arsenic, total copper, and total lead concentrations with the relevant ecological screening levels shows that total arsenic and total copper concentrations exceeded some ecological screening levels, but total lead concentrations remained below the most stringent freshwater and marine ecological screening level (**freshwater**: Lowest Effect Level [31 mg/kg]; **marine**: T20 [chemical concentration corresponding to 20 percent probability of observing toxicity] [30 mg/kg]). Total arsenic concentrations in Lower Klamath Project reservoir and Klamath River Estuary sediments only exceeded lower NOAA Screen Quick References Table (SQuiRT) freshwater and marine screening levels for arsenic in sediment (**freshwater**: Threshold Effect Concentrations [9.79 mg/kg], Threshold Effects Level [5.9 mg/kg], Lowest Effect Level [6 mg/kg]; **marine**: T20 [chemical concentration corresponding to 20 percent probability of observing toxicity] [7.4 mg/kg], Threshold Effects Level [7.24 mg/kg], Effects Range-Low [8.2 mg/kg]) with no measured total arsenic concentrations in reservoir or estuary sediments above freshwater or marine probable effects concentrations (**freshwater**: Probable Effect Concentrations [33mg/kg], Severe Effect Level [33 mg/kg], Probable Effect Level [17 mg/kg]; **marine**: T50 [chemical concentration corresponding to 50 percent probability of observing toxicity] [20 mg/kg], Probable Effect Level [41.6 mg/kg], Effects Range-Medium [70 mg/kg]). Total copper concentrations in Lower Klamath Project reservoir and Klamath River Estuary sediments also only exceeded lower NOAA Screen Quick References Table (SQuiRT) freshwater and marine screening levels for copper in sediment (**freshwater**: Threshold Effect Concentrations [31.6 mg/kg], Threshold Effects Level [37.3 mg/kg], Lowest Effect Level [16 mg/kg]; **marine**: T20 [chemical concentration corresponding to 20 percent probability of observing toxicity] [32 mg/kg], Threshold Effects Level [18.7 mg/kg], Effects Range-Low [34 mg/kg]) with no measured total copper concentrations in reservoir or estuary sediments above freshwater or marine probable effects concentrations (**freshwater**: Probable Effect Concentrations [149 mg/kg], Probable Effect Level [197 mg/kg]; **marine**: T50 [chemical concentration corresponding to 50 percent probability of observing toxicity] [94 mg/kg], Probable Effect Level [108 mg/kg]).

Note that while total metal concentrations were measured in the existing sediment cores, metals are typically bound to fine sediments and exhibit limited bioavailability or aquatic toxicity. The amount of bioavailable metals released by sediments may vary significantly depending on the sediment (surface area, availability of sorption sites, organic material, and clay content) and water properties (temperature, dissolved organic compounds, suspended particles, pH, various inorganic cations and anions like those composing hardness and alkalinity) (USEPA 2007).

Several chemicals identified as COPCs may occur in reservoir sediments at concentrations similar to background levels, however, background concentrations of most chemicals associated with Lower Klamath Project reservoir sediments are generally unavailable for the Klamath Basin. Arsenic

concentrations in measured reservoir sediments (4.3 to 15 mg/kg) were within the range of arsenic concentrations measured in soil samples from the Mid- and Lower Klamath Basin (0.8 to 23 mg/kg with typical arsenic concentrations between approximately 2.0 and 7.0 mg/kg) (USGS NGS 2008) and arsenic may be naturally elevated in the Upper Klamath Basin, with average regional background arsenic concentrations of 3.99 mg/kg ± 5.03 mg/kg in the vicinity of the Upper Klamath Lake (Sturdevant 2010; ODEQ 2013; Sullivan and Round 2016). Suitable background sites characterized by similar sediment compositions as the Lower Klamath Project reservoirs, but without the same potential chemical sources (e.g., urban areas, irrigated agriculture, industry, and hydroelectric development), could not be identified (CDM 2011).

Overall, there were relatively few chemicals in sediment from the three reservoirs (and the Klamath River Estuary) identified as COPCs, with several COPCs being listed for the reservoirs only because the reporting limits were greater than freshwater or marine SLs. Analytical testing methods for chemicals were selected to achieve a reporting limit 3 to 5 times lower than the lowest applicable sediment screening level or water quality criteria. Despite this, due to limitations of the standard methods, several reporting limits were greater than the associated SLs and other reporting limits were not achieved due to background effects of the sample matrix or required sample dilutions (USBR 2011). However, as part of multiple lines of evidence (see *Contaminants in Aquatic Biota* below), CDM (2011) concluded that the sediment quality of reservoirs does not appear to be notably contaminated based on the detected COPCs in reservoir sediments and comparisons to ecological freshwater and marine SEF, USACE Dredge Material Management Program (DMMP), NOAA Screening Quick Reference Tables (SQuiRT), and ODEQ bioaccumulative SLs along with comparisons to human health SLs, including USEPA residential (total carcinogenic and total non-carcinogenic) regional screening levels (RSLs), CalEPA OEHHA California Human Health Screening Levels (CHHSLs), or ODEQ bioaccumulation (human subsistence and human general) SLs.

Updates to SEF Screening Levels

In 2015, new SEF SLs were implemented by the RSET to replace the 2009 SEF SLs. RSET undertook a range of updates to the various SEF SLs, including increasing SLs, decreasing SLs, adding SLs for new chemicals, and removing SLs for chemicals listed in the 2009 SEF SLs (RSET 2009, 2018). The majority of the changes to the SLs were updates to the freshwater SEF SLs with only a few updates to the marine SEF SLs (e.g., the marine SL for DDT was revised from 34 ug/kg in 2009 to 12 ug/kg in 2018). The 2009 Pacific Northwest SEF freshwater SLs and the updated freshwater SLs detailed in the 2018 Pacific Northwest SEF are presented in Table C-9. While the value of SLs for some analytes changed between the 2009 and 2018 SEF, the changes in SLs did not alter the detected COPC list determined by CDM (2011) or the resulting analysis, since the detected COPCs were not listed only in reference to the SEF SLs. More specifically, a decrease in the lower SEF SL (SL1) for nickel between the

2009 and 2018 SEF did not change its classification in the COPC list, because nickel had already been identified as a COPC in the CDM (2011) analysis for exceedances of the FWS TEL, FWS LEL, and FWS TEC screening values. Nickel concentrations measured in reservoir sediments (18 to 33 mg/kg) were occasionally above the nickel 2018 SEF lower SL (26 mg/kg), so exceedances of the 2018 SEF lower SL would be added to the list of reasons why nickel is listed as a COPC for the reservoir sediment. While the chromium SEF SLs decreased, chromium concentrations in reservoir sediments were still below chromium 2018 SEF SLs, so it is still not a COPC for reservoir sediments. Selenium was added to the list of 2018 SEF SLs, but selenium concentrations measured in reservoir sediments were less than the 2018 SEF SLs and it would not be a COPC.

As some SEF SLs are less than the laboratory reporting limit, the COPCs listed in CDM (2011) would change with application of the 2018 SEF SLs for the following reasons:

1. an SL no longer applied for a chemical in the 2018 SEF SL;
2. an SL was added for a new chemical and the USBR (2011) reporting limit for that chemical was less than the 2018 SEF SL; or
3. an SL was added for a new chemical and the chemical had not been tested in the USBR (2011) analysis of reservoir sediments.

Analyte-specific details are provided below.

The 2009 SEF SLs for PAHs no longer appear in the 2018 SEF SLs, so they would be removed from the COPC list. Total PAHs would be added to the COPC list, because it is a new analyte in the 2018 SEF SLs and the total PAHs were not measured as part of the USBR (2011) tests. While individual PAHs were measured in reservoir sediment testing and the range of the reporting limits for individual PAHs (6.7 to 1,200 ug/kg) were below the total PAHs 2018 SEF lower SL (17,000 ug/kg), total PAHs were not measured and would need added to the COPC list. Similarly, individual aroclors (e.g., aroclor 1221) would be removed from the COPC list and total aroclors would be added to the COPC list since it was not measured as part of the USBR (2011) testing.

The 2018 SEF added SLs for several organochlorine pesticides (i.e., 4-4’-DDD, 4-4’-DDE, 4-4’-DDT, dieldrin, beta-hexachlorocyclohexane, and endrin ketone). UBSR (2011) testing did not detect any of these chemicals in reservoir sediments and the reporting limits for these chemicals were above the 2018 SEF SL, so 4-4’-DDD, 4-4’-DDE, 4-4’-DDT, dieldrin, beta-hexachlorocyclohexane, and endrin ketone would not need to be added to the COPC list based on 2018 SEF SLs.

The 2018 SEF revised the SLs for phthalates (Bis(2-ethylhexyl) phthalate and Di-N-octyl phthalate), removed SLs for phthalates (Butyl benzyl phthalate and Dimethyl phthalate), and added SLs for phthalates (Di-n-butyl-phthalate). None of the phthalates were detected in reservoir sediments above the reporting limit, but all the phthalates with 2018 SEF SLs would be retained or added to the

COPC list since their reporting limit was below the 2018 SEF SLs. The phthalates without 2018 SEF SLs (Butyl benzyl phthalate and Dimethyl phthalate) would be removed from the COPC list.

The 2018 SEF added SLs for several SVOC phenols (Phenol, 4-Methylphenol, and Pentachlorophenol). Pentachlorophenol was not detected in USBR (2011) reservoir sediments and the reporting limit was below the 2018 SEF SLs, so it would not need to be added to the COPC list. Phenol and 4-Methylphenol were not detected in reservoir sediments, but the reporting limit was greater than the 2018 SEF SLs, so it would be added to the COPC list.

SLs were also added in the 2018 SEF for the extractable compounds benzoic acid, carbazole, and dibenzofuran. These three chemicals were not detected in USBR (2011) sediment tests, but the range of reporting limits was greater than the 2018 SEF SLs. As such, they would be added to the COPCs list.

Several new chemicals were added to the list of chemicals with 2018 SEF SLs that had not been previously considered or measured in USBR (2011) reservoir sediments tests. Butyltins are a group of organotin compounds used as stabilizers for polyvinyl chloride (PVC), biocides, fungicides, and anti-biofouling agents, especially used in coatings and paints applied to the bottom hull of ships to minimize biofouling (USEPA 2003; RSET 2018). Tributyltin is the primarily form of butyltin of concern in the environment due to its use as an anti-biofouling agent in paints for large ships with other forms (mono-, di-, and tetra-butyltin) occurring as byproducts as tributyltin breaks down. Elevated concentrations of butyltins in fresh and salt waters, sediments, and biota are primarily associated with harbors, marinas, boat yards, and dry docks with frequent ship traffic, but use of butyltin as an anti-biofouling agent on nets, crab pots, docks, and water cooling towers also contributes to its presence in aquatic environments (WHO 1999; USEPA 2003). According to RSET (2018), the need for analysis of butyltins (and other organotins) is limited to areas and sites affected by vessel maintenance and construction activities, marine shipping, and frequent vessel traffic (e.g., shipyards, boatyards, marinas, and marine terminals). Conditions in the Hydroelectric Reach of the Klamath River and upstream reaches did not support these activities historically and currently the reservoirs do not experience frequent large vessel traffic, therefore the site-specific SEF butyltin SLs would not apply to the Lower Klamath Project.

Total Petroleum Hydrocarbons (TPHs) represent gasoline, diesel, and other petroleum hydrocarbon compounds (e.g., motor oil or grease). While many other individual hydrocarbons that are present in gasoline, diesel, and petroleum products (e.g., PAHs, VOCs, SVOCs) were measured by USBR (2011), the overarching TPH test was not performed, thus TPHs would need to be added to the COPC list.

While the COPCs list would change due to the changes in SLs between the 2009 SEF and 2018 SEF, the previous CDM (2011) analysis of the five exposure pathways still sufficiently analyzes the potential effects of chemicals in Lower Klamath Project reservoir sediments through sediment toxicity and bioaccumulation tests for macroinvertebrates and/or fish. Since the sediment toxicity and bioaccumulation tests were performed using sediment samples from the Lower Klamath Project reservoirs, the results quantify the integrative (cumulative) effects of all COPCs in the reservoir sediments, even if the full updated list of COPCs was not included in the CDM (2011) analysis. Additionally, SEF SLs were only one of three ecological freshwater sediment SLs used in the original analysis, so the other SLs (USACE DMMP, NOAA SQuiRT, and ODEQ bioaccumulation) ensure that the CDM (2011) analysis sufficiently assessed the inorganic and organic contaminants in reservoir sediment that may impact freshwater aquatic species. Finally, SEF SLs were not used as human health screening levels, so the changes in the SEF SLs would not alter the CDM (2011) analysis with respect to reservoir sediments on human health.

Updates to U.S. EPA National Recommended Water Quality Criteria
In 2015, the USEPA published an update to its National Recommended Water Quality Criteria (NRWQC) for human health, with the 2015 NRWQC updating the criteria of 94 chemicals from the previous 2002 NRWQC (USEPA 2002, 2015a, 2015b). While analysis of sediment screening levels and the COPC list directly evaluated inorganic and organic contaminants in the reservoirs sediments and the overall sediment quality of reservoirs, the NRWQC was one of six sets of human health water quality criteria used to assess human exposure to chemicals from consumption of water and organisms or the consumption of organisms only. In other words, sediment screening levels were used to assess measurements of contaminants in the reservoir sediments, while NRWQC were used to assess potential chemical concentrations released into the water column from reservoir sediments during suspension. The changes in the human health NRWQC between 2015 and the previous criteria reflected updates to exposure inputs, bioaccumulation factors, health toxicity values, and relative source contributions. The 2015 update to the NRWQC typically decreased the water quality criteria for chemicals with previously established water quality criteria, but it also added water quality criteria for several chemicals (USEPA 2015b). A comparison of the 2015 NRWQC and the previous NRWQC for human health is shown below in Table C-9-A.

Variations in the NRWQC for human health between the 2015 update and the previous water quality criteria would not alter the CDM (2011) analysis or conclusions on the potential toxicity associated with water column exposure under a dam removal scenario. As previously mentioned, NRWQC were one of six sets of human health water quality criteria (i.e., California Department of Public Health California Code of Regulations, California Basin Plan, NRWQC, California Ocean Plan, ODEQ Human Health, and ODEQ Water Quality) evaluated by CDM (2011). Multiple NRWQC used in CDM (2011) were less

stringent than the other water quality criteria used and the updated 2015 NRWQC are still less stringent than some of the other water quality criteria. In these instances, variations in the NRWQC between 2015 and the previous criteria would not alter the assessment of reservoir sediments since a more stringent water quality criterion was the basis of the analysis and conclusions by CDM (2011). Additionally, the majority of the chemicals in the updated 2015 NRWQC were part of the previous NRWQC, so the 2009 – 2010 USBR Sediment Chemistry Investigation (USBR 2011) included the relevant chemicals in reservoir sediment testing; the chemicals were not detected during measurements of elutriate chemical concentrations; and the CDM (2011) analysis included these results in its assessment of the potential human exposure to inorganic and organic contaminants under a dam removal scenario. Three chemicals in the 2015 NRWQC did not exist in the previous NRWQC (i.e., 1,1,2,2-tetrachloroethane, pentachlorobenzene, pentachlorophenol). However, pentachlorophenol was part of the California Basin Plan water quality criteria, so it was tested as part of the 2009 – 2010 USBR Sediment Chemistry Investigation. Pentachlorophenol was not detected in elutriate measurements (i.e., less than the reporting limit) (USBR 2011). The two chemicals 1,1,2,2-tetrachloroethane, pentachlorobenzene were not measured by elutriate testing in the 2009 – 2010 USBR Sediment Chemistry Investigation. However, 1,1,2,2-tetrachloroethane was included in the reservoir sediment testing and it was not detected (i.e., less than the reporting limit) (USBR 2011).

It is not possible to directly confirm that chemicals are above or below 2015 NRWQC for human health for the two chemicals that were not measured in elutriate testing (i.e., 1,1,2,2-tetrachloroethane and pentachlorobenzene) or the chemicals with applicable 2015 NRWQC less than the laboratory analytical reporting limits (i.e., the standard laboratory tests used could not measure whether the analytes were present above NRWQC because the smallest amount the laboratory tests could detect [i.e., the reporting limit] for those analytes was greater than the NRWQC itself). Under a dam removal scenario, the potential human exposure to chemicals in the new 2015 NRWQC that were not measured in 2009 and 2010 elutriate testing or to chemicals with NRWQC less than reporting limits would be limited to the duration SSCs in the Klamath River are above background conditions. Additionally, the NRWQC are based on human exposure by consuming water and organisms (e.g., drinking water and eating fish or mussels exposed to the chemicals) or consuming organisms only (e.g., eating fish exposed to the chemicals), so potential human exposure would be further limited by the likelihood of individuals drinking water or consuming organisms during the period when SSCs in the Klamath River are above background concentrations. Furthermore, potential human exposure to chemicals in the water column under a dam removal scenario were assessed in CDM (2011) using five other sets of human health water quality criteria along with toxicity bioassays, so the 2015 update to the NRWQC for human health would not be expected to alter the overall CDM (2011) analysis or conclusions.

Sediment toxicity and bioaccumulation tests
Toxicity equivalent quotients (TEQs) were calculated for dioxin, furan, and dioxin-like PCBs in reservoir sediment samples to evaluate potential adverse effects from exposure to dioxin, furan, and dioxin-like PCBs. TEQs ranged from approximately 4 to 9 pg/g for J.C. Boyle Reservoir, 5 to 10 pg/g for Copco No. 1 Reservoir, and 2 to 4 pg/g for Iron Gate Reservoir. In some cases, these values are slightly higher than background values reported by USEPA for Region 9 (i.e., 2 to 5 pg/g), Region 10 (i.e., 4 pg/g), and for non-impacted lakes of the United States (i.e., 5.3 pg/g) (USEPA 2010, CDM 2011). The calculated TEQs may also be within the range of local background values. Since the TEQs are only slightly above regional background concentrations and the nationwide background for non-impacted lakes, they have limited potential for adverse effects for fish exposed to reservoir sediments (CDM 2011).

Toxicity tests generally indicated low potential for sediment toxicity to benchmark benthic indicator species since the 10-day survival of these species in reservoir sediments was similar compared to laboratory controls, except in a single sample from J.C. Boyle Reservoir, where a decrease in survival of the benthic midge *Chironomus dilutus* in the reservoir sediment sample (64 percent) (compared to the laboratory control at 95 percent) indicated a moderate potential for sediment toxicity (CDM 2011). Additional bioaccumulation tests of reservoir sediment samples using two benthic organisms (i.e., *Corbicula fluminea* [Asian clams] and *Lumbricula variegates* [blackworms]) showed 100 percent survival with minimal weight changes in J.C. Boyle Reservoir sediments over the 28-day bioaccumulation test period, further supporting the conclusion that there was generally low potential for sediment toxicity to benthic species from reservoir sediments. Results of elutriate chemistry and elutriate toxicity tests on rainbow trout (*Oncorhynchus mykiss*) are discussed as part of the Proposed Project potential impact analysis (Section 3.2.5.7 *Inorganic and Organic Contaminants*). Collectively, the elutriate chemistry and elutriate toxicity test results do not identify a consistent pattern of toxicity by location, representative organism, or conditions.

Overall, twenty lines of evidence were used with various lines of evidence integrated to evaluate the five exposure pathways and to draw conclusions regarding potential adverse effects from the chemicals present in the reservoir sediments (Table C-10). Lines of evidence related to contaminants in aquatic biota are detailed and discussed together below. Based on these twenty lines of evidence from the 2009 to 2010 Secretarial Determination study, reservoir sediments do not appear to be highly contaminated (CDM 2011). No consistent pattern of elevated chemical composition is observed across discrete sampling locations within a reservoir. No single reservoir was observed to be consistently more or less contaminated based on these 20 lines of evidence. Where elevated concentrations of chemicals in sediment are found, the degree of exceedance based on comparisons of measured (i.e., detected) chemical concentrations to

SLs is small, and in several cases, may reflect regional background conditions (CDM 2011).

Table C-6. Chemicals in Sediment that Exceed One or More Freshwater Sediment Screening Levels. Source: CDM (2011).

Chemical	COC Based on Detect (D) or Elevated Reporting Limit (RL)	Units	Range of Detections for Detected Analytes that Exceed One or More Screening Levels	Range of Reporting Limits (RL) for Non-Detects	Ratio of Maximum Chemical Concentration to SL for Detected Analytes[a]	Screening Values Exceeded	Highest of Screening Value Hierarchy Level[b]
J.C. Boyle Reservoir							
Nickel	D	mg/kg	19–32	---	2 [c]	FWS TEL, **FWS LEL** [c], FWS TEC	2d [c]
4,4-DDD	D	ug/kg	3.7	---	9.5	ODEQ Bioacc SLV	2c
4,4-DDE	D	ug/kg	3.4	---	8.7	ODEQ Bioacc SLV	2c
4,4-DDT	D	ug/kg	4.1	---	11	ODEQ Bioacc SLV	2c
Dieldrin	D	ug/kg	3.4	---	1.5–9.2	FWS TEL, FWS LEL, FWS TEC, **ODEQ F-FW, ODEQ B-I**, ODEQ B-P, ODEQ M-I, ODEQ M-P	2c
2,3,4,7,8-PECDF	D	pg/g	1.5–1.5	---	1.4–8.8	**ODEQ F-FW**, ODEQ B-I, **ODEQ M-I**	2c
2,3,7,8-TCDD	D	pg/g	0.19	---	3.7	ODEQ M-I	2c
Iron	D	mg/kg	21,000–37,000	---	1.85	FWS LEL	2d
Cadmium	RL	mg/kg	---	0.16–0.84	---	SEF-SL1	2a
Aroclor 1221	RL	ug/kg	---	0.24–0.49	---	SEF-SL1 (total PCBs)	2a
Aroclor 1232	RL	ug/kg	---	0.16–0.24	---	SEF-SL1 (total PCBs)	2a
Aroclor 1242	RL	ug/kg	---	0.045–0.24	---	SEF-SL1 (total PCBs)	2a

Chemical	COC Based on Detect (D) or Elevated Reporting Limit (RL)	Units	Range of Detections for Detected Analytes that Exceed One or More Screening Levels	Range of Reporting Limits (RL) for Non-Detects	Ratio of Maximum Chemical Concentration to SL for Detected Analytes[a]	Screening Values Exceeded	Highest of Screening Value Hierarchy Level[b]
Aroclor 1248	RL	ug/kg	---	0.045–0.24	---	SEF-SL1 (total PCBs)	2a
Aroclor 1254	RL	ug/kg	---	0.045–0.24	---	SEF-SL1 (total PCBs)	2a
Aroclor 1260	RL	ug/kg	---	0.045–0.24	---	SEF-SL1 (total PCBs)	2a
Bis(2-ethylhexyl)phthalate	RL	ug/kg	---	230–1200	---	SEF-SL1	2a
Butyl benzyl phthalate	RL	ug/kg	---	230–1200	---	SEF-SL1	2a
Dimethyl phthalate	RL	ug/kg	---	230–1200	---	SEF-SL1	2a
Di-n-octyl phthalate	RL	ug/kg	---	230–1200	---	SEF-SL1	2a
2-METHYLNAPHTHALENE	RL	ug/kg	---	230–1200	---	SEF-SL1	2a
ACENAPHTHENE	RL	ug/kg	---	230–1200	---	SEF-SL1	2a
ACENAPHTHYLENE	RL	ug/kg	---	230–1200	---	SEF-SL1	2a
BENZO(K)FLUORANTHENE	RL	ug/kg	---	230–1200	---	SEF-SL1	2a
DIBENZ(A,H)ANTHRACENE	RL	ug/kg	---	230–1200	---	SEF-SL1	2a
DIBENZOFURAN	RL	ug/kg	---	230–1200	---	SEF-SL1	2a
FLUORENE	RL	ug/kg	---	230–1200	---	SEF-SL1	2a
Chlordane (Technical)	RL	ug/kg	---	4.5–24	---	ODEQ Bioacc SLV	2c
Chlordane-Alpha	RL	ug/kg	---	0.9–4.9	---	ODEQ Bioacc SLV	2c
Chlordane-Gamma	RL	ug/kg	---	0.9–4.9	---	ODEQ Bioacc SLV	2c
Dieldrin	RL	ug/kg	---	0.9–4.9	---	ODEQ Bioacc SLV	2c
BHC-Gamma (HCH-gamma, Lindane)	RL	ug/kg	---	0.9–4.9	---	SQuiRTs (TEL, LEL, PEL, TEC)	2d

Chemical	COC Based on Detect (D) or Elevated Reporting Limit (RL)	Units	Range of Detections for Detected Analytes that Exceed One or More Screening Levels	Range of Reporting Limits (RL) for Non-Detects	Ratio of Maximum Chemical Concentration to SL for Detected Analytes[a]	Screening Values Exceeded	Highest of Screening Value Hierarchy Level[b]
Endrin	RL	ug/kg	---	0.9–4.9	---	SQuiRTs (TEL, LEL, TEC)	2d
Heptachlor	RL	ug/kg	---	0.9–4.9	---	SQuiRTs (TEL, LEL, TEC)	2d
Heptachlor Epoxide	RL	ug/kg	---	0.9–4.9	---	SQuiRTs (TEL, PEL, TEC)	2d
Toxaphene	RL	ug/kg	---	45–240	---	SQuiRTs (TEL)	2d
Copco No. 1 Reservoir							
Nickel	D	mg/kg	22–32	---	2 [c]	FWS TEL, **FWS LEL** [c], FWS TEC	2d [c]
2,3,4,7,8-PECDF	D	pg/g	1.8–1.9	---	1.7–11.2	**ODEQ F-FW, ODEQ B-I, ODEQ M-I**	2c
Iron	D	mg/kg	21,000–24,000	---	1.2	FWS LEL	2d
SILVER	RL	mg/kg	---	1.8–2.4	---	SEF-SL1	2a
AROCLOR 1221	RL	ug/kg	---	0.24–0.3	---	SEF-SL1 (total PCBs)	2a
AROCLOR 1232	RL	ug/kg	---	0.12–0.15	---	SEF-SL1 (total PCBs)	2a
BIS(2-ETHYLHEXYL) PHTHALATE	RL	ug/kg	---	580–730	---	SEF-SL1	2a
BUTYL BENZYL PHTHALATE	RL	ug/kg	---	580–730	---	SEF-SL1	2a
DIMETHYL PHTHALATE	RL	ug/kg	---	580–730	---	SEF-SL1	2a

Chemical	COC Based on Detect (D) or Elevated Reporting Limit (RL)	Units	Range of Detections for Detected Analytes that Exceed One or More Screening Levels	Range of Reporting Limits (RL) for Non-Detects	Ratio of Maximum Chemical Concentration to SL for Detected Analytes[a]	Screening Values Exceeded	Highest of Screening Value Hierarchy Level[b]
DI-N-OCTYL PHTHALATE	RL	ug/kg	---	580–730	---	SEF-SL1	2a
2-METHYLNAPHTHALENE	RL	ug/kg	---	580–730	---	SEF-SL1	2a
ACENAPHTHYLENE	RL	ug/kg	---	580–730	---	SEF-SL1	2a
BENZO(K)FLUORANTHENE	RL	ug/kg	---	580–730	---	SEF-SL1	2a
DIBENZOFURAN	RL	ug/kg	---	580–730	---	SEF-SL1	2a
4,4'-DDE	RL	ug/kg	---	2.4–3	---	SQuiRTs (TEL)	2d
4,4'-DDT	RL	ug/kg	---	2.4–3	---	SQuiRTs (TEL)	2d
BHC-gamma (HCH-gamma, Lindane)	RL	ug/kg	---	2.4–3	---	SQuiRTs (TEL, PEL, TEC)	2d
CHLORDANE (TECHNICAL)	RL	ug/kg	---	12–15	---	SQuiRTs (TEL, LEL, PEL, TEC)	2d
DIELDRIN	RL	ug/kg	---	2.4–3	---	SQuiRTs (TEL, LEL, TEC)	2d
ENDRIN	RL	ug/kg	---	2.4–3	---	SQuiRTs (TEC)	2d
HEPTACHLOR	RL	ug/kg	---	2.4–3	---	SQuiRTs (TEL, TEC)	2d
HEPTACHLOR EPOXIDE	RL	ug/kg	---	2.4–3	---	SQuiRTs (TEL, PEL, TEC)	2d
TOXAPHENE	RL	ug/kg	---	120–150	---	SQuiRTs (TEL)	2d

Chemical	COC Based on Detect (D) or Elevated Reporting Limit (RL)	Units	Range of Detections for Detected Analytes that Exceed One or More Screening Levels	Range of Reporting Limits (RL) for Non-Detects	Ratio of Maximum Chemical Concentration to SL for Detected Analytes[a]	Screening Values Exceeded	Highest of Screening Value Hierarchy Level[b]
Iron Gate Reservoir							
Nickel	D	mg/kg	18–33	---	2.1 [c]	FWS TEL, **FWS LEL** [c], FWS TEC	2d [c]
2,3,4,7,8-PECDF	D	pg/g	0.74	---	1.1–4.4	ODEQ B-I, ODEQ M-I	2c
Iron	D	mg/kg	26,000–32,000	---	1.6	FWS LEL	2d
SILVER	RL	mg/kg	---	0.94–2.2	---	SEF-SL1	2a
AROCLOR 1221	RL	ug/kg	---	0.067–0.3	---	SEF-SL1 (total PCBs)	2a
AROCLOR 1232	RL	ug/kg	---	0.033–0.15	---	SEF-SL1 (total PCBs)	2a
BIS(2-ETHYLHEXYL) PHTHALATE	RL	ug/kg	---	170–730	---	SEF-SL1	2a
BUTYL BENZYL PHTHALATE	RL	ug/kg	---	170–730	---	SEF-SL1	2a
DI-N-OCTYL PHTHALATE	RL	ug/kg	---	170–730	---	SEF-SL1	2a
2-METHYLNAPHTHALENE	RL	ug/kg	---	170–730	---	SEF-SL1	2a
ACENAPHTHYLENE	RL	ug/kg	---	170–730	---	SEF-SL1	2a
BENZO(K)FLUORANTHENE	RL	ug/kg	---	170–730	---	SEF-SL1	2a
DIBENZOFURAN	RL	ug/kg	---	170–730	---	SEF-SL1	2a
NAPHTHALENE	RL	ug/kg	---	5–520	---	SEF-SL1	2a

Chemical	COC Based on Detect (D) or Elevated Reporting Limit (RL)	Units	Range of Detections for Detected Analytes that Exceed One or More Screening Levels	Range of Reporting Limits (RL) for Non-Detects	Ratio of Maximum Chemical Concentration to SL for Detected Analytes[a]	Screening Values Exceeded	Highest of Screening Value Hierarchy Level[b]
4,4'-DDE	RL	ug/kg	---	0.67–3	---	SQuiRTs (TEL, TEC)	2d
4,4'-DDT	RL	ug/kg	---	0.67–3	---	SQuiRTs (TEL)	2d
BHC-gamma (HCH-gamma, Lindane)	RL	ug/kg	---	0.67–3	---	SQuiRTs (TEL, PEL, TEC)	2d
CHLORDANE (TECHNICAL)	RL	ug/kg	---	3.3–15	---	SQuiRTs (TEL, PEL, LEL, TEC)	2d
DIELDRIN	RL	ug/kg	---	0.67–3	---	SQuiRTs (TEL, LEL, TEC)	2d
ENDRIN	RL	ug/kg	---	0.67–3	---	SQuiRTs (TEL, TEC)	2d
HEPTACHLOR	RL	ug/kg	---	0.67–3	---	SQuiRTs (TEL, TEC)	2d
HEPTACHLOR EPOXIDE	RL	ug/kg	---	0.67–3	---	SQuiRTs (TEL, PEL, TEC)	2d
TOXAPHENE	RL	ug/kg	---	33–150	---	SQuiRTs (TEL)	2d

Chemical	COC Based on Detect (D) or Elevated Reporting Limit (RL)	Units	Range of Detections for Detected Analytes that Exceed One or More Screening Levels	Range of Reporting Limits (RL) for Non-Detects	Ratio of Maximum Chemical Concentration to SL for Detected Analytes[a]	Screening Values Exceeded	Highest of Screening Value Hierarchy Level[b]
Klamath River Estuary							
Lower Klamath							
Chromium	D	mg/kg	96	--	1.0	**SL1-FWS**, SL2-FWS, FWS TEL, FWS LEL, FWS PEL, FWS TEC	2b
Nickel	D	mg/kg	110	--	1.8 [c]	**SL1-FWS,** SL2-FWS, FWS TEL, FWS LEL, FWS PEL, FWS TEC	2b
Iron	D	mg/kg	24,000–24,000	--	1.2	**FWS LEL**	2d
BIS(2-ETHYLHEXYL) PHTHALATE	RL	ug/kg	---	230	---	**SEF-SL1**	2a
DIMETHYL PHTHALATE	RL	ug/kg	---	230	---	**SEF-SL1**	2a
DI-N-OCTYL PHTHALATE	RL	ug/kg	---	230	---	**SEF-SL1**	2a
CHLORDANE (TECHNICAL)	RL	ug/kg	---	4.6	---	**SQuiRTs (TEL, TEC)**	2d
HEPTACHLOR EPOXIDE	RL	ug/kg	---	0.91	---	**SQuiRTs (TEL)**	2d
TOXAPHENE	RL	ug/kg	---	46	---	**SQuiRTs (TEL)**	2d

Chemical	COC Based on Detect (D) or Elevated Reporting Limit (RL)	Units	Range of Detections for Detected Analytes that Exceed One or More Screening Levels	Range of Reporting Limits (RL) for Non-Detects	Ratio of Maximum Chemical Concentration to SL for Detected Analytes[a]	Screening Values Exceeded	Highest of Screening Value Hierarchy Level[b]
Upper Klamath							
Chromium	D	mg/kg	96–97	---	1.0	**SL1-FWS,** FWS TEL, FWS LEL, FWS PEL, FWS TEC	2a
Bis(2-ethylhexyl)phthalate	D	ug/kg	250	---	1.1	**SL1-FWS**	2a
DIMETHYL PHTHALATE	RL	ug/kg	---	230	---	**SEF-SL1**	2a
DI-N-OCTYL PHTHALATE	RL	ug/kg	---	230	---	**SEF-SL1**	2a
CHLORDANE (TECHNICAL)	RL	ug/kg	---	4.6	---	**SQuiRTs (TEL, TEC)**	2d
HEPTACHLOR EPOXIDE	RL	ug/kg	---	0.93	---	**SQuiRTs (TEL)**	2d
TOXAPHENE	RL	ug/kg	---	46	---	**SQuiRTs (TEL)**	2d

Notes:

Screening Level Hierarchy --
Retain if above:
1) DMMP-MLs
2a) SEF-SL1
2b) SEF-SL1 AND SEF-SL2
2c) Chemicals with no SEF and one or more ODEQ bioaccumulative SLVs exceeded
2d) Chemicals with no SEF or ODEQ but one or more SQuiRT exceeded

Units:
Metals: mg/kg
Pesticides: ug/kg
dioxins and furans: pg/g
SVOCs: ug/kg
phthalates: ug/kg

Key:

FWS = U.S. Fish and Wildlife Service
DMMP = Dredged Material Management Program
TEL = Threshold Effect Level
LEL = Lowest Effect level
SL1 = Sediment Screening Level 1
TEC = Threshold Effect Concentration
SEF = Sediment Evaluation Framework
PEL = Probable Effect Level
SLV = Screening Level Value
ODEQ: = Oregon Department of Environmental Quality
B-P: Bird population
B-I: Bird individual
M-I: Mammal individual
M-P: Mammal population
F-FW: Fish-freshwater

[a] Ratio of maximum detected concentration to the SL is typically expressed as a Hazard Quotient (HQ). This ratio is presented above for each detected chemical and is calculated using the maximum detected concentration; the highest and lowest of screening values when multiple screening values are exceeded of same level in screening hierarchy. When more than two screening values are exceeded, the screening level used for calculation of the ratio (HQ) are in bold.

[b] Screening level hierarchy depicted in CDM (2011) Figure 2.

[c] Updated from CDM (2011) Table 2 based on review of screening values listed in CDM (2011) Table A-2 and range of detections for detected analytes in CDM (2011) and USBR (2011).

Based on the information provided in Table A-6 in CDM (2011) and database query for ambiguous and positive exceedances.

Table C-7. Chemicals in Sediment that Exceed One or More Human Health Sediment Screening Levels. Source: CDM (2011).

Chemical	COC Based on Detect (D) or Elevated Reporting Limit (RL)	Units	Range of Detections for Detected Analytes that Exceed One or More Screening Levels	Range of Reporting Limits (RL) for Non-Detects	Ratio of Maximum Chemical Concentration to SL for Detected Analytes[1]	Screening Values Exceeded	Notes
J.C. Boyle Reservoir							
Arsenic	D	mg/kg	4.3–15	---	38–214	**EPA RSL TOT CAR**, **CHHSL Res**, CHHSL Comm	a
Nickel	D	mg/kg	19–32	---	84	**EPA RSL TOT CAR**	a
4,4-DDD	D	ug/kg	3.7	---	11–93	ODEQ BSLV H-S, ODEQ BSLV H-G	---
4,4-DDE	D	ug/kg	3.4	---	10–85	ODEQ BSLV H-S, ODEQ BSLV H-G	---
4,4-DDT	D	ug/kg	4.1	---	12–103	ODEQ BSLV H-S, ODEQ BSLV H-G	---
Dieldrin	D	ug/kg	3.4	---	420–3,400	ODEQ BSLV H-S, ODEQ BSLV H-G	---

Chemical	COC Based on Detect (D) or Elevated Reporting Limit (RL)	Units	Range of Detections for Detected Analytes that Exceed One or More Screening Levels	Range of Reporting Limits (RL) for Non-Detects	Ratio of Maximum Chemical Concentration to SL for Detected Analytes[(1)]	Screening Values Exceeded	Notes
1,2,3,4,6,7,8-HPCDD	D	pg/g	170–180	---	2.1	ODEQ BSLV H-S	---
1,2,3,4,7,8-HXCDD	D	pg/g	1.5–1.6	---	4.4	ODEQ BSLV H-S	---
1,2,3,6,7,8-HXCDD	D	pg/g	6.6–7.3	---	2.7–21	ODEQ BSLV H-S, ODEQ BSLV H-G	---
1,2,3,7,8,9-HXCDD	D	pg/g	3.7	---	1.4–11	ODEQ BSLV H-S, ODEQ BSLV H-G	---
1,2,3,4,7,8-HXCDF	D	pg/g	1.7–2.1	---	6.2	ODEQ BSLV H-S	
1,2,3,6,7,8-HXCDF	D	pg/g	4.4–5.3	---	2.0–16	ODEQ BSLV H-S, ODEQ BSLV H-G	---
1,2,3,7,8,9-HXCDF	D	pg/g	0.66–0.67	---	0.5–1.9	ODEQ BSLV H-S	---
1,2,3,7,8-PECDD	D	pg/g	1.1	---	4.1–37	ODEQ BSLV H-S, ODEQ BSLV H-G	---
1,2,3,7,8-PECDF	D	pg/g	0.88–1.1	---	3.5	ODEQ BSLV H-S	---
2,3,4,6,7,8-HXCDF	D	pg/g	3–3.2	---	1.2–9.4	ODEQ BSLV H-S, ODEQ BSLV H-G	---
2,3,4,7,8-PECDF	D	pg/g	1.5	---	50–405	ODEQ BSLV H-S, ODEQ BSLV H-G	---
2,3,7,8-TCDD	D	pg/g	0.19	---	19–173	ODEQ BSLV H-S, ODEQ BSLV H-G	b
2,3,7,8-TCDF	D	pg/g	0.88–0.9	---	1.2–9.6	ODEQ BSLV H-S, ODEQ BSLV H-G	---

Chemical	COC Based on Detect (D) or Elevated Reporting Limit (RL)	Units	Range of Detections for Detected Analytes that Exceed One or More Screening Levels	Range of Reporting Limits (RL) for Non-Detects	Ratio of Maximum Chemical Concentration to SL for Detected Analytes[(1)]	Screening Values Exceeded	Notes
Pentachlorophenol	D	ug/kg	34	---	1.1	ODEQ BSLV H-S	b
4,4,'-DDD	RL	ug/kg	---	0.9–4.9	---	ODEQ	---
4,4,'-DDE	RL	ug/kg	---	0.9–4.9	---	ODEQ	---
4,4,'-DDT	RL	ug/kg	---	0.9–4.9	---	ODEQ	---
Aroclor 1221	RL	ug/kg	---	0.24–0.49	---	EPA RSL	---
Aroclor 1232	RL	ug/kg	---	0.16–0.24	---	EPA RSL	---
Aroclor 1242	RL	ug/kg	---	0.045–0.24	---	EPA RSL	---
Aroclor 1248	RL	ug/kg	---	0.045–0.24	---	EPA RSL	---
Aroclor 1254	RL	ug/kg	---	0.045–0.24	---	EPA RSL	---
Aroclor 1260	RL	ug/kg	---	0.045–0.24	---	EPA RSL	---
BHC-Gamma (HCH-gamma, Lindane)	RL	ug/kg	---	0.9–4.9	---	CHHSLs	---

Chemical	COC Based on Detect (D) or Elevated Reporting Limit (RL)	Units	Range of Detections for Detected Analytes that Exceed One or More Screening Levels	Range of Reporting Limits (RL) for Non-Detects	Ratio of Maximum Chemical Concentration to SL for Detected Analytes[(1)]	Screening Values Exceeded	Notes
Chlordane (Technical)	RL	ug/kg	---	4.5–24	---	ODEQ	---
Chlordane-Alpha	RL	ug/kg	---	0.9–4.9	---	ODEQ	---
Chlordane-Gamma	RL	ug/kg	---	0.9–4.9	---	ODEQ	---
1,2,3-TRICHLOROPROPANE	RL	ug/kg	---	6.7–36	---	EPA RSL	---
1,2-DIBROMO-3-CHLOROPROPANE	RL	ug/kg	---	6.7–36	---	EPA RSL	---
3,3'-DICHLOROBENZIDINE	RL	ug/kg	---	230–1200	---	EPA RSL	---
BENZ(A)ANTHRACENE	RL	ug/kg	---	230–1200	---	EPA RSL	---
BENZO(A)PYRENE	RL	ug/kg	---	230–1200	---	EPA RSL, CHHSLs	---
BENZO(B)FLUORANTHENE	RL	ug/kg	---	230–1200	---	EPA RSL	---

Chemical	COC Based on Detect (D) or Elevated Reporting Limit (RL)	Units	Range of Detections for Detected Analytes that Exceed One or More Screening Levels	Range of Reporting Limits (RL) for Non-Detects	Ratio of Maximum Chemical Concentration to SL for Detected Analytes[(1)]	Screening Values Exceeded	Notes
BIS(2-CHLOROETHYL) ETHER	RL	ug/kg	---	230–1200	---	EPA RSL	---
DIBENZ(A,H)ANTHRACENE	RL	ug/kg	---	230–1200	---	EPA RSL	---
FLUORENE	RL	ug/kg	---	230–1200	---	EPA RSL	---
HEXACHLOROBENZENE	RL	ug/kg	---	230–1200	---	ODEQ, USEPA RSL	---
INDENO(1,2,3-CD)PYRENE	RL	ug/kg	---	230–1200	---	EPA RSL	---
N-NITROSODI-N-PROPYLAMINE	RL	ug/kg	---	230–1200	---	EPA RSL	---
TRANS-1,4-DICHLORO-2-BUTENE	RL	ug/kg	---	6.7–36	---	EPA RSL	---
1,2-DIBROMOETHANE	RL	ug/kg	---	6.7–36	---	EPA RSL	---
Copco No. 1 Reservoir							
Arsenic	D	mg/kg	6.3–13	---	33–186	**EPA RSL TOT CAR, CHHSL Res,** CHHSL Comm	---
Nickel	D	mg/kg	22–32	---	84	EPA RSL TOT CAR	---

Chemical	COC Based on Detect (D) or Elevated Reporting Limit (RL)	Units	Range of Detections for Detected Analytes that Exceed One or More Screening Levels	Range of Reporting Limits (RL) for Non-Detects	Ratio of Maximum Chemical Concentration to SL for Detected Analytes[(1)]	Screening Values Exceeded	Notes
1,2,3,4,6,7,8-HPCDD	D	pg/g	180–190	---	---	----	c
1,2,3,4,6,7,8-HPCDF	D	pg/g	89–96	---	---	----	c
1,2,3,4,7,8-HXCDD	D	pg/g	1.7–1.9	---	---	----	c
1,2,3,6,7,8-HXCDD	D	pg/g	8.8–9.8	---	---	----	c
1,2,3,7,8,9-HXCDD	D	pg/g	4.2–4.3	---	---	----	c
1,2,3,4,7,8-HXCDF	D	pg/g	2.3–2.8	---	---	----	c
1,2,3,6,7,8-HXCDF	D	pg/g	3.5–5.5	---	---	----	c
1,2,3,7,8,9-HXCDF	D	pg/g	1.0	---	---	----	c
2,3,4,6,7,8-HXCDF	D	pg/g	3.2–3.7	---	---	----	c
1,2,3,7,8-PECDD	D	pg/g	1.2–1.4	---	---	----	c
1,2,3,7,8-PECDF	D	pg/g	0.84	---	---	----	c
2,3,4,7,8-PECDF	D	pg/g	1.8–1.9	---	---	----	c
2,3,7,8-TCDF	D	pg/g	0.99–1.2	---	---	---	c
AROCLOR 1221	RL	ug/kg	---	0.24–0.3	---	EPA RSL	---
AROCLOR 1232	RL	ug/kg	---	0.12–0.15	---	EPA RSL	---
BHC-gamma (HCH-gamma, Lindane)	RL	ug/kg	---	2.4–3	---	CHHSLs	---

Chemical	COC Based on Detect (D) or Elevated Reporting Limit (RL)	Units	Range of Detections for Detected Analytes that Exceed One or More Screening Levels	Range of Reporting Limits (RL) for Non-Detects	Ratio of Maximum Chemical Concentration to SL for Detected Analytes[1]	Screening Values Exceeded	Notes
1,2,3-TRICHLOROPROPANE	RL	ug/kg	---	18–22	---	EPA RSL	---
1,2-DIBROMO-3-CHLOROPROPANE	RL	ug/kg	---	18–22	---	EPA RSL	---
BENZ(A)ANTHRACENE	RL	ug/kg	---	580–730	---	EPA RSL	---
BENZO(A)PYRENE	RL	ug/kg	---	580–730	---	EPA RSL, CHHSLs	---
BENZO(B)FLUORANTHENE	RL	ug/kg	---	580–730	---	EPA RSL	---
BIS(2-CHLOROETHYL) ETHER	RL	ug/kg	---	580–730	---	EPA RSL	---
DIBENZ(A,H)ANTHRACENE	RL	ug/kg	---	580–730	---	EPA RSL	---
HEXACHLOROBENZENE	RL	ug/kg	---	580–730	---	EPA RSL	---
INDENO(1,2,3-CD)PYRENE	RL	ug/kg	---	580–730	---	EPA RSL	---
N-NITROSODI-N-PROPYLAMINE	RL	ug/kg	---	580–730	---	EPA RSL	---
TRANS-1,4-DICHLORO-2-BUTENE	RL	ug/kg	---	18–22	---	EPA RSL	---

Chemical	COC Based on Detect (D) or Elevated Reporting Limit (RL)	Units	Range of Detections for Detected Analytes that Exceed One or More Screening Levels	Range of Reporting Limits (RL) for Non-Detects	Ratio of Maximum Chemical Concentration to SL for Detected Analytes[(1)]	Screening Values Exceeded	Notes
Iron Gate Reservoir							
Arsenic	D	mg/kg	7.4–10	---	26–143	**EPA RSL TOT CAR, CHHSL Res,** CHHSL Comm	---
Nickel	D	mg/kg	18–33	---	87	EPA RSL TOT CAR	---
1,2,3,4,7,8-HXCDD	D	pg/g	1.1	---	---	----	c
1,2,3,6,7,8-HXCDD	D	pg/g	3.4–3.5	---	---	----	c
1,2,3,7,8,9-HXCDD	D	pg/g	2–2.5	---	---	----	c
1,2,3,4,7,8-HXCDF	D	pg/g	1.2	---	---	----	c
1,2,3,6,7,8-HXCDF	D	pg/g	1.2–1.4	---	---	----	c
2,3,4,6,7,8-HXCDF	D	pg/g	1.2–1.4	---	---	----	c
1,2,3,7,8-PECDD	D	pg/g	0.62–0.82	---	---	----	c
1,2,3,7,8-PECDF	D	pg/g	0.44–0.52	---	---	----	c
2,3,4,7,8-PECDF	D	pg/g	0.74	---	---	----	c
2,3,7,8-TCDF	D	pg/g	0.68	---	---	---	c

Chemical	COC Based on Detect (D) or Elevated Reporting Limit (RL)	Units	Range of Detections for Detected Analytes that Exceed One or More Screening Levels	Range of Reporting Limits (RL) for Non-Detects	Ratio of Maximum Chemical Concentration to SL for Detected Analytes[1]	Screening Values Exceeded	Notes
AROCLOR 1221	RL	ug/kg	---	0.067–0.3	---	EPA RSL	---
AROCLOR 1232	RL	ug/kg	---	0.033–0.15	---	EPA RSL	---
1,2,3-TRICHLOROPROPANE	RL	ug/kg	---	5–22	---	EPA RSL	---
1,2-DIBROMO-3-CHLOROPROPANE	RL	ug/kg	---	5–22	---	EPA RSL	---
BENZ(A)ANTHRACENE	RL	ug/kg	---	170–730	---	EPA RSL	---
BENZO(A)PYRENE	RL	ug/kg	---	170–730	---	EPA RSL, CHHSLs	---
BENZO(B)FLUORANTHENE	RL	ug/kg	---	170–730	---	EPA RSL	---
BIS(2-CHLOROETHYL) ETHER	RL	ug/kg	---	170–730	---	EPA RSL	---
DIBENZ(A,H)ANTHRACENE	RL	ug/kg	---	170–730	---	EPA RSL	---
HEXACHLOROBENZENE	RL	ug/kg	---	170–730	---	EPA RSL	---
INDENO(1,2,3-CD)PYRENE	RL	ug/kg	---	170–730	---	EPA RSL	---
N-NITROSODI-N-PROPYLAMINE	RL	ug/kg	---	170–730	---	EPA RSL	---
TRANS-1,4-DICHLORO-2-BUTENE	RL	ug/kg	---	5–22	---	EPA RSL	---

Chemical	COC Based on Detect (D) or Elevated Reporting Limit (RL)	Units	Range of Detections for Detected Analytes that Exceed One or More Screening Levels	Range of Reporting Limits (RL) for Non-Detects	Ratio of Maximum Chemical Concentration to SL for Detected Analytes[(1)]	Screening Values Exceeded	Notes
Klamath River Estuary							
Lower Klamath River Estuary							
Arsenic	D	mg/kg	3.2	---	8.2–46	**EPA RSL TOT CAR, CHHSL Res,** CHHSL Comm	---
Nickel	D	mg/kg	110	---	289	EPA RSL TOT CAR	---
BHC-gamma (HCH-gamma, Lindane)	RL	ug/kg	---	0.91	---	CHHSLs	---
1,2,3-TRICHLOROPROPANE	RL	ug/kg	---	6.8	---	EPA RSL	---
1,2-DIBROMO-3-CHLOROPROPANE	RL	ug/kg	---	6.8	---	EPA RSL	---
BENZ(A)ANTHRACENE	RL	ug/kg	---	230	---	EPA RSL	---
BENZO(A)PYRENE	RL	ug/kg	---	230	---	EPA RSL, CHHSLs	---
BENZO(B)FLUORANTHENE	RL	ug/kg	---	230	---	EPA RSL	---
BIS(2-CHLOROETHYL) ETHER	RL	ug/kg	---	230	---	EPA RSL	---
DIBENZ(A,H)ANTHRACENE	RL	ug/kg	---	230	---	EPA RSL	---
INDENO(1,2,3-CD)PYRENE	RL	ug/kg	---	230	---	EPA RSL	---
N-NITROSODI-N-PROPYLAMINE	RL	ug/kg	---	230	---	EPA RSL	---

Chemical	COC Based on Detect (D) or Elevated Reporting Limit (RL)	Units	Range of Detections for Detected Analytes that Exceed One or More Screening Levels	Range of Reporting Limits (RL) for Non-Detects	Ratio of Maximum Chemical Concentration to SL for Detected Analytes[(1)]	Screening Values Exceeded	Notes
Upper Klamath River Estuary							
Arsenic	D	mg/kg	2.2	---	5.6–31	**EPA RSL TOT CAR, CHHSL Res,** CHHSL Comm	---
Nickel	D	mg/kg	110	---	289	EPA RSL TOT CAR	---
BHC-gamma (HCH-gamma, Lindane)	RL	ug/kg	---	0.93	---	CHHSLs	---
1,2,3-TRICHLOROPROPANE	RL	ug/kg	---	7	---	EPA RSL	---
1,2-DIBROMO-3-CHLOROPROPANE	RL	ug/kg	---	7	---	EPA RSL	---
BENZ(A)ANTHRACENE	RL	ug/kg	---	230	---	EPA RSL	---
BENZO(A)PYRENE	RL	ug/kg	---	230	---	EPA RSL, CHHSLs	---
BENZO(B)FLUORANTHENE	RL	ug/kg	---	230	---	EPA RSL	---
BIS(2-CHLOROETHYL) ETHER	RL	ug/kg	---	230	---	EPA RSL	---
DIBENZ(A,H)ANTHRACENE	RL	ug/kg	---	230	---	EPA RSL	---
INDENO(1,2,3-CD)PYRENE	RL	ug/kg	---	230	---	EPA RSL	---
N-NITROSODI-N-PROPYLAMINE	RL	ug/kg	---	230	---	EPA RSL	---
TRANS-1,4-DICHLORO-2-BUTENE	RL	ug/kg	---	7	---	EPA RSL	---

Notes:

[1] Ratio of maximum detected concentration to the SL is typically expressed as a Hazard Quotient (HQ). This ratio is presented above for each detected chemical and is calculated using the maximum detected concentration; the highest and lowest of screening values when multiple screening values are exceeded of same level in screening hierarchy. When more than two screening values are exceeded, the screening level used for calculation of the ratio (HQ) are in bold.

Screening Level Hierarchy for Human Health:

USEPA Residential RSLs (total carcinogenic and total non-carcinogenic), CHHSLs, and ODEQ bioaccumulation SLVs (Human Subsistence and Human General)

a no ODEQ values

b below USEPA RSLs, CHHSLs

c ODEQ values not applicable per text of Appendix A (only applicable for J.C. Boyle Reservoir); USEPA RSL and CHHSLs not available

Key:		Units:	
EPA =	U.S. Environmental Protection Agency	metals:	mg/kg
RSL =	Residential Screening Level	pesticides:	ug/kg
TOT CAR =	Total carcinogen	dioxins and furans:	pg/g
TOT NON CAR =	Total non-carcinogen	SVOCs:	ug/kg
CHHSL =	California Human Health Screening Levels		
BSLV =	Land Quality Division Sediment Bioaccumulation Screening Level Values		
Comm =	commercial/industrial		
Res =	residential		

Table C-8. Chemicals in Sediment that Exceed One or More Marine Sediment Screening Levels. Source: CDM (2011).

Chemical	COC Based on Detect (D) or Elevated Reporting Limit (RL)	Units	Range of Detections for Detected Analytes that Exceed One or More Screening Levels	Range of Reporting Limits (RL) for Non-Detects	Ratio of Maximum Chemical Concentration to SL for Detected Analytes[a]	Screening Values Exceeded	Highest of Screening Value Hierarchy Level[b]
J.C. Boyle Reservoir							
Dieldrin	D	ug/kg	3.4	---	1.8	**SEF-SL1**, SEF-SL2, MS ERL, MS T20, MS TEL, MS T50, F-M	2a
2,3,4,7,8-PECDF	D	pg/g	1.5–1.5	---	1.4	ODEQ BSLV	2c
Butyl benzyl phthalate	RL	ug/kg	---	230–1,200	---	DMMP-ML	1
2,4-DIMETHYLPHENOL	RL	ug/kg	---	230–1,200	---	DMMP-ML	1
2-METHYLPHENOL	RL	ug/kg	---	230–1,200	---	DMMP-ML	1
4-METHYLPHENOL	RL	ug/kg	---	230–1,200	---	DMMP-ML	1
BENZOIC ACID	RL	ug/kg	---	930–4,800	---	DMMP-ML	1
BENZYL ALCOHOL	RL	ug/kg	---	230–1,200	---	DMMP-ML	1
HEXACHLOROBENZENE	RL	ug/kg	---	230–1,200	---	DMMP-ML	1
N-NITROSODIPHENYLAMINE	RL	ug/kg	---	230–1,200	---	DMMP-ML	1
Aroclor 1232	RL	ug/kg	---	0.16–0.24	---	DMMP-SL, SEF-SL1 (total PCBs)	2a
Aroclor 1242	RL	ug/kg	---	0.045–0.24	---	DMMP-SL, SEF-SL1 (total PCBs)	2a
Aroclor 1248	RL	ug/kg	---	0.045–0.24	---	DMMP-SL, SEF-SL1 (total PCBs)	2a

Chemical	COC Based on Detect (D) or Elevated Reporting Limit (RL)	Units	Range of Detections for Detected Analytes that Exceed One or More Screening Levels	Range of Reporting Limits (RL) for Non-Detects	Ratio of Maximum Chemical Concentration to SL for Detected Analytes[(a)]	Screening Values Exceeded	Highest of Screening Value Hierarchy Level[(b)]
Aroclor 1254	RL	ug/kg	---	0.045–0.24	---	DMMP-SL, SEF-SL1 (total PCBs)	2a
Aroclor 1260	RL	ug/kg	---	0.045–0.24	---	DMMP-SL, SEF-SL1 (total PCBs)	2a
Chlordane (Technical)	RL	ug/kg	---	4.5–24	---	DMMP-SL, SEF-SL1	2a
Chlordane-Alpha	RL	ug/kg	---	0.9–4.9	---	DMMP-SL, SEF-SL1	2a
Chlordane-Gamma	RL	ug/kg	---	0.9–4.9	---	DMMP-SL, SEF-SL1	2a
Heptachlor	RL	ug/kg	---	0.9–4.9	---	SEF-SL1	2a
Endrin	RL	ug/kg	---	0.9–4.9	---	no value	2c
Heptachlor Epoxide	RL	ug/kg	---	0.9–4.9	---	SQuiRTs (T20, PEL)	2c
Toxaphene	RL	ug/kg	---	45–240	---	SQuiRTs (TEL)	2c
BENZO(B)FLUORANTHENE	RL	ug/kg	---	230–1200	---	SQuiRTs (T20, T50)	2c
Butyl benzyl phthalate	RL	ug/kg		230–1,200		DMMP-ML	
Copco No. 1 Reservoir							
2,4-DIMETHYLPHENOL	RL	ug/kg	---	580–730	---	DMMP-ML	1
2-METHYLPHENOL	RL	ug/kg	---	580–730	---	DMMP-ML	1
BENZOIC ACID	RL	ug/kg	---	2,300–2,900	---	DMMP-ML	1
HEXACHLOROBENZENE	RL	ug/kg	---	580–730	---	DMMP-ML	1
N-NITROSODIPHENYLAMINE	RL	ug/kg	---	580–730	---	DMMP-ML	1

Chemical	COC Based on Detect (D) or Elevated Reporting Limit (RL)	Units	Range of Detections for Detected Analytes that Exceed One or More Screening Levels	Range of Reporting Limits (RL) for Non-Detects	Ratio of Maximum Chemical Concentration to SL for Detected Analytes[(a)]	Screening Values Exceeded	Highest of Screening Value Hierarchy Level[(b)]
AROCLOR 1221	RL	ug/kg	---	0.24–0.3	---	DMMP-SL, SEF-SL1 (total PCBs)	2a
AROCLOR 1232	RL	ug/kg	---	0.12–0.15	---	DMMP-SL, SEF-SL1 (total PCBs)	2a
CHLORDANE (TECHNICAL)	RL	ug/kg	---	12–15	---	DMMP-SL, SEF-SL1	2a
CHLORDANE-ALPHA	RL	ug/kg	---	2.4–3	---	SEF-SL1	2a
CHLORDANE-GAMMA	RL	ug/kg	---	2.4–3	---	SEF-SL1	2a
DIELDRIN	RL	ug/kg	---	2.4–3	---	SEF-SL1	2a
HEPTACHLOR	RL	ug/kg	---	2.4–3	---	SEF-SL1	2a
HEPTACHLOR EPOXIDE	RL	ug/kg	---	2.4–3	---	SQuiRTs (T20, PEL)	2c
BENZO(B)FLUORANTHENE	RL	ug/kg	---	580–730	---	SQuiRTs (T20)	2c
BENZO(G,H,I)PERYLENE	RL	ug/kg	---	580–730	---	no value	2c
Iron Gate Reservoir							
1,4-DICHLOROBENZENE	RL	ug/kg	---	5–520	**---**	DMMP-ML	1
2,4-DIMETHYLPHENOL	RL	ug/kg	---	170–730	**---**	DMMP-ML	1
2-METHYLPHENOL	RL	ug/kg	---	170–730	**---**	DMMP-ML	1
BENZOIC ACID	RL	ug/kg	---	670–2900	**---**	DMMP-ML	1
HEXACHLOROBENZENE	RL	ug/kg	---	170–730	**---**	DMMP-ML	1
HEXACHLOROBUTADIENE	RL	ug/kg	---	5–520	**---**	DMMP-ML	1
N-NITROSODIPHENYLAMINE	RL	ug/kg	---	170–730	**---**	DMMP-ML	1

Chemical	COC Based on Detect (D) or Elevated Reporting Limit (RL)	Units	Range of Detections for Detected Analytes that Exceed One or More Screening Levels	Range of Reporting Limits (RL) for Non-Detects	Ratio of Maximum Chemical Concentration to SL for Detected Analytes[a]	Screening Values Exceeded	Highest of Screening Value Hierarchy Level[b]
AROCLOR 1221	RL	ug/kg	---	0.067–0.3	**---**	DMMP-SL, SEF-SL1 (total PCBs)	2a
AROCLOR 1232	RL	ug/kg	---	0.033–0.15	**---**	DMMP-SL, SEF-SL1 (total PCBs)	2a
CHLORDANE (TECHNICAL)	RL	ug/kg	---	3.3–15	**---**	DMMP-SL, SEF-SL1	2a
CHLORDANE-ALPHA	RL	ug/kg	---	0.67–3	**---**	SEF-SL1	2a
CHLORDANE-GAMMA	RL	ug/kg	---	0.67–3	**---**	SEF-SL1	2a
DIELDRIN	RL	ug/kg	---	0.67–3	**---**	SEF-SL1	2a
HEPTACHLOR	RL	ug/kg	---	0.67–3	**---**	SEF-SL1	2a
HEPTACHLOR EPOXIDE	RL	ug/kg	---	0.67–3	**---**	SEF-SL1	2a
1,2,4-TRICHLOROBENZENE	RL	ug/kg	---	5–520	**---**	DMMP-SL, SEF-SL1	2a
1,3-DICHLOROBENZENE	RL	ug/kg	---	5–520	**---**	DMMP-SL	2a
BENZO(B)FLUORANTHENE	RL	ug/kg	---	170–730	**---**	SQuiRTs (T20)	2c
Klamath River Estuary							
Lower Klamath							
2,4-DIMETHYLPHENOL	RL	ug/kg	---	230	---	DMMP-ML	1
2-METHYLPHENOL	RL	ug/kg	---	230	---	DMMP-ML	1
BENZOIC ACID	RL	ug/kg	---	910	---	DMMP-ML	1
N-NITROSODIPHENYLAMINE	RL	ug/kg	---	230	---	DMMP-ML	1
CHLORDANE (TECHNICAL)	RL	ug/kg	---	4.6	---	SEF-SL1	2a
HEPTACHLOR EPOXIDE	RL	ug/kg	---	0.91	---	SQuiRTs (T20)	2c

Chemical	COC Based on Detect (D) or Elevated Reporting Limit (RL)	Units	Range of Detections for Detected Analytes that Exceed One or More Screening Levels	Range of Reporting Limits (RL) for Non-Detects	Ratio of Maximum Chemical Concentration to SL for Detected Analytes[a]	Screening Values Exceeded	Highest of Screening Value Hierarchy Level[b]
TOXAPHENE	RL	ug/kg	---	46	---	SQuiRTs (TEL)	2c
BENZO(B)FLUORANTHENE	RL	ug/kg	---	230	---	SQuiRTs (T20)	2c
Upper Klamath							
2,4-DIMETHYLPHENOL	RL	ug/kg	---	230	---	DMMP-ML	1
2-METHYLPHENOL	RL	ug/kg	---	230	---	DMMP-ML	1
BENZOIC ACID	RL	ug/kg	---	930	---	DMMP-ML	1
N-NITROSODIPHENYLAMINE	RL	ug/kg	---	230	---	DMMP-ML	1
CHLORDANE (TECHNICAL)	RL	ug/kg	---	4.6	---	SEF-SL1	2a
HEPTACHLOR EPOXIDE	RL	ug/kg	---	0.93	---	SQuiRTs (T20)	2c
TOXAPHENE	RL	ug/kg	---	46	---	SQuiRTs (TEL)	2c
BENZO(B)FLUORANTHENE	RL	ug/kg	---	230	---	SQuiRTs (T20)	2c

Notes:

Screening Level Hierarchies for Marine Waters--
Retain if above:
1) DMMP-MLs
2a) SEF-SL1 or DMMP-SL
2b) SEF-SL1 or DMMP-SL AND SEF-SL2 or DMMP-BT
2c) Chemicals with no SEF or DMMP and one or more SQuiRTs exceeded

Units:

metals:	mg/kg
pesticides:	ug/kg
dioxins and furans:	pg/g
SVOCs:	ug/kg
phthalates:	ug/kg

Key:

MS = marine sediment
DMMP = Dredged Material Management Program
ERL = Effects Range Low
ERM = Effects Range Median
TEL = Threshold Effect Level
F-M = Fish-marine
SL1 = Sediment Screening Level 1
PEL = Probable Effect Level
SEF = Sediment Evaluation Framework
ODEQ = Oregon Department of Environmental Quality
T20 = concentration representing 20 percent probability of observing effect
RL = Reporting Limit
T50 = concentration representing 50 percent probability of observing effect
D = Detect
BSLV = Land Quality Division Sediment Bioaccumulation Screening Level Values
ML = Maximum Level

[a] Ratio of maximum detected concentration to the SL is typically expressed as a Hazard Quotient (HQ). This ratio is presented above for each detected chemical and is calculated using the maximum detected concentration; the highest and lowest of screening values when multiple screening values are exceeded of same level in screening hierarchy. When more than two screening values are exceeded, the screening level used for calculation of the ratio (HQ) are in bold.

[b] Screening level hierarchy depicted on Figure 2 in CDM (2011).

Based on the information provided in Table A-5 in CDM (2011) and database query for ambiguous and positive exceedances.

Table C-9. 2009 and 2018 Pacific Northwest Sediment Evaluation Framework Freshwater Screening Levels. Adapted from RSET (2009) and RSET (2018).

Analyte	Units	Pacific Northwest SEF [a]				Add (+), Remove (-), or No Change (o) to COPC[d] list
		SL1[b] 2009	SL1[b] 2018	SL2[c] 2009	SL2[c] 2018	
Metals						
Arsenic	mg/kg	20	14	51	120	o
Cadmium	mg/kg	1.1	2.1	1.5	5.4	-
Chromium	mg/kg	95	72	100	88	o
Copper	mg/kg	80	400	830	1,200	o
Lead	mg/kg	340	360	430	>1,300	o
Mercury	mg/kg	0.28	0.66	0.75	0.8	o
Nickel	mg/kg	60	26	70	110	+
Selenium	mg/kg	n/a[e]	11	n/a	>20	o
Silver	mg/kg	2	0.57	2.5	1.7	o
Zinc	mg/kg	130	3,200	400	>4,200	o
Organics						
Polycyclic Aromatic Hydrocarbons (PAHs)						
Total PAHs	ug/kg	n/a	17,000	n/a	30,000	+
2-Methylnaphthalene	ug/kg	470	n/a	560	n/a	-
Acenaphthene	ug/kg	1,100	n/a	1,300	n/a	-
Acenaphthylene	ug/kg	470	n/a	640	n/a	-
Anthracene	ug/kg	1,200	n/a	1,600	n/a	-
Benz(a)anthracene	ug/kg	4,300	n/a	5,800	n/a	-
Benzo(a)pyrene	ug/kg	3,300	n/a	4,800	n/a	-
Benzo(g,h,i)perylene	ug/kg	4,000	n/a	5,200	n/a	-
Benzo(k)fluoranthene	ug/kg	600	n/a	4,000	n/a	-
Chrysene	ug/kg	5,900	n/a	6,400	n/a	-
Dibenz(a,h)anthracene	ug/kg	800	n/a	840	n/a	-
Dibenzofuran	ug/kg	400	n/a	440	n/a	-
Fluoranthene	ug/kg	11,000	n/a	15,000	n/a	-
Fluorene	ug/kg	1,000	n/a	3,000	n/a	-
Indeno(1,2,3-cd)pyrene	ug/kg	4,100	n/a	5,300	n/a	-
Naphthalene	ug/kg	500	n/a	1,300	n/a	-
Phenanthrene	ug/kg	6,100	n/a	7,600	n/a	-
Pyrene	ug/kg	8,800	n/a	16,000	n/a	-

Analyte	Units	Pacific Northwest SEF [a]				Add (+), Remove (-), or No Change (o) to COPC[d] list
		SL1[b] 2009	SL1[b] 2018	SL2[c] 2009	SL2[c] 2018	
Organics						
Polychlorinated biphenyl (PCBs)						
Total PCBs	pg/g	60,000	n/a	120,000	n/a	+
Total Aroclors	ug/kg	n/a	110	n/a	2,500	-
Organics						
Pesticides/Herbicides/Insecticides: Organochlorine Pesticides						
4,4'-DDD	ug/kg	n/a	310	n/a	860	o
4,4'-DDE	ug/kg	n/a	21	n/a	33	o
4,4'-DDT	ug/kg	n/a	100	n/a	8,100	o
BHC-alpha (HCH-alpha)	ug/kg	n/a	n/a	n/a	n/a	o
BHC-beta(HCH-beta)	ug/kg	n/a	n/a	n/a	n/a	o
BHC-gamma (HCH-gamma, Lindane)	ug/kg	n/a	n/a	n/a	n/a	o
Chlordane	ug/kg	n/a	n/a	n/a	n/a	o
Chlordane (technical)	ug/kg	n/a	n/a	n/a	n/a	o
Chlordane-alpha	ug/kg	n/a	n/a	n/a	n/a	o
Chlordane-gamma	ug/kg	n/a	n/a	n/a	n/a	o
Dieldrin	ug/kg	n/a	4.9	n/a	9.3	o
Heptachlor	ug/kg	n/a	n/a	n/a	n/a	o
Heptachlor epoxide	ug/kg	n/a	n/a	n/a	n/a	o
beta-Hexachlorocyclohexane	ug/kg	n/a	7.2	n/a	11	o
Endrin ketone	ug/kg	n/a	8.5	n/a	n/a	o
Organics						
Phthalates						
Bis(2-ethylhexyl) phthalate	ug/kg	220	500	320	22,000	o
Butyl benzyl phthalate	ug/kg	260	n/a	370	n/a	-
Dimethyl phthalate	ug/kg	46	n/a	440	n/a	-
Di-n-butyl-phthalate	ug/kg	n/a	380	n/a	1,000	+
Di-N-octyl phthalate	ug/kg	26	39	45	1,100	o

Analyte	Units	Pacific Northwest SEF [a]				Add (+), Remove (-), or No Change (o) to COPC[d] list
		SL1[b] 2009	SL1[b] 2018	SL2[c] 2009	SL2[c] 2018	
Organics						
Semi-Volatile Organic Compounds (SVOCs): Phenols						
Phenol	ug/kg	n/a	120	n/a	210	+
4-Methylphenol	ug/kg	n/a	260	n/a	2,000	+
Pentachlorophenol	ug/kg	n/a	1,200	n/a	<1,200	o
Organics						
SVOCs: Chlorinated hydrocarbons						
Hexachlorobenzene	ug/kg	n/a	n/a	n/a	n/a	o
Organics						
Polychlorinated Dioxins and Furans						
1,2,3,4,6,7,8-HPCDD	pg/g	n/a	n/a	n/a	n/a	o
1,2,3,4,6,7,8-HPCDF	pg/g	n/a	n/a	n/a	n/a	o
1,2,3,4,7,8,9-HPCDF	pg/g	n/a	n/a	n/a	n/a	o
1,2,3,4,7,8-HXCDD	pg/g	n/a	n/a	n/a	n/a	o
1,2,3,4,7,8-HXCDF	pg/g	n/a	n/a	n/a	n/a	o
1,2,3,6,7,8-HXCDD	pg/g	n/a	n/a	n/a	n/a	o
1,2,3,6,7,8-HXCDF	pg/g	n/a	n/a	n/a	n/a	o
1,2,3,7,8,9-HXCDD	pg/g	n/a	n/a	n/a	n/a	o
1,2,3,7,8,9-HXCDF	pg/g	n/a	n/a	n/a	n/a	o
1,2,3,7,8-PECDD	pg/g	n/a	n/a	n/a	n/a	o
1,2,3,7,8-PECDF	pg/g	n/a	n/a	n/a	n/a	o
2,3,4,6,7,8-HXCDF	pg/g	n/a	n/a	n/a	n/a	o
2,3,4,7,8-PECDF	pg/g	n/a	n/a	n/a	n/a	o
2,3,7,8-TCDD	pg/g	n/a	n/a	n/a	n/a	o
2,3,7,8-TCDF	pg/g	n/a	n/a	n/a	n/a	o
OCDD	pg/g	n/a	n/a	n/a	n/a	o
OCDF	pg/g	n/a	n/a	n/a	n/a	o

Analyte	Units	Pacific Northwest SEF [a]				Add (+), Remove (-), or No Change (o) to COPC[d] list
		SL1[b] 2009	SL1[b] 2018	SL2[c] 2009	SL2[c] 2018	
Site Specific Chemicals of Concern						
Butyltins						
Monobutyltin (µg/kg)	ug/kg	n/a	540	n/a	>4,800	o
Dibutyltin (µg/kg)	ug/kg	n/a	910	n/a	130,000	o
Tributyltin (µg/kg)	ug/kg	n/a	47	n/a	320	o
Tetrabutyltin (µg/kg)	ug/kg	n/a	97	n/a	>97	o
Total [Bulk] Petroleum Hydrocarbons (TPHs)						
TPH-diesel	mg/kg	n/a	340	n/a	510	+
TPH-residual	mg/kg	n/a	3,600	n/a	4,400	+
Miscellaneous Extractables Compounds						
Benzoic acid	ug/kg	n/a	2,900	n/a	3,800	+
Carbazole	ug/kg	n/a	900	n/a	1,100	+
Dibenzofuran	ug/kg	n/a	200	n/a	680	+

[a] Sediment Evaluation Framework
[b] Screening Level 1
[c] Screening Level 2
[d] Chemicals of Potential Concern
[e] not applicable

Units Key:

g	gram
kg	kilogram (1,000 grams)
mg	milligram (10^{-3} grams)
ug	microgram (10^{-6} grams)
pg	picogram (10^{-12} grams)

Table C-9-A. 2015 and Previous USEPA National Recommended Water Quality Criteria (NRWQC) for Human Health. Adapted from USEPA (2015b).

Analyte	CAS No.	2015 Human Health NRWQC		Previous Human Health NRWQC	
		Consumption of Water + Organism (ug/L)	Consumption of Organism Only (ug/L)	Consumption of Water + Organism (ug/L)	Consumption of Organism Only (ug/L)
1,1,1-Trichloroethane	71-55-6	10,000	200,000	*	---
1,1,2,2-Tetrachloroethane	79-34-5	0.2	3	0.17	4
1,1,2-Trichloroethane	79-00-5	0.55	8.9	0.59	16
1,1-Dichloroethylene	75-35-4	300	20,000	330	7,100
1,2,4,5-Tetrachlorobenzene	95-94-3	0.03	0.03	0.97	1.1
1,2,4-Trichlorobenzene	120-82-1	0.071	0.076	35	70
1,2-Dichlorobenzene	95-50-1	1,000	3,000	420	1,300
1,2-Dichloroethane	107-06-2	9.9	650	0.38	37
1,2-Dichloropropane	78-87-5	0.90	31	0.5	15
1,2-Diphenylhydrazine	122-66-7	0.03	0.2	0.036	0.2
1,3-Dichlorobenzene	541-73-1	7	10	320	960
1,3-Dichloropropene	542-75-6	0.27	12	0.34	21
1,4-Dichlorobenzene	106-46-7	300	900	63	190
2,4,5-Trichlorophenol	95-95-4	300	600	1,800	3,600
2,4,6-Trichlorophenol	88-06-2	1.5	2.8	1.4	2.4
2,4-Dichlorophenol	120-83-2	10	60	77	290
2,4-Dimethylphenol	105-67-9	100	3,000	380	850
2,4-Dinitrophenol	51-28-5	10	300	69	5,300
2,4-Dinitrotoluene	121-14-2	0.049	1.7	0.11	3.4
2-Chloronaphthalene	91-58-7	800	1,000	1,000	1,600
2-Chlorophenol	95-57-8	30	800	81	150

Analyte	CAS No.	2015 Human Health NRWQC		Previous Human Health NRWQC	
		Consumption of Water + Organism (ug/L)	Consumption of Organism Only (ug/L)	Consumption of Water + Organism (ug/L)	Consumption of Organism Only (ug/L)
2-Methyl-4,6-Dinitrophenol	534-52-1	2	30	13	280
3,3'-Dichlorobenzidine	91-94-1	0.049	0.15	0.021	0.028
3-Methyl-4-Chlorophenol	59-50-7	500	2,000	*	*
Acenaphthene	83-32-9	70	90	670	990
Acrolein	107-02-8	3	400	6	9
Acrylonitrile	107-13-1	0.061	7.0	0.051	0.25
Aldrin	309-00-2	0.00000077	0.00000077	0.000049	0.00005
alpha-Hexachlorocyclohexane (HCH)	319-84-6	0.00036	0.00039	0.0026	0.0049
alpha-Endosulfan	959-98-8	20	30	62	89
Anthracene	120-12-7	300	400	8,300	40,000
Benzene	71-43-2	0.58 - 2.1	16 - 58	0.61 - 2.2	14 - 51
Benzidine	92-87-5	0.00014	0.011	0.000086	0.0002
Benzo(a)anthracene	56-55-3	0.0012	0.0013	0.0038	0.018
Benzo(a)pyrene	50-32-8	0.00012	0.00013	0.0038	0.018
Benzo(b)fluoranthene	205-99-2	0.0012	0.0013	0.0038	0.018
Benzo(k)fluoranthene	207-08-9	0.012	0.013	0.0038	0.018
beta-Hexachlorocyclohexane (HCH)	319-85-7	0.0080	0.014	0.0091	0.017
beta-Endosulfan	33213-65-9	20	40	62	89
Bis(2-Chloro-1-Methylethyl) Ether	108-60-1	200	4,000	1,400	65,000
Bis(2-Chloroethyl) Ether	111-44-4	0.030	2.2	0.03	0.53
Bis(2-Ethylhexyl) Phthalate	117-81-7	0.32	0.37	1.2	2.2
Bis(Chloromethyl) Ether	542-88-1	0.00015	0.017	0.0001	0.00029
Bromoform	75-25-2	7.0	120	4.3	140

Analyte	CAS No.	2015 Human Health NRWQC		Previous Human Health NRWQC	
		Consumption of Water + Organism (ug/L)	Consumption of Organism Only (ug/L)	Consumption of Water + Organism (ug/L)	Consumption of Organism Only (ug/L)
Butylbenzyl Phthalate	85-68-7	0.10	0.10	1,500	1,900
Carbon Tetrachloride	56-23-5	0.4	5	0.223	1.6
Chlordane	57-74-9	0.00031	0.00032	0.0008	0.00081
Chlorobenzene	108-90-7	100	800	130	1,600
Chlorodibromomethane	124-48-1	0.80	21	0.4	13
Chloroform	67-66-3	60	2,000	5.7	470
Chlorophenoxy Herbicide (2,4-D)	94-75-7	1,300	12,000	100	---
Chlorophenoxy Herbicide (2,4,5-TP) [Silvex]	93-72-1	100	400	10	---
Chrysene	218-01-9	0.12	0.13	0.0038	0.018
Cyanide	57-12-5	4	400	140	140
Dibenzo(a,h)anthracene	53-70-3	0.00012	0.00013	0.0038	0.018
Dichlorobromomethane	75-27-4	0.95	27	0.55	17
Dieldrin	60-57-1	0.0000012	0.0000012	0.000052	0.000054
Diethyl Phthalate	84-66-2	600	600	17,000	44,000
Dimethyl Phthalate	131-11-3	2,000	2,000	270,000	1,100,000
Di-n-Butyl Phthalate	84-74-2	20	30	2,000	4,500
Dinitrophenols	25550-58-7	10	1,000	69	5,300
Endosulfan Sulfate	1031-07-8	20	40	62	89
Endrin	72-20-8	0.03	0.03	0.059	0.06
Endrin Aldehyde	7421-93-4	1	1	0.29	0.3
Ethylbenzene	100-41-4	68	130	530	2,100
Fluoranthene	206-44-0	20	20	130	140

Analyte	CAS No.	2015 Human Health NRWQC		Previous Human Health NRWQC	
		Consumption of Water + Organism (ug/L)	Consumption of Organism Only (ug/L)	Consumption of Water + Organism (ug/L)	Consumption of Organism Only (ug/L)
Fluorene	86-73-7	50	70	1,100	5,300
gamma-Hexachlorocyclohexane (HCH)	58-89-9	4.2	4.4	0.98	1.8
Heptachlor	76-44-8	0.0000059	0.0000059	0.000079	0.000079
Heptachlor Epoxide	1024-57-3	0.000032	0.000032	0.000039	0.000039
Hexachlorobenzene	118-74-1	0.000079	0.000079	0.00028	0.00029
Hexachlorobutadiene	87-68-3	0.01	0.01	0.44	18
Hexachlorocyclohexane (HCH)-Technical	608-73-1	0.0066	0.010	0.0123	0.0414
Hexachlorocyclopentadiene	77-47-4	4	4	40	1,100
Hexachloroethane	67-72-1	0.1	0.1	1.4	3.3
Indeno(1,2,3-cd)pyrene	193-39-5	0.0012	0.0013	0.0038	0.018
Isophorone	78-59-1	34	1,800	35	960
Methoxychlor	72-43-5	0.02	0.02	100	---
Methyl Bromide	74-83-9	100	10,000	47	1,500
Methylene Chloride	75-09-2	20	1,000	4.6	590
Nitrobenzene	98-95-3	10	600	17	690
Pentachlorobenzene	608-93-5	0.1	0.1	1.4	1.5
Pentachlorophenol	87-86-5	0.03	0.04	0.27	3
Phenol	108-95-2	4,000	300,000	10,000	860,000
p,p'-Dichlorodiphenyldichloroethane (DDD)	72-54-8	0.00012	0.00012	0.00031	0.00031

Analyte	CAS No.	2015 Human Health NRWQC		Previous Human Health NRWQC	
		Consumption of Water + Organism (ug/L)	Consumption of Organism Only (ug/L)	Consumption of Water + Organism (ug/L)	Consumption of Organism Only (ug/L)
p,p'-Dichlorodiphenyldichloroethylene (DDE)	72-55-9	0.000018	0.000018	0.00022	0.00022
p,p'-Dichlorodiphenyltrichloroethane (DDT)	50-29-3	0.000030	0.000030	0.00022	0.00022
Pyrene	129-00-0	20	30	830	4,000
Tetrachloroethylene (Perchloroethylene)	127-18-4	10	29	0.69	3.3
Toluene	108-88-3	57	520	1,300	15,000
Toxaphene	8001-35-2	0.00070	0.00071	0.00028	0.00028
trans-1,2-Dichloroethylene (DCE)	156-60-5	100	4,000	140	10,000
Trichloroethylene (TCE)	79-01-6	0.6	7	2.5	30
Vinyl Chloride	75-01-4	0.022	1.6	0.025	2.4

* NRWQC for this analyte were not provided in USEPA's previous update.

--- No NRWQC for the analyte in USEPA's previous update.

Units Key:

ug/L microgram per liter

Table C-10. Summary of the Lines of Evidence Used to Evaluate Each Exposure Pathway. Source: CDM (2011).

Line of Evidence	Exposure Pathways				
	1	**2**	**3**	**4**	**5**
Sediment Evaluation Framework Level 2A Step 1 – Sediment Screening Levels					
1. DMMP Marine MLs				+	
Sediment Evaluation Framework Level 2A Steps 2a, 2b, 2c, 2d – Sediment Screening Levels					
2. Ecological SLs (freshwater and marine)			+	+	+
3. Ecological TEQ SLVs (sediment)			+	+	+
Sediment Evaluation Framework Level 2B – Results of Water Quality Criteria Evaluations and Bioassays					
4. Elutriate WQC (ecological)	+			+	
5. Benthic midge *(Chironomus dilutens)* Bioassay			+	+	+
6. Benthic amphipod *(Hyalella azteca)* Bioassay			+	+	+
7. Rainbow trout *(Oncorhynchus mykiss)* Bioassay	+			+	
8. Asian clam *(Corbicula fluminea)*[1] Bioaccumulation Study/BSAF			+		+
9. Blackworm *(Lumbriculus variegatus)* [2] Bioaccumulation Study/BSAF			+		+
10. Asian clam *(Corbicula fluminea)* [1] Tissue TRV			+	+	+
11. Blackworm *(Lumbriculus variegatus)* [2] Tissue TRV			+	+	+

Line of Evidence	Exposure Pathways				
Special Evaluations – Human Health in Sediment and Fish Tissue					
12. Yellow perch (*Perca flavescens*) Tissue TRV (ecological)			+	+	+
13. Bullhead (*Ameirus sp.*) Tissue TRV (ecological)			+	+	+
14. Fish Tissue TEQ (ecological)			+	+	+
15. HHSLs		+	+		+
16. HH TEQ SLVs (sediment)		+	+		+
17. Elutriate WQC (human health)					
18. Perch Tissue TRV (human health)			+		+
19. Bullhead Tissue TRV (human health)			+		+
20. Fish Tissue TEQ (human health)			+		+

+: Applicable line of evidence for exposure pathway

[1] Representative bivalve

[2] Representative oligochaete

Key:

DMMP = Dredged Material Management Program
ML = Maximum Level
SL = Screening Level
TEQ = Toxic Equivalency
SLV = Screening Level Value
WQC = Water Quality Criteria
TRV = Toxicity Reference Value
BSAF = Biota-Sediment Accumulation Factor
HHSL = Human Health Screening Level
HH = Human Health

Contaminants in Aquatic Biota

Separate assessments of contaminants in fish tissue for the Hydroelectric Reach have been undertaken by SWAMP and PacifiCorp. SWAMP data include sport fish tissue samples collected during 2007 and 2008 to evaluate accumulated contaminants in nearly 300 lakes statewide. Sport fish were sampled to provide information on potential human exposure to selected contaminants and to represent the higher aquatic trophic levels (i.e., the top of the aquatic food web).

In the Hydroelectric Reach, fish tissue samples were collected in Copco No. 1 and Iron Gate reservoirs and analyzed for total mercury, selenium, and PCBs (Iron Gate Reservoir only) (Davis et al. 2010). SWAMP data for Iron Gate and Copco No. 1 reservoirs (Table C-11) indicate mercury tissue concentrations above the USEPA criterion of 300 nanograms per gram (ng/g) methylmercury in fish tissue to protect the health of consumers of noncommercial freshwater fish; and greater than the OEHHA public health guideline levels advisory tissue level (Klasing and Brodberg 2008) for consumption for 3 and 2 servings per week (70

and 150 ng/g wet weight, respectively) and the fish contaminant goal (220 ng/g wet weight). Measured selenium concentrations were 3 to 4 orders of magnitude lower than OEHHA thresholds of concern (2,500 to 15,000 ng/g wet weight) and PCB concentrations were below the lowest OEHHA threshold (i.e., fish contaminant goal of 3.6 ng/g wet weight) (Davis et al. 2010).

Table C-11. Total Mercury, Selenium, and PCBs in (ng/g wet weight) in Largemouth Bass taken from Iron Gate and Copco No. 1 Reservoirs During 2007 to 2008 (Davis et al. 2010).

Contaminant	Species	Iron Gate Reservoir	Copco No. 1 Reservoir
Methylmercury	Largemouth Bass (LMB)	330	310
Selenium	LMB	80	80
PCBs	LMB	1.31	*Not reported*

In a screening-level study of potential chemical contaminants in fish tissue in J.C. Boyle, Copco No. 1, and Iron Gate reservoirs, PacifiCorp analyzed metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, and zinc), organochlorine (pesticide) compounds, and PCBs in largemouth bass (*Micropterus salmoides*) (PacifiCorp 2004c). PacifiCorp reported that, in general, contaminant levels in fish tissue are below both screening level values for protection of human health (USEPA 2000) and recommended guidance values for the protection of wildlife (MacDonald 1994). Exceptions to this include measured fish tissue levels of total mercury in samples from Copco No. 1 and Iron Gate reservoirs as compared to the wildlife screening level of 0.00227 ug/g and measured fish tissue levels of arsenic (less than 0.3 ug/g) that PacifiCorp indicated may equal or exceed the toxicity screening level for subsistence fishers (0.147 ug/g) in samples of largemouth bass from J.C. Boyle, Copco No. 1, and Iron Gate reservoirs. Subsequent reanalysis of the PacifiCorp mercury tissue data indicates that all tissue samples exceed the most protective wildlife screening level of 0.00227 ug/g, samples from J.C. Boyle, Copco No. 1, and Iron Gate reservoirs exceed the screening level for subsistence fishers (0.049 ug/g), and samples from Copco No. 1 and Iron Gate reservoirs exceed the screening level for recreational fishers (0.4 ug/g) (Table C-12).

Table C-12. Total Mercury Concentrations (ug/g wet weight) in Largemouth Bass (LMB) Composite Tissue Samples taken from Lower Klamath Project Reservoirs in 2003 (PacifiCorp 2004c).

Sample	Composite	Site	Species	Total Mercury (ug/g wet weight)[1]
L-262-03	2F	J.C. Boyle Reservoir	LMB	0.153
L-262-03	3F	J.C. Boyle Reservoir	LMB	0.190
L-273-03	1F	Iron Gate Reservoir	LMB	0.564
L-273-03	2F	Iron Gate Reservoir	LMB	0.508
L-273-03	3F	Copco No. 1 Reservoir	LMB	0.563
L-273-03	4F	Copco No. 1 Reservoir	LMB	0.389
		Method Detection Limit		0.003[2]
		Method Reporting Limit		0.007[2]
		Screening Levels[3]:		
		Recreational fishers		0.4
		Subsistence fishers		0.049
		Wildlife		0.00227

[1] PacifiCorp (2004c) total mercury data was provided in ng/g dry weight. Data was converted to ug/g wet weight using percent moisture data provided for each sample by Moss Landing Marine Laboratory (A. Bonnema, pers. comm., 17 February 2011).

[2] The Method Detection Limit and Reporting Limit were converted from dry weight to wet weight using an average of the percent moisture data for all samples.

[3] Screening Levels (SLs) are numeric chemical guidelines that are used to assess and characterize the potential toxicity or bioaccumulative nature of environmental samples (i.e., sediments, water, organism tissue).

Additionally, PacifiCorp indicated that some of the fish tissue samples from J. C. Boyle and Copco No. 1 reservoirs exceeded the suggested wildlife screening value for total DDTs (Table C-13) (DDE,p,p' was detected; however DDT and DDD were not detected in the study), and total PCB values exceeded the screening level for subsistence fishers in largemouth bass from J.C. Boyle, Copco No. 1, and Iron Gate Reservoirs (Table C-14). Dioxins were not tested.

Table C-13. Total DDE Concentration (ng/g) in Large Mouth Bass (LMB) Composite Tissue Samples taken from Lower Klamath Project Reservoirs in 2003 (PacifiCorp 2004c).

Sample	Composite	Site	Species	DDE,p,p' (ng/g wet weight)
L-262-03	2F	J.C. Boyle Reservoir	LMB	<2.00
L-262-03	2F Duplicate	J.C. Boyle Reservoir	LMB	<2.00
L-262-03	3F	J.C. Boyle Reservoir	LMB	2.91
L-273-03	1F	Iron Gate Reservoir	LMB	<2.00
L-273-03	2F	Iron Gate Reservoir	LMB	<2.00
L-273-03	3F	Copco Reservoir	LMB	2.16
L-273-03	4F	Copco Reservoir	LMB	<2.00
		Method Detection Limit		0.56
		Method Reporting Limit		2
		Screening Levels[1] (for Total DDTs):		
		Recreational fishers		117
		Subsistence fishers		14.4
		Wildlife		0.2–1.07

[1] Screening Levels (SLs) are numeric chemical guidelines that are used to assess and characterize the potential toxicity or bioaccumulative nature of environmental samples (i.e., sediments, water, organism tissue).

Table C-14. Total PCB Concentrations (ng/g) in Large Mouth Bass (LMB) Composite Tissue Samples taken from Lower Klamath Project Reservoirs in 2003 (PacifiCorp 2004c).

Sample	Composite	Site	Species	Total PCB (ng/g wet weight)
L-262-03	2F	J.C. Boyle Reservoir	LMB	0.885
L-262-03	2F Duplicate	J.C. Boyle Reservoir	LMB	1.397
L-262-03	3F	J.C. Boyle Reservoir	LMB	3.521
L-273-03	1F	Iron Gate Reservoir	LMB	6.574
L-273-03	2F	Iron Gate Reservoir	LMB	4.909
L-273-03	3F	Copco Reservoir	LMB	2.822
L-273-03	4F	Copco Reservoir	LMB	2.158
		Method Detection Limit		Varies
		Method Reporting Limit		0.2
		Screening Levels[1]:		
		Recreational fishers		20
		Subsistence fishers		2.45
		Wildlife		100

[1] Screening Levels (SLs) are numeric chemical guidelines that are used to assess and characterize the potential toxicity or bioaccumulative nature of environmental samples (i.e., sediments, water, organism tissue).

To provide additional lines of evidence in the Klamath Dam Removal Secretarial Determination sediment evaluation, the potential for chemicals in sediment samples to bioaccumulate in aquatic species was investigated using laboratory invertebrates (Asian clams, *Corbicula fluminea*; and Black worms, *Lumbriculus variegates*) exposed to reservoir-derived sediments. Results indicated that multiple chemicals were found in invertebrate tissue (acenaphthene, arsenic, benzo(a)pyrene, DDD/DDE, endosulfan I, endosulfan II, endosulfan sulfate, fluoranthene, hexachlorobenzene, lead, mercury, phenanthrene, pyrene, total PBDEs, total PCBs). Of these detected chemicals, only fluoranthene possessed a toxicity reference value (TRV) for the species tested; exceedances of the fluoranthene TRV were only identified above the No Effect TRV and were below the Low Effect TRV. Tissue-based TRVs were unavailable for the remaining invertebrate chemicals detected, and hexachlorobenzene has no tissue-based TRVs (for any species) (CDM 2011).

Lastly, two species of field-caught fish (yellow perch and bullhead) were collected during late September 2010 from J.C. Boyle, Copco No. 1, and Iron Gate reservoirs and analyzed for contaminant concentrations (CDM 2011). Table C-

15 lists all the chemicals detected in the fish tissue along with a list of chemicals tested for, but not detected in any sample of fish tissue. Chemicals found in the fish tissue samples included 2,3,7,8-TCDD, arsenic, DDE/DDT, dieldrin, endrin, mercury, mirex, selenium, and total PCBs (CDM 2011). Mercury exceeded tissue-based TRVs for perch in Iron Gate Reservoir and bullhead samples in all three reservoirs (CDM 2011). TRVs were not available the remaining several chemicals detected in yellow perch and bullhead samples (CDM 2011). Results of chemical analyses of field collected fish revealed that no consistent pattern of contaminant distribution was identified among chemicals, media type, or location. Data revealed that fish can accumulate a fairly large number of sediment-associated chemicals; however, regional background conditions may be elevated for more than one of the measured chemicals (e.g., arsenic, mercury) (CDM 2011).

Table C-15. Chemicals Detected and Not Detected in Fish Tissue Field Caught in 2010 from J.C. Boyle, Copco No. 1, and Iron Gate reservoirs (CDM 2011).

Bullhead (*Ameiurus sp.*)		**Yellow Perch (*Perca flavescens*)**	
Detected[1]	**Not Detected[2]**	**Detected[1]**	**Not Detected[2]**
2,4'-DDD	2,4'-DDT	2,4'-DDD	Acenaphthene
2,4'-DDE	Acenaphthene	2,4'-DDE	Acenaphthylene
2-Fluorobiphenyl	Acenaphthylene	2,4'-DDT	Aldrin
4,4'-DDD	Aldrin	2-Fluorobiphenyl	Anthracene
4,4'-DDE	Anthracene	4,4'-DDD	BDE (4)
4,4'-DDT	BDE (3)	4,4'-DDE	Benzo(a)anthracene
alpha-BHC	Benzo(a)anthracene	4,4'-DDT	Benzo(a)pyrene
Arsenic	Benzo(a)pyrene	alpha-BHC	Benzo(b)fluoranthene
BDE (8)	Benzo(b)fluoranthene	Arsenic	Benzo(ghi)perylene
beta-BHC	Benzo(ghi)perylene	BDE (7)	Benzo(k)fluoranthene
cis-Chlordane	Benzo(k)fluoranthene	beta-BHC	Chrysene
cis-Nonachlor	Chrysene	cis-Chlordane	D/F (14)
D/F (1)	D/F (14)	cis-Nonachlor	Dibenz(a,h)anthracene
delta-BHC	Dibenz(a,h)anthracene	D/F (1)	Endosulfan I
Dieldrin	Endosulfan I	delta-BHC	Endosulfan II
Endosulfan sulfate	Endosulfan II	Dieldrin	Endrin aldehyde
Fluorene	Endrin	Endosulfan sulfate	Endrin ketone
gamma-BHC (Lindane)	Endrin aldehyde	Endrin	Fluoranthene
Heptachlor epoxide	Endrin ketone	gamma-BHC (Lindane)	Fluorene
Hexachlorobenzene	Fluoranthene	Heptachlor	Indeno(1,2,3-cd)pyrene
Lead	Heptachlor	Heptachlor epoxide	Lead

Bullhead (*Ameiurus sp.*)		**Yellow Perch (*Perca flavescens*)**	
Detected[1]	**Not Detected[2]**	**Detected[1]**	**Not Detected[2]**
Mercury	Indeno(1,2,3-cd)pyrene	Hexachlorobenzene	OCDF
Methoxychlor	OCDF	Mercury	PCB congeners (24)
Mirex	PCB congeners (28)	Methoxychlor	Phenanthrene
Naphthalene	Phenanthrene	Mirex	Pyrene
Nitrobenzene-d5	Pyrene	Naphthalene	Total HpCDF
OCDD	Total HpCDF	Nitrobenzene-d5	Total HxCDD
oxy-Chlordane	Total HxCDD	OCDD	Total HxCDF
PCB congeners (181)	Total HxCDF	oxy-Chlordane	Total PeCDD
Selenium	Total PeCDD	PCB congeners (185)	Total PeCDF
Total HpCDD	Total PeCDF	Selenium	Total TCDD
trans-Chlordane	Total TCDD	Total HpCDD	Total TCDF
trans-Nonachlor	Total TCDF	trans-Chlordane	
		trans-Nonachlor	

[1] Detected in one or more samples
[2] Not detected in any sample

In 2017, the State Water Board established water quality objectives for mercury to protect people and wildlife from consuming fish that contain high levels of mercury (State Water Board 2017). Five mercury fish tissue water quality objectives were developed depending on consumption patterns by individuals and wildlife. The Copco No. 1 and Iron Gate reservoirs were 303(d) listed as impaired for mercury by the State Water Board based on four or more lines of evidence showing mercury concentrations in fish fillets exceeding USEPA 304(a) concentrations of methylmercury in fish tissue of trophic level 4 fish (USEPA 2000; PacifiCorp 2004c; Davis et al. 2010; CDM 2011). No TMDL has been determined for Copco No. 1 or Iron Gate reservoirs, with an expected TMDL completion date of 2025.

C.7.2 Mid- to Lower Klamath Basin

C.7.2.1 Iron Gate Dam to Salmon River

Water Column Contaminants

SWAMP collected water quality data for inorganic and organic contaminants from 2000 through 2005 at eight monitoring sites from the Oregon-California state line (RM 214.1) to Klamath River at Klamath Glen (RM 5.9) (North Coast Regional Board 2008). As was the case for the SWAMP state line site (Section C.7.1.1), results for the four sites in the reach from Iron Gate Dam to the Salmon River

indicated that with the exception of aluminum, all other measured concentrations of inorganic constituents (i.e., arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver and zinc) were in compliance with all water quality objectives at the time of sampling. Aluminum concentrations (26.3 to 280.0 ug/L) exceeded the USEPA continuous concentration for freshwater aquatic life protection (87 ug/L) on 23 of 59 site visits (39 percent exceedance rate), exceeded the USEPA secondary MCL for drinking water (50 ug/L) on 37 site visits (63 percent exceedance rate), and exceeded the California Department of Health Services secondary MCL for drinking water (200 ug/L) on five site visits (8 percent exceedances rate) (North Coast Regional Board 2008). The Klamath River from Iron Gate Dam to its confluence with the Scott River is 303(d) listed for aluminum. Water quality measurements in 2002 and 2003 at two USGS gage stations downstream of Iron Gate Dam to the Salmon River indicate that, with the exception of barium, nickel, magnesium, and calcium, the concentration of trace elements either remained the same or decreased as water flowed downstream, most likely because of binding to other particles and settling out of the water column (Tables C-16 and C-17; Flint et al. 2005). Additional data from two more USGS gage stations downstream of the confluence of the Klamath River and the Salmon River further support these trends, except for magnesium which does not continue to increase downstream of the Salmon River. Asarian and Kann (2014) note that the mean dissolved copper concentrations at three Klamath River sites between 2001 to 2013 are approximately 0.75 ug/L or less and the maximum is always less than 1.5 ug/L.

Sediment Contaminants

Sediment data for inorganic and organic contaminants in the Klamath River from Iron Gate Dam to the Salmon River are not readily available, nor are fish tissue analyses for contaminants in the lower Klamath River.

Table C-16. Water Quality Data Collected at 4 Sites in the Klamath River in 2002 (Flint et al. 2005).

Trace Element	Walker[1]	Seiad[2]	Orleans[3]	Klamath[4]
Aluminum	2	2	1	<1
Antimony	E0.04	E0.04	E0.05	<0.05
Arsenic	5	4	3	3
Barium	8.0	10.0	14.0	14.0
Beryllium	<0.06	<0.06	<0.06	<0.06
Cadmium	<0.04	<0.04	<0.04	<0.04
Chromium	<0.8	2.4	<0.8	<0.8
Cobalt	0.13	0.13	0.1	0.08
Copper	0.6	1.2	0.8	0.7
Manganese	6.1	7.2	2.5	3
Mercury	E0.01	0.01	<0.01	E0.01

Trace Element	Walker[1]	Seiad[2]	Orleans[3]	Klamath[4]
Mercury (total recoverable)	E0.01	0.02	<0.01	<0.01
Molybdenum	1.0	1.0	0.8	0.6
Nickel	1.00	1.36	2.28	2.43
Selenium	<2	<2	<2	E1
Silver	<1	<1	<1	<1
Zinc	ND	ND	ND	1
Uranium	0.13	0.12	0.11	0.07

Notes:
1 Klamath River at Walker Bridge (USGS 11517818)
2 Klamath River at Seiad Valley (USGS 11520500)
3 Klamath River at Orleans (USGS 11523000)
4 Klamath River near Klamath (USGS 11530500)
All data shown in micrograms per liter.

Table C-17. Water Quality Data Collected at 4 Sites in the Klamath River in 2003 (Flint et al. 2005).

Trace Element	Walker[1]		Seiad[2]		Orleans[3]		Klamath[4]	
	July	Sept	July	Sept	July	Sept	July	Sept
Calcium	15.3	12.7	16.9	14.4	16.0	15.6	15.5	15.9
Magnesium	9.63	8.21	10.6	9.22	8.19	8.69	7.59	8.77
Potassium	2.85	2.55	2.25	2.47	1.47	1.99	0.91	1.34
Sodium	16.6	14.1	13.4	13.9	8.18	11.3	5.25	7.59
Chloride	5.37	5.21	5.48	5.65	3.78	5.23	2.87	3.87
Fluoride	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Silica	27.2	36.1	23.9	34.4	19.8	29.2	16.2	21.4
Sulfate	11.9	6.4	10.5	6.5	7.0	5.9	5.7	5.4

Notes:
1 Klamath River at Walker Bridge (USGS 11517818)
2 Klamath River at Seiad Valley (USGS 11520500)
3 Klamath River at Orleans (USGS 11523000)
4 Klamath River near Klamath (USGS 11530500)
All data shown in micrograms per liter.

C.7.2.2 Salmon River to Klamath River Estuary

Water Column Contaminants

SWAMP collected water quality data for inorganic and organic contaminants from 2001 through 2005 at three monitoring sites in this reach of the Klamath River to Klamath Glen (RM 5.9) (North Coast Regional Board 2008). With the exception of aluminum, all other measured concentrations of inorganic constituents (i.e., arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, and zinc) were in compliance with all water quality objectives at the time of sampling. Aluminum concentrations (8.8 to 565.0 ug/L) exceeded the USEPA continuous concentration for freshwater aquatic life protection (87 ug/L) on 12 of 28 site visits (43 percent exceedance rate), exceeded the USEPA secondary MCL for drinking water (50 ug/L) on 15 site visits (54 percent exceedance rate), and exceeded the California Department of Health Services secondary MCL for drinking water (200 ug/L) on four site visits (14 percent exceedances rate). At one station (Klamath River at Klamath Glen [RM 5.9]), grab samples were analyzed for 100 pesticides, pesticide constituents, or pesticide metabolites; 50 PCB congeners; and 6 phenolic compounds. There were no PCB detections, but the pesticide disulfoton was detected in one sample. Disulfoton is a systemic organophosphate insecticide for which there is no numeric water quality objective. Similar to the Klamath River from downstream of Iron Gate to the confluence with the Salmon River, the water quality measurements in 2002 and 2003 at two USGS gage stations in the Lower Klamath River from the confluence with the Salmon River to the Klamath River Estuary indicate that, with the exception of barium, nickel, and calcium, the concentration of trace elements either remained the same or decreased as water flowed downstream, most likely because of binding to other particles and settling out of the water column (Tables C-16 and C-17; Flint et al. 2005). While barium concentrations remain the same at the two USGS gage stations between the Salmon River and the Klamath River Estuary (Orleans and Klamath), a comparison of barium concentrations at those gages with the two upstream gages (Walker Bridge and Seiad Valley) shows an increasing trend in barium with distance downstream from Iron Gate Dam. Nickel concentrations consistently increase with distance downstream.

Sediment Contaminants

Sediment data characterizing inorganic and organic contaminants in the Lower Klamath River from the Salmon River to the Klamath River Estuary are not readily available, nor are fish tissue analyses for contaminants in this reach of the Klamath River. Sediment data from the Klamath River Estuary are described below.

C.7.2.3 Klamath River Estuary

Sediment and water column data for inorganic and organic contaminants in the Klamath River Estuary are not readily available. However, contaminant conditions in the Klamath River Estuary (RM 0 to 3.9) are likely to be similar to

those a few miles upstream at the site for which SWAMP data have been recently collected (see previous section).

As part of the Secretarial Determination studies, a sediment evaluation evaluated the potential environmental and human health impacts of the downstream release of sediment deposits currently stored behind the dams under the Proposed Project. Sediment cores were collected during 2009 to 2010 at multiple sites and at various sediment depths per site, including two locations in the Klamath River Estuary (see Section C.7.1.1). Overall, using thirteen lines of evidence from the 2009 to 2010 Secretarial Determination study (Lines of Evidence 1 to 11, 15, and 16 in Table C-10), sediment quality in the Klamath River Estuary does not appear to be highly contaminated (CDM 2011). The other lines of evidence were not used in the evaluation of conditions in the Klamath River Estuary, because no fish tissue was collected from the Klamath River Estuary. Where elevated concentrations of chemicals in sediment were found (i.e., arsenic, chromium, iron, nickel, bis[2-ethylhexyl]phthalate), the degree of exceedance based on comparisons of measured (i.e., detected) chemical concentrations to SLs was small and in several cases (i.e., arsenic, nickel) may reflect regional background conditions (CDM 2011). The results of the acute toxicity bioassays for midge and amphipod identified no statistically significant difference in survival of either test organism exposed to estuary sediments compared to control sediments. As with the reservoir sediments (Section C.7.1.1), the lone chemical identified in tissue from invertebrates exposed to estuary sediments above TRVs was fluoranthene. Further, it was only identified above the No Effect TRV, and was below the Low Effect TRV. TEQs for dioxin, furan, and dioxin-like PCBs were all below 0.2 pg/g for the Klamath River Estuary, thus adverse effects from exposure to TEQs are not expected following exposure to sediment in the Klamath River Estuary (CDM 2011).

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APPENDIX D. WATER QUALITY ENVIRONMENTAL EFFECTS DETERMIMATION METHODOLOGY SUPPLEMENTAL INFORMATION

Volume II Appendix D Section D.1.1 Available Numeric Models for Analysis of the Proposed Project and Alternatives – Klamath River Water Quality Model (KRWQM), paragraph 1 on page D-1:

Numeric models[113] used to assess potential water quality impacts for the Proposed Project and Alternatives are presented in Table D-1. For the FERC relicensing process, PacifiCorp developed the Klamath River Water Quality Model (KRWQM) (Watercourse Engineering, Inc. 2003, PacifiCorp 2004, 2005), consisting of linked Resource Management Associates (RMA) RMA-2 and RMA-11 dimensional models for riverine segments, where RMA-2 simulates riverine hydrodynamics and RMA-11 simulates water quality processes, and a 2-dimensional CE-QUAL-W2 model used for water quality in reservoir segments. The 2004/2005 KRWQM does not include an analysis for the Klamath River Estuary. The ~~KRWQM~~2004/2005 KRWQM possesses the following attributes (Tetra Tech 2009a):

Volume II Appendix D Section D.1.1 Available Numeric Models for Analysis of the Proposed Project and Alternatives – Klamath River Water Quality Model (KRWQM), paragraph 2 on page D-1:

~~KRWQM~~2004/2005 KRWQM results for water temperature and dissolved oxygen compare the existing condition (all Project dams in place) to four without-dams scenarios (i.e., without Iron Gate Dam ["WIG"]; without Copco No. 1, Copco No. 2, and Iron Gate dams ["WIGC"]; without J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate dams ["WIGCJCB"]; and without Keno, J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate dams ["WOP" and "WOP2"]). Model runs were calibrated using data from calendar years 2001□2004 (PacifiCorp 2004). General modeling assumptions in comparison to conditions considered for this EIR water quality effects analyses are presented in Table D-2. Limitations and sources of uncertainty for the ~~KRWQM~~2004/2005 KRWQM are presented in Watercourse Engineering, Inc. (2003).

Volume II Appendix D Section D.1.1 Available Numeric Models for Analysis of the Proposed Project and Alternatives – Klamath River Water Quality Model (KRWQM), new paragraph 3 on page D-1:

[113] Here numeric models refers to mathematical models that are developed to represent the physical, chemical, and biological conditions in waterbodies such as rivers, lakes, reservoirs, wetlands, estuaries, and the ocean.

More recent 2019 KRWQM documentation (PacifiCorp 2019) indicates that PacifiCorp has developed an updated version of the KRWQM model, where the updates were primarily focused on Keno Reservoir. However, PacifiCorp (2019) does not present comparisons of dam removal scenarios, so the previous 2004/2005 KRWQM results cannot be replaced with the newer 2019 KRWQM results in the EIR analyses.

Volume II Appendix D Section D.1.1 Available Numeric Models for Analysis of the Proposed Project and Alternatives – Klamath River TMDL Model, paragraph 3 on page D-1:

For development of Klamath River Total Maximum Daily Loads (TMDLs) in Oregon and California, Oregon DEQ, North Coast Regional Board, and the United States Environmental Protection Agency (USEPA) Regions 9 and 10 collaborated to enhance the existing ~~KRWQM~~2004/2005 KRWQM by revisiting assumptions for several model algorithms, including the three-dimensional Environmental Fluid Dynamics Code model, to represent water quality in the Klamath River Estuary. Algorithm enhancements are described in Tetra Tech (2009a). The Klamath River TMDL model was calibrated for water temperature, dissolved oxygen, nutrients (TP, TN, ortho-phosphorus, nitrate, ammonia), and pH using year 2000 data, with the exception of the Klamath River Estuary which was calibrated using year 2004 data. Additional model corroboration was conducted for Klamath River reaches in Oregon using data from year 2002, indicating that the Klamath River TMDL model scenarios reproduce general temporal and spatial trends in the observed data (Tetra Tech 2009a). Four simulated scenarios were run for the Klamath River TMDL model including the following (Tetra Tech 2009b):

Volume II Appendix D Section D.1.1 Available Numeric Models for Analysis of the Proposed Project and Alternatives – Klamath River TMDL Model, Table D-1 Numeric Models Used to Assess Potential Water Quality Impacts for the Proposed Project and Alternatives on page D-3:

Table D-1. Numeric Models Used to Assess Potential Water Quality Impacts for the Proposed Project and Alternatives.

Reach	**Water Quality Parameter**					
	Water Temperature	**Sediment and Turbidity**	**Dissolved Oxygen**		**Nutrients**	**pH**
	Long-term[1]	**Short-term[2]**	**Short-term[2]**	**Long-term[1]**	**Long-term[1]**	**Long-term[1]**
No Project Alternative, Continued Operations with Fish Passage Alternative						
Downstream from J.C. Boyle Reservoir (RM 229.8)	Klamath TMDL T4BSRN Klamath TMDL T1BSR RBM10			Klamath TMDL T4BSRN Klamath TMDL T1BSR	Klamath TMDL T4BSRN	Klamath TMDL T4BSRN
Oregon-California State line (RM 214.1)						
Downstream from Iron Gate Dam (RM 193.1)						
Shasta River (RM 179.5)						
Scott River (RM 145.1)						
Seiad Valley (RM 132.7)						
Salmon River (RM 66.3)						
Trinity River (RM 43.3)						

Reach	Water Quality Parameter					
	Water Temperature	**Sediment and Turbidity**	**Dissolved Oxygen**		**Nutrients**	**pH**
	Long-term[1]	**Short-term[2]**	**Short-term[2]**	**Long-term[1]**	**Long-term[1]**	**Long-term[1]**
Turwar (RM 5.6)						
Klamath River Estuary (RM 0-3.9)						
Proposed Project, Partial Removal Alternative, No Hatchery Alternative						
Downstream from J.C. Boyle Reservoir (RM 229.8)	Klamath TMDL TOD2RN			Klamath TMDL TOD2RN	Klamath TMDL TOD2RN	Klamath TMDL TOD2RN
Oregon-California State line (RM 214.1)						
Downstream from Iron Gate Dam (RM 193.1)	Klamath TMDL TCD2RN ~~KRWQM~~2004/2005 KRWQM WIGCJCB[3] RBM10	Reclamation SRH-1	Reclamation, USFWS, USGS, Stillwater Sciences BOD/IOD	Klamath TMDL TCD2RN ~~KRWQM~~2004/2005 KRWQM WIGCJCB[3]	Klamath TMDL TCD2RN	Klamath TMDL TCD2RN
Shasta River (RM 179.5)						
Scott River (RM 145.1)						
Seiad Valley (RM 132.7)						
Salmon River (RM 66.3)						
Trinity River (RM 43.3)						
Turwar (RM 5.6)						
Klamath River Estuary (RM 0-3.9)						

Reach	Water Quality Parameter					
	Water Temperature	**Sediment and Turbidity**	**Dissolved Oxygen**		**Nutrients**	**pH**
	Long-term[1]	**Short-term[2]**	**Short-term[2]**	**Long-term[1]**	**Long-term[1]**	**Long-term[1]**
Three Dam Removal Alternative, Two Dam Removal Alternative						
Downstream from J.C. Boyle Reservoir (RM 229.8)						
Oregon-California State line (RM 214.1)						
Downstream from Iron Gate Dam (RM 193.1)	~~KRWQM~~2004/2005 KRWQM WIGC[3] RBM10			~~KRWQM~~2004/2005 KRWQM WIGC[3]		
Shasta River (RM 179.5)						
Scott River (RM 145.1)						
Seiad Valley (RM 132.7)						
Salmon River (RM 66.3)						
Trinity River (RM 43.3)						
Turwar (RM 5.6)						
Klamath River Estuary (RM 0-3.9)						

[1] Long-term—greater than 2 years following dam removal/construction of fish passage facilities or greater than 5 years for the No Project Alternative

[2] Short-term—less than 2 years following dam removal/construction of fish passage facilities or 1–5 years for the No Project Alternative.

[3] ~~KRWQM~~2004/2005 KRWQM results for the scenarios shown are available for the mainstem Klamath River immediately downstream from Iron Gate Dam, at the Scott River confluence, and at the Salmon River confluence (PacifiCorp 2004, 2005). While the KRWQM was run for the Hydroelectric Reach, results for that reach were not presented in PacifiCorp (2004, 2005).

Key:

Klamath TMDL T4BSRN—with-dams Oregon and California TMDLs allocation scenario (Tetra Tech 2009b).

Klamath TMDL T1BSR—natural conditions baseline scenario for California TMDLs (Tetra Tech 2009b). The T1BSR natural conditions scenario is useful for analyzing those water quality parameters that rely on a comparison to background or natural levels for regulatory water quality standards, such as water temperature and dissolved oxygen.

Klamath TMDL TOD2RN—Oregon TMDLs allocation scenario (Tetra Tech 2009b).

Klamath TMDL TCD2RN—California TMDLs allocation scenario (Tetra Tech 2009b).

~~KRWQM~~2004/2005 KRWQM WIGCJCB—Klamath River Water Quality Model Without Iron Gate, Copco No. 1, Copco No. 2, and J.C. Boyle dams scenario (Watercourse Engineering, Inc. 2003, PacifiCorp 2004)

Volume II Appendix D Section D.1.1 Available Numeric Models for Analysis of the Proposed Project and Alternatives – Klamath River TMDL Model, Table D-2 Comparison of Assumptions and Parameters for Available Numeric Models to Conditions Used for the Assessment of Potential Water Quality Impacts on page D-5:

Table D-2. Comparison of Assumptions and Parameters for Available Numeric Models to Conditions Used for the Assessment of Potential Water Quality Impacts.

Assumptions/Model Parameters	**Available Numeric Models for Long-term Conditions**			**Conditions Considered for Lower Klamath Project EIR**			
	~~KRWQM~~2004/2005 KRWQM	**Klamath TMDL**	**RBM10**	**Proposed Project, Partial Removal Alternative, No Hatchery Alternative**	**No Project and Continued Operations with Fish Passage Alternative**	**Three Dam Removal**	**Two Dam Removal**
Water quality constituents considered	• Water temperature [1] • Dissolved oxygen[1] • Nutrients • Chlorophyll-a	• Water temperature • Dissolved oxygen • Nutrients • pH • Chlorophyll-a	• Water temperature	• Water temperature • Suspended material • Dissolved oxygen • Nutrients • pH • Chlorophyll-a			

Assumptions/Model Parameters	**Available Numeric Models for Long-term Conditions**			**Conditions Considered for Lower Klamath Project EIR**			
	~~KRWQM~~2004/2005 KRWQM	**Klamath TMDL**	**RBM10**	**Proposed Project, Partial Removal Alternative, No Hatchery Alternative**	**No Project and Continued Operations with Fish Passage Alternative**	**Three Dam Removal**	**Two Dam Removal**
Dams remaining in-place (different modeling scenario names are shown in quotations for ~~KRWQM~~2004/2005 KRWQM and the Klamath TMDL model)	• "WOP" and "WOP2" = Link River • "WIGCJCB" = Link River and Keno • "WIGC" = Link River, Keno, J.C. Boyle • "WIG" = Link River, Keno, J.C. Boyle, Copco No. 1 and 2 • "EC" = Link River, Keno, J.C. Boyle, Copco No. 1 and 2, Iron Gate	• "T4BSRN" = Link River, Keno, J.C. Boyle, Copco No. 1 and 2, Iron Gate • "TOD2RN" and "TCD2RN" = Link River and Keno Reef [2] • "T1BSR" = Link River and Keno Reef [2]	"No Action Alternative" = J.C. Boyle, Copco No. 1, Copco No. 2, Iron Gate	None	J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate	J.C. Boyle	J.C. Boyle and Copco No. 2

Assumptions/Model Parameters	**Available Numeric Models for Long-term Conditions**			**Conditions Considered for Lower Klamath Project EIR**			
	~~KRWQM~~2004/2005 KRWQM	**Klamath TMDL**	**RBM10**	**Proposed Project, Partial Removal Alternative, No Hatchery Alternative**	**No Project and Continued Operations with Fish Passage Alternative**	**Three Dam Removal**	**Two Dam Removal**
Flows	• Existing conditions for 2000–2004 [3] • NMFS 2002 Biological Opinion Mandatory Flows for the Klamath Project	Existing conditions for 2000 [4]	2010 Biological Opinion Mandatory (NMFS) and KBRA Flows[5]	See Section 3.1.6	See Sections 4.2.1.2 and 4.4.1.1	See Section 4.6.1.1	See Section 4.5.1.1
Reaches	Link River Dam (RM 259.7) to Turwar (RM 5.6)	Link River Dam (RM 259.7) to the Klamath River Estuary (RM 0–3.9)	Link River Dam (RM 259.7) to the Pacific Ocean	J.C. Boyle Reservoir (RM 233.3) to the Klamath River Estuary (RM 0–3.9)			
Analysis year(s)	2000–2004	2000	2012–2061	As detailed in EIR Sections 3 and 4			
Climate change	Not included	Not included	Included				

Assumptions/Model Parameters	**Available Numeric Models for Long-term Conditions**			**Conditions Considered for Lower Klamath Project EIR**			
	~~KRWQM~~2004/2005 KRWQM	**Klamath TMDL**	**RBM10**	**Proposed Project, Partial Removal Alternative, No Hatchery Alternative**	**No Project and Continued Operations with Fish Passage Alternative**	**Three Dam Removal**	**Two Dam Removal**
Nutrients							
Upper Klamath Lake and inputs to Keno Impoundment[6]	Current conditions at the time of the model development[7]	OR and CA full TMDL compliance [8]	Not applicable	• Eventual OR and CA full TMDL compliance[8] • Timescale assumed to be decades			
Small tributaries to the lower Klamath River (i.e., Iron Gate Dam to Klamath River Estuary)	• TN: 0.275 mg/L • TP: 0.075 mg/L	• TN: 0.077 mg/L [10] • TP: 0.014 mg/L [10]	Not applicable	See assumptions for Klamath TMDL			

Assumptions/Model Parameters	**Available Numeric Models for Long-term Conditions**			**Conditions Considered for Lower Klamath Project EIR**			
	~~KRWQM~~2004/2005 KRWQM	**Klamath TMDL**	**RBM10**	**Proposed Project, Partial Removal Alternative, No Hatchery Alternative**	**No Project and Continued Operations with Fish Passage Alternative**	**Three Dam Removal**	**Two Dam Removal**
Algae and particulate organic matter (POM)							
Upper Klamath Lake and inputs to Keno Impoundment[6]	Current conditions at the time of the model development[7]	OR and CA full TMDL compliance[8]	Not applicable	• OR and CA full TMDL compliance[8] • Timescale unknown			
Settling rates in all reservoirs	• Algal settling rate = 1.0 m/day • POM = 0.5 m/day [9]	• Algal settling rate = 0.3 m/day [11] • POM = 0.8 m/day [11]	Not applicable	See assumptions for Klamath TMDL			

[1] Published results available for water temperature and dissolved oxygen in PacifiCorp (2005). Additional results available in the FERC record and as an electronic appendix to http://www.riverbendsci.com/reports-and-publications-1/klam_wq_model_eval.pdf

[2] The historically natural Keno Reef was included in place of Keno Dam, such that the Keno Reach is not characterized as a free-flowing river.

[3] The WOP2 scenario has "smoothed flows" from Klamath Irrigation Project, to account for the fact that if Keno Dam were removed, Link releases would have to be smoothed due to instream flow requirements downstream.

[4] Exceptions to current conditions include the TIBSR model (natural conditions) where dramatically increased summer flows (i.e., no diversions) were assumed for tributaries to the mainstem Klamath River. USBR 2005 "un-depleted natural flows" were used for flows at Link River Dam and Keno Impoundment. For T4BSRN, TOD2RN, and TCD2RN, Shasta River flows are increased by 45 cfs. Hydropower peaking in the J.C. Boyle Peaking Reach was not included in the no-dam scenarios (TOD2RN, TCD2RN, T1BSR) (Tetra Tech 2009a).

[5] While analysis for the Lower Klamath Project EIR considered the 2013 Joint Biological Opinion and the court-ordered flushing and emergency dilution flows, the KBRA and 2013 Joint Biological Opinion flows were determined to be sufficiently similar (see Section 3.1.6) that modeling using KBRA flows was used if modeling using 2013 Joint Biological Opinion flows was not available.

[6] Upper Klamath Lake and inputs to Keno impoundment are model boundary inputs for the available numeric models only. The area of analysis for water quality constituents in the Lower Klamath Project License Surrender only considers the Klamath River in Oregon from J.C. Boyle Reservoir to the Oregon-California State line to the extent that conditions in that reach influence water quality in California. See Section 3.2.1 for further details.

[7] Current conditions at the time of the model development based on combination of individual samples and long-term monthly averages (used when individual samples not available) from Freemont Bridge (near outlet of Upper Klamath Lake, Link Dam, and Eastside/Westside powerhouses. Current conditions at the time of the model development for other inputs to Keno Impoundment are based on combination of individual samples and averages.

[8] Full implementation assumes the decrease in nutrient loads at the Oregon-California State line is 87% for TP and 62% for TN and BOD (calculated from information in Table 2-8, Kirk et al. [2010]). Analysis for the Lower Klamath Project EIR only considered OR TMDL compliance with regard to what crosses the Oregon-California State line into California and how it may influence water quality in the Upper, Mid-, and Lower Klamath Basin in California.

[9] PacifiCorp (2005).

[10] North Coast Regional Board (2010).

[11] Tetra Tech (2009a).

Volume II Appendix D Section D.1.1 Available Numeric Models for Analysis of the Proposed Project and Alternatives – Considerations for the Lower Klamath Project, paragraph 2 on page D-8:

As presented in Table D-2, major differences between the existing numeric models and the conditions considered for water quality analyses in this EIR include the following:

- The Klamath River TMDL TOD2RN and TCD2RN ("dams out") model runs remove PacifiCorp dams and represent Keno Dam as the historical natural Keno Reef, such that the Keno Reach is not characterized as a free-flowing river. The ~~KRWQM~~2004/2005 KRWQM includes a model run retaining Keno. The analysis in this EIR retains Keno Dam for the Proposed Project and all alternatives.
- River flows for the Lower Klamath Project EIR analysis are based on the NMFS and USFWS 2013 Joint Biological Opinion flows (NMFS and USFWS 2013) and the court-ordered flushing and emergency dilutions flows (U.S. District Court 2017), but modeling using KBRA flows are used if modeling using the 2013 Joint Biological Opinion flows are not available. The KBRA and 2013 Joint Biological Opinion flows are sufficiently similar (see Section 3.1.6) that modeling using KBRA flows still captures the range of conditions under 2013 Joint Biological Opinion flows. The river flows used in the Lower Klamath Project EIR analysis tend to be greater than those modeled in either the Klamath River TMDL model (with the exception of T1BSR) or the ~~KRWQM~~2004/2005 KRWQM.
- Climate change was not considered in either the ~~KRWQM~~2004/2005 KRWQM or the Klamath River TMDL model.
- The RBM10 water temperature model includes climate change projections, but uses NMFS 2010 Biological Opinion (NMFS 2010) flows "BO" alternative for the "No Action Alternative" analyzed in the Secretarial Determination studies and KBRA flows for the "Action Alternative" analyzed in the Secretarial Determination studies.

References

Volume II Appendix D Section D.4 References, pages D-16 through D-18, includes the following revisions:

PacifiCorp. 2019. Response to the State Water Resources Control Board request for additional information related to PacifiCorp's February 2019 comments on the draft environmental impact report for the Lower Klamath Project License Surrender. Prepared by PacifiCorp, Portland, Oregon for California State Water Resources Control Board, Sacramento, California.

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APPENDIX E. AN ANALYSIS OF POTENTIAL SUSPENDED SEDIMENT EFFECTS ON ANADROMOUS FISH IN THE KLAMATH BASIN

E.2 Methods

Volume II Appendix E Section E.2 Methods, paragraph 1 on page E-2:

Daily durations of SSC concentrations were modeled assuming the Proposed Project occurred within each of the 48 years in the available hydrology from 1961 through 2009. As described in Chapter 6 of USBR (2012), the 2010 NMFS BiOp (NMFS 2010a) flows were used for modeling suspended sediment, but flow requirements in the Klamath River have changed since the modeling was performed. The NMFS and USFWS 2013 Joint BiOp flows (NMFS and USFWS 2013) along with 2017 court-ordered flushing and emergency dilution flows were required during the period February 2017 – March 2019 ~~are the current key flow requirements to which the LKP must operate~~. The 2019 Biological Opinion flows (2019 BiOp Flows) are now the current operational flow requirement for the Klamath River (see also Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project)*. The 2013 Joint BiOp and the 2019 BiOp retained the overall magnitude of 2010 BiOp flows, but altered flow conditions by shifting the monthly timing and water year type distribution of flows. As described in Section 4.2.1.1 *[No Project Alternative] Alternative Description* ~~3.1.6 Summary of Available Hydrology Information for the Proposed Project~~, during January through May the 2013 Joint BiOp (NMFS and USFWS 2013) flows~~, that replaced the 2010 BiOp flows,~~ are ~~sufficiently similar~~ within the range of 2010 BiOp Flows ~~to the 2010 BiOp flow releases~~ used in the modeling approximately 99 percent of the time, such that the model results are still representative of the key hydrological factors including timing, frequency, and magnitude of flows released during winter and spring. Peak 2013 BiOp Flows during extremely wet years (1 percent of the time) would not be captured by the 2010 BiOp Flows. Similarly, under the 2019 BiOp Flows, January through May flows are within the range of 2010 BiOp Flows used in the modeling 99.9 percent of the time, and peak 2019 BiOp Flows would not be captured by the 2010 BiOp Flows 0.1 percent of the time (see also Section 4.2.1.1 *[No Project Alternative] Alternative Description*).

E.2.2 Using the Model to Predict Suspended Sediment Concentrations

E.2.2.1 Range of Conditions Assessed

Volume II Appendix E Section E.2.2.1 Methods – Using the Model to Predict Suspended Sediment Concentrations – Range of Conditions Assessed, paragraph 3 on page E-6:

Similarly, by definition, the "extreme conditions for fish" and "worst impacts on fish" described above use a 10 percent threshold of analysis, which means that for any given species and life-stage there are only a few corresponding water years in the modeled hydrologic record during which the predicted high SSCs and associated exposure durations would occur. There are few instances in which the high SSCs condition would occur in the same water year for multiple life-stages of a given species (e.g., two years [4 percent] for coho salmon smolts and adults), and few instances (< 0.5 percent) in which the high SSCs condition would occur in the same water year for multiple species and life-stages. Because the peak 2010 BiOp Flows would not capture the extreme January and February maximum 2013 or 2019 BiOp flows, the modeled SSC peaks using the 2010 BiOp Flows may be slightly underpredicting (0.1 to 1 percent of the time) for extreme conditions for fish under existing conditions.

E.3 Results

E.3.1 Existing Conditions

E.3.1.3 Coho Salmon

Volume II Appendix E Section E.3.1.3 Results – Existing Conditions – Coho Salmon, Table E-4 Predicted Newcombe and Jensen Severity Index and Anticipated Effects on Coho Salmon for Klamath River at Seiad Valley (RM 132.7) on page E-13:

Table E-4. Predicted Newcombe and Jensen Severity Index and Anticipated Effects on Coho Salmon for Klamath River at Seiad Valley (RM 132.7).

Life-history Stage (period)	SEV at Conditions			Effects on Production
	Mild[1]	Median[2]	Extreme[3]	
Adult upstream migrants (Sept 1–Jan 1) 30 days of exposure to median SSC for the period	6.6	7.2	8.5	Moderate to major stress and impaired homing for adults migrating upstream (~4 percent of all populations exposed).

Life-history Stage (period)	SEV at Conditions			Effects on Production
	Mild[1]	Median[2]	Extreme[3]	
Spawning, incubation, and fry emergence (Nov 1–Mar 14) 60 days of exposure to highest SSC for the period	11.6	12.2	12.9	No modeling of suspended sediment infiltration into gravel was conducted. Available information suggests 20 to 60 percent mortality of spawning adults, incubating eggs, and emergent fry in the mainstem; typically, a small percentage of the percent of the Upper Klamath River Population spawns in the mainstem as opposed to tributaries.
Age-1 juveniles during winter (Nov 15–Feb 14) Exposure to highest SSC for the period	7.4	8.7	9.9	Moderate to major stress and reduced growth rates depending on conditions for age 1 juveniles rearing the mainstem. An unknown but assumed small number of all juveniles (<1 percent) rear in mainstem during winter.
Age-0 juveniles during summer (Mar 15–Nov 14) Exposure to highest SSC for the period	8.8	9.5	10.2	Major stress to some mortality depending on conditions for age 0 juveniles rearing in mainstem.
Age 1 juvenile outmigration (Feb 15–May 31) 20 days of exposure to ~~median~~ lowest SSC for the period	~~8.3~~6.8	~~8.7~~7.3	~~8.9~~8.1	Moderate to major stress and reduced growth rates depending on conditions for smolts.

[1] Mild conditions for fish = 90 percent exceedance probability
[2] Median conditions for fish = 50 percent exceedance probability
[3] Extreme conditions for Fish (10 percent exceedance probability

Volume II Appendix E Section E.3.1.3 Results – Existing Conditions – Coho Salmon, paragraph 1 on page E-20:

Additional age 0 juveniles depart from tributaries in the Mid-Klamath and Salmon River population units (and possibly others) during fall (Soto et al. 2008, Hillemeier et al. 2009). Some of these have been observed to overwinter in tributaries and off-channel habitats in the lower mainstem Klamath River near or within the estuary (Soto et al. 2008, Hillemeier et al. 2009, Soto et al. 2016). T. Soto (Senior Biologist, Karuk Tribe, pers. comm., 2019) and others have observed that juvenile coho salmon using off-channel habitats during the winter appear to be seeking refuge from high water velocities, as well as refuge from high suspended sediment loads. Very often off-channel areas are disconnected from the main channel, and thus have lower suspended sediment loads (Sullivan et al. 2009). Therefore, coho salmon juveniles rearing in off-channel habitats would be less affected by suspended sediments than fish rearing within the mainstem, ~~which may reduce the amount of time they are exposed to suspended sediment in the mainstem.~~

E.3.2 Proposed Project

Volume II Appendix E Section E.3.2 Results – Proposed Project, paragraph 2 on page E-29:

Model results (USBR 2012) indicate that the ~~significant~~ short-term impact of increased SSCs is limited to one year following the initiation of dam removal regardless of the type of hydrology (i.e., dry, normal, or wet conditions) present during the drawdown period. The SSCs in the Klamath River from the erosion of reservoir sediment deposits would not exceed a two-week duration of increased concentrations greater than 100 mg/L ~~be less than the SSC threshold of significance (i.e., 100 mg/L for two or more consecutive weeks)~~ by the end of post-dam removal year 1 and there would be no substantial~~ignificant~~ increase~~impact~~ due to the release of reservoir sediment deposits currently trapped behind the Lower Klamath Project dams. In the long-term, any SSCs generated by remobilized sediment from dam removal, which is anticipated in the reach from Iron Gate Dam to Cottonwood Creek where sediment deposition is predicted to occur during and following drawdown, would occur during flood events (i.e., flows > 10,250 cfs). During flood events of this magnitude, substantial sediment and debris mobilization would occur with or without dam removal; therefore, no significant difference in the long-term hydrological conditions due to sediment remobilization are anticipated. ~~As a result, the hydrologic conditions beyond the first year following dam removal will have minimal effect toward the impact of increased SSC. After the first year following dam removal, the flow will be confined within the historical main channel and no longer be able to access the remaining fine sediment left on the floodplain, unless an extremely high flood event is to occur. As a result, the suspended sediment condition in the Klamath River after the first year will be similar to~~

~~existing conditions with minimal impact from dam removal under most hydrological conditions. The riverine flows will have the potential to access the reservoir deposits left on the floodplain only during high flood events, during which the additional suspended sediment from erosion of the reservoir deposits is expected to be minor (high flow events carry high concentrations of suspended solids and any increase in SSCs from reservoir sediments would be insignificant).~~ In the following sections, the predicted SSCs and upper error estimates of the predicted SSCs (USBR 2012) are used to assess ~~predicted for~~ the most-likely and worst impacts ~~on fish scenarios are used to evaluate the potential effects of the Proposed Project on~~ anadromous fish species from the Proposed Project.

E.3.2.3 Coho Salmon

Volume II Appendix E Section E.3.2.3 Results – Proposed Project – Coho Salmon, paragraph 4 on page E-35:

Adult coho salmon enter the Klamath River between late September and mid-December, with peak upstream migration occurring between late October and mid-November. Based on adult coho salmon migration observations in the Scott River (2007–2009), Shasta River (2007–2009), and Bogus Creek (2003–2009), on average only approximately 4 percent of adults remain in the mainstem Klamath River after December 15 ~~(initiation of reservoir drawdown under the Proposed Project)~~ (California Department of Fish and Game, unpubl. data).

Volume II Appendix E Section E.3.2.3 Results – Proposed Project – Coho Salmon, paragraph 2 on page E-37:

Under existing conditions, SSCs are typically high during the winter in the mainstem Klamath River and predicted to cause major stress under all scenarios (least impacts on fish, most-likely impacts on fish, or worst impacts on fish). Under the Proposed Project, age-1 juveniles (progeny of the dam removal year 1 cohort) that have either successfully over-summered or moved from tributaries into the mainstem Klamath River during the fall, could be exposed to much higher SSCs in the mainstem during the winter of dam removal than under existing conditions, and may suffer mortality rates of up to 40 percent under a worst impacts on fish scenario (Table E-10). However, many juvenile coho salmon in the mainstem Klamath River appear to migrate downstream to rear and may avoid adverse conditions in the mainstem by using tributary or off-channel habitats during winter, thus reducing high SSC exposure and potential mortality (Soto et al. 2008, Hillemeier et al. 2009, Soto et al. 2016).

References

Volume II Appendix E Section E.6 References, pages E-48 through E-58, includes the following revisions:

Soto, T., D. Hillemeier, S. Silloway, A. Corum, A. Antonetti, M. Kleeman, L. Lestelle. 2016. The role of the Klamath River mainstem corridor in the life history and performance of juvenile coho salmon (*Oncorhynchus kisutch*): May 2007–August 2011. August 2013 (updated April 2016). Submitted to USBR Mid-Pacific Region, Klamath Area Office, Klamath Falls, Oregon.

Sullivan, S. M. P., and M. C. Watzin. 2009. Stream-floodplain connectivity and fish assemblage diversity in the Champlain Valley, Vermont, U.S.A. Journal of Fish Biology 74: 1,394-1,418.

References cited as part of text included in the Appendix E list of revisions:

Hillemeier, D., T. Soto, S. Silloway, A. Corum, M. Kleeman, and L. Lestelle. 2009. The role of the Klamath River mainstem corridor in the life history and performance of juvenile coho salmon (*Oncorhynchus kisutch*): May 2007–May 2008. Prepared by Yurok Fisheries Program, Klamath, California; Karuk Tribe Department of Natural Resources, Orleans, California; and Biostream Environmental, Poulsbo, Washington for Bureau of Reclamation, Klamath Falls, Oregon.

NMFS (National Marine Fisheries Service). 2010. Biological opinion on the operation of the Klamath Project between 2010 and 2018. Prepared for Bureau of Reclamation by NOAA Fisheries Service, Southwest Region. https://www.fisheries.noaa.gov/resource/document/2010-klamath-project-biological-opinion.

NMFS and USFWS (U. S. Fish and Wildlife Service). 2013. Biological opinions on the effects of proposed Klamath Project operations from May 31, 2013, through March 31, 2023, on five federally listed threatened and endangered species. Prepared by NMFS, Southwest Region, Northern California Office; and USFWS, Pacific Southwest Region, Klamath Falls Fish and Wildlife Office.

Soto, T., A. Corum, H. Voight, D. Hillemeier, and L. Lestelle. 2008. The role of the Klamath River mainstem corridor in the life history and performance of juvenile coho salmon (*Oncorhynchus kisutch*). Phase 1 Report: 2006-07 winter. Prepared for Bureau of Reclamation, Mid-Pacific Region, Klamath Area Office, Klamath Falls, Oregon.

USBR (U.S. Bureau of Reclamation). 2012. Hydrology, hydraulics and sediment transport studies for the Secretary's Determination on Klamath River Dam Removal and Basin Restoration. Technical Report No. SRH-2011-02. Prepared for Mid-Pacific Region, Bureau of Reclamation, Technical Service Center, Denver, Colorado.

APPENDIX F. POTENTIAL EFFECTS OF DAM REMOVAL ON CHANNEL BED ELEVATIONS, GRAIN SIZE, AND RELATED ANADROMOUS FISH HABITAT IN THE KLAMATH RIVER

Volume II Appendix F Section F.5.1.2 Proposed Project – Changes in Bed Substrate – Summer Steelhead, paragraph 4 on page F-13:

With the removal of the dams, summer steelhead would be able to re-establish throughout much of their historical range, including the mainstem and tributaries within the Hydroelectric Reach and the upper basin (Hamilton et al. 2005). Under the Proposed Project, improved pool habitat would also benefit rearing summer steelhead. ~~Under the Proposed Project, increased coarse sediment supply and finer channel substrate in the mainstem Klamath River downstream of Iron Gate Dam would improve spawning habitat, and improved pool habitat would benefit rearing summer steelhead.~~

Volume II Appendix F Section F.5.2.2 Proposed Project – Lower Klamath River: Downstream from Iron Gate Dam – Changes in Bed Elevation, paragraph 1 on page F-16:

Short-term (2-year) model simulations—focused on reservoir sediment erosion and fine sediment load in the Klamath River following drawdown—indicate ~~no significant deposition between Iron Gate Dam and Bogus Creek (RM 192.6),~~ up to about 0.9 feet of reach-averaged deposition between Bogus Creek and Willow Creek (RM 188.0), and up to about 0.4 feet of deposition from Willow Creek to Cottonwood Creek (USBR 2012) (Figure F-11, Figure F-12, Figure F-13). Conservative long-term (50-year) simulations focused on bed elevation change indicate that fine and coarse sediment deposition within 2 years of dam removal may be up to 1.7 feet between Bogus Creek and Willow Creek and up to 0.9 feet between Willow Creek and Cottonwood Creek (see Figure 9-31 in USBR 2012). Model simulations indicate that reaches located farther downstream will change little (< 0.5 feet of erosion or deposition). Eight miles of the Klamath River mainstem channel could potentially be affected by sediment release and resupply, representing 4 percent of the total mainstem channel length downstream of Iron Gate Dam (190 miles). Bed elevations over the long-term (from 5 to 50 years) would adjust to a new equilibrium in response to the restored sediment supply from upstream areas. Model simulations predict up to approximately 1.7 ~~2 to 3~~ feet of aggradation between Iron Gate Dam and Cottonwood Creek over the next 50 years (USBR 2012).

Volume II Appendix F Section F.5.2.2 Proposed Project – Lower Klamath River: Downstream from Iron Gate Dam – Changes in Bed Elevation, Figure F-11

Reach-Averaged Bed Elevation Change for Two Successive Wet, Median, or Dry Water Years Following Dam Removal (based on simulation results provided by USBR, March 2012) on page F-17:

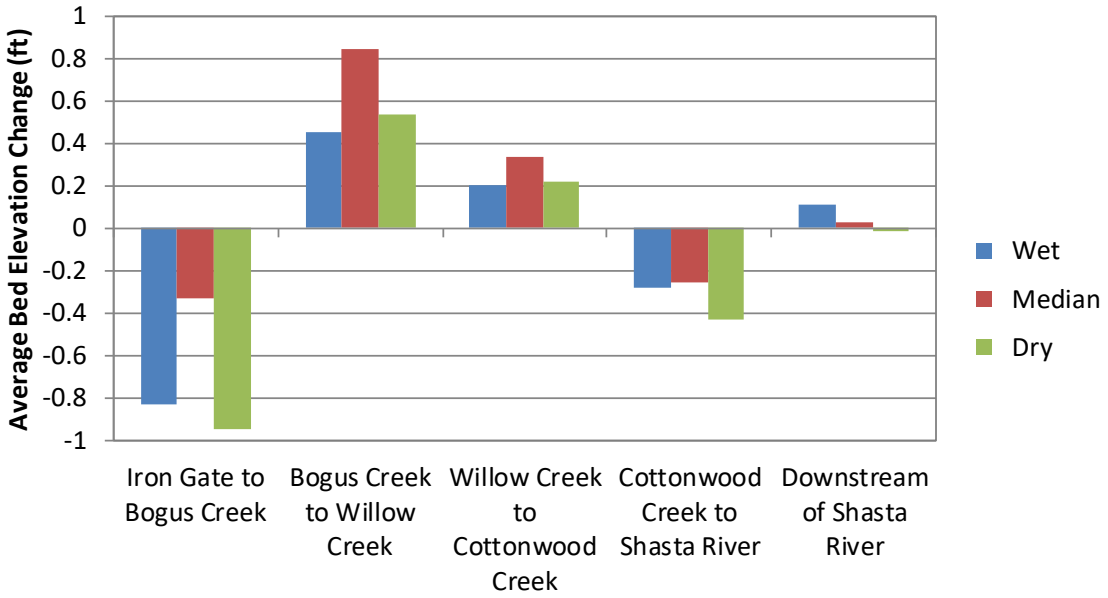

Figure F-11. Reach-Averaged Bed Elevation Change for Two Successive Wet, Median, or Dry Water Years Following Dam Removal (based on simulation results provided by USBR, March 2012). Model results contain more uncertainty in the reach from Iron Gate to Bogus Creek due to data gaps.

Volume II Appendix F Section F.5.2.3 Proposed Project – Lower Klamath River: Downstream from Iron Gate Dam – Changes in Bed Substrate, paragraph 2 on page F-18:

The probability of transporting fine sediment out of the reach ~~from Iron Gate Dam to Bogus Creek~~ depends on flow magnitude and duration. USBR (2012) estimated that a flow of 6,000 cfs in the reach from Bogus Creek to Willow Creek would be the median estimate necessary to initiate flushing of sands and fine material from the bed following dam removal. This flow is approximately equal to the 2-year recurrence interval flood (50 percent probability of occurring in a given year) at Iron Gate. ~~If the dams are removed during a median or dry year, the probability that sand and finer sediment would be flushed from the bed is 50 percent by the end of the first year following removal, 75 percent by the end of second year following removal, and over 95 percent by end of the fifth year following removal.~~

Volume II Appendix F Section F.5.2.3 Proposed Project – Lower Klamath River: Downstream from Iron Gate Dam – Changes in Bed Substrate, paragraph 1 on page F-21:

Under the Proposed Project, the channel bed elevations would increase in response to increased sediment supply. Flows required to mobilize the channel bed would decrease in the reach between Bogus Creek and Cottonwood Creek due to fining of the riverbed. USBR (2012) estimated the magnitude and return period of flows required to mobilize sediment downstream from Iron Gate Dam, 10 years after dam removal, using reach-averaged predicted grain sizes from long-term SRH-1D simulations. The estimates indicate that under the Proposed Project, the threshold for initiation of bed mobilization from Bogus Creek to Willow Creek and from Willow Creek to Cottonwood Creek would range from ~~3~~4,000 to 8,000~~7,000~~ cfs (1.5- to 3.25~~2.5~~-year return period) and ~~5,000~~4,500 to ~~9,000~~8,500 cfs (1.5- to 3~~.2~~-year return period), respectively (the ranges of estimates are based on the variation in the reference shear stress for mobilization [0.025 to 0.035]) (USBR 2012, pages 9-86 to 9-88). These mobility thresholds are lower than under current conditions and the No Project Alternative. Downstream from the Shasta River, there would be no difference in flow magnitudes required for bed mobilization between the Proposed Project and current conditions or the No Project Alternative.

Volume II Appendix F Section F.5.2.3 Proposed Project – Lower Klamath River: Downstream from Iron Gate Dam – Changes in Bed Substrate – Bedload sediment effects on aquatic species – Fall-run Chinook Salmon, paragraph 2 on page F-21:

Bedload sediment effects on aquatic species

Fall-run Chinook Salmon

The Proposed Project Could Have Short-term Effects on Spawning Habitat

The proportion of sand in the channel bed will likely be higher during the first four months following dam removal than under existing conditions. More interstitial sand in the Klamath River channel upstream of the Cottonwood Creek confluence could reduce embryo survival-to-emergence in these reaches (Chapman 1988). ~~The approximately 8-mile affected channel length encompasses only four percent of the current total Klamath River channel length.~~Based on redd surveys indicating an average of 2,100 redds in the mainstem Klamath River (Magneson and Wright 2010), and escapement estimates (CDFG 2010, unpublished data), on average eight percent of all anticipated fall-run Chinook salmon redds occur in the Klamath Basin during fall-run spawning. Less than half of the fall-run Chinook salmon redds (< 1,050 on average, or < 4 percent of Klamath Basin spawners) are constructed within the reach from Iron Gate Dam to Cottonwood Creek (Magneson and Wright 2010) that would be most susceptible to the interstitial sand resulting from dam removal. ~~These e~~Effects would be most apparent in successive median or dry years following dam removal, but less apparent in successive wet years.

References

Volume II Appendix F Section F-11 References, pages F25 through F-27, includes the following revisions:

CDFG. 2010. Klamath River Mainstem Spawner Escapement Estimates, 1978–2009. Unpublished data received from M. Knechtle, Biologist, California Department of Fish and Game, Yreka, California.

Magneson, M. D., and K. Wright. 2010. Mainstem Klamath River fall Chinook salmon redd survey 2009. Arcata Fisheries Data Series Report DS 2010-19. U.S. Fish and Wildlife Service, Arcata Fish and Wildlife Office, Arcata, California.

Other references cited as part of text included in the Appendix F list of revisions:

Chapman, D. W. 1988. Critical Review of Variables Used to Define Effects of Fines in Redds of Large Salmonids. Transactions of the American Fisheries Society 117: 1–21.

USBR (U.S. Bureau of Reclamation). 2012. Hydrology, hydraulics and sediment transport studies for the Secretary's Determination on Klamath River Dam Removal and Basin Restoration. Technical Report No. SRH-2011-02. Prepared for Mid-Pacific Region, Bureau of Reclamation, Technical Service Center, Denver, Colorado.

APPENDIX H. RARE NATURAL COMMUNITES DOCUMENTED IN THE PROJECT VICINITY

Volume II Appendix H, Table H-1 Rare Natural Communities Documented in the Project Vicinity[1] on page H-1:

Table H-1. Rare Natural Communities Documented in the Project Vicinity[1,2].

Natural Community (Holland 1986)	~~Rank[2]~~ Status[3] (Global/State)	Habitat Description [3,4]	Included in or Excluded from the EIR, and Rationale	Corresponding MCV Alliances that are Considered Rare Natural Communities[5]
Coastal and Valley Freshwater Marsh	G3/S2.1	Dominated by perennial, emergent monocots including tules (*Schoenoplectus* spp.) and cattails (*Typha* spp.). Often forms completely closed canopies.	Included; likely occurs in areas typed as Palustrine within the Primary Area of Analysis.	Slough Sedge Swards, Sand Dune Sedge Swaths, Mats of Floating Pennywort, Quillwort Beds, Yellow Pond-Lily Mats, Water-Parsley Marsh, Hardstem and California Bulrush Marshes, American Bulrush Marsh, Small-Fruited Bulrush Marsh
Darlingtonia Seep	G4/S3.2	Typically on peridotite but also on other parent materials in wet boggy meadows and other habitats saturated with running water that may or may not have peat.[5]	Included; may be habitat in the Primary Area of Analysis.	California Pitcher Plant Fens
Northern Interior Cypress Forest	G2/S2.2	An open forest dominated by cypress (*Cupressus* spp.) that is low in stature, usually less than 49.5 feet. On dry, rocky, sterile, often ultramafic soils.	Included; may be inclusions in forested areas within the Primary Area of Analysis.	Baker Cypress Stands, McNab Cypress Woodland, Sargent Cypress Woodland

Natural Community (Holland 1986)	**~~Rank~~[2]Status[3] (Global/State)**	**Habitat Description [3]4**	**Included in or Excluded from the EIR, and Rationale**	**Corresponding MCV Alliances that are Considered Rare Natural Communities[5]**
Northern Basalt Flow Vernal Pool[6]	G2/S2.1	A low, amphibious, herbaceous community dominated by annual herbs and grasses. Germination and growth begin with fall rains, often continuing even when inundated. Pools are typically less than 540 square feet. Rising spring temperatures evaporate the pools.	Included; may be habitat in the Primary Area of Analysis.	Needle Spike Rush Stands, Water Blinks – Annual Checkerbloom Vernal Pools
Sitka Spruce Forest	G1/S1.1	Dense forest dominated by Sitka spruce with a dense understory of broadleaved trees, shrubs and perennial herbs, including several species of ferns.	Included; may be inclusions in forested areas immediately adjacent to the coast within the Primary Area of Analysis.	Sitka Spruce Forest
Upland Douglas-fir Forest	G4/S3.1	A mixed-age climax forest dominated by Douglas-fir (*Pseudotsuga menziesii)*. Stands are typically even-aged and dense with canopy closure greater than 70 percent. Sites typically occur on moderately deep, well-drained soils.	Included; may be inclusions in areas typed as Douglas Fir within the Primary Area of Analysis.	Douglas Fir – Tanoak Forest

[1] Source: CDFW. 2017. California Natural Diversity Database. RareFind5. Electronic database. Natural Heritage Division, California Department of Fish and Game, Sacramento, California. https://map.dfg.ca.gov/rarefind/view/RareFind.aspx [Accessed May 2017].

[2] Details regarding what rare natural communities are documented and may have potential habitat in the Secondary Area of Analysis are not included since this area was analyzed at a programmatic level.

[23] Status:

Global Rank

- G1 Critically Imperiled—At very high risk of extinction due to extreme rarity (often five or fewer populations), very steep declines, or other factors.
- G2 Imperiled: At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.
- G3 Vulnerable: At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.
- G4 Apparently Secure: Uncommon but not rare; some cause for long-term concern due to declines or other factors.

State Rank

- S1 Critically Imperiled—Critically imperiled in the state because of extreme rarity (often five or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state/province.
- S2 Imperiled: Imperiled in the nation or state/province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province.
- S3 Vulnerable: Vulnerable in the nation or state/province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.

Additional Threat Ranks

- 0.1 Very Threatened
- 0.2 Threatened

[34] Holland, R. F. 1986. Preliminary descriptions of the terrestrial natural communities of California. California Department of Fish and Game, Nongame-Heritage Program, Sacramento, California. unless otherwise noted.

~~[4] Details regarding what rare natural communities are documented and may have potential habitat in the Secondary Area of Analysis are not included since this area was analyzed at a programmatic level.~~

~~[5] Sawyer, J. O., T. Keeler-Wolf, and J. M. Evens. 2009. A manual of California vegetation. Second edition. California Native Plant Society Press, in collaboration with California Department of Fish and Game. Sacramento. CNPS (California Native~~

~~Plant Society).~~ CNPS (California Native Plant Society). 2019. A manual of California vegetation. Online edition. California Native Plant Society, Sacramento, California. Available at: http://www.cnps.org/cnps/vegetation/

[6] Listed as “Northern Vernal Pool” in CNDDB; assumed based on distribution to be Northern Basalt Flow Vernal pool Holland Type.

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APPENDIX J. SPECIAL-STATUS PLANT, FISH, AND WILDLIFE SCOPING LIST

Volume II Appendix J, Table J-3 Special-status Terrestrial Wildlife Documented in the Project Vicinity, new row 2 on page J-75:

Common Name Scientific Name	Status[a] Federal/ State/USDA Forest Service, US Bureau of Land Management	Query Sources	Distribution in California	Habitat Association	Included in or Excluded from EIR, and Rationale
Canada Lynx *Lynx canadensis*	FT/--/--	USFWS	The range of the species in Oregon does not extend into California	Boreal forests	Excluded from further analysis. The species range includes Oregon, but does not include California (USFWS 2019[b]).

[a] Status codes:

Federal:

- FE = Listed as endangered under the federal Endangered Species Act
- FT = Listed as threatened under the federal Endangered Species Act
- FPT = Federally proposed as threatened
- BGEPA = Federally protected under the Bald and Golden Eagle Protection Act
- FSS = Forest Service Sensitive species
- BLMS = Bureau of Land Management Sensitive Species

State:

- SE = Listed as Endangered under the California Endangered Species Act
- ST = Listed as Threatened under the California Endangered Species Act
- SCE = State Candidate Endangered
- SCT = State Candidate Threatened
- SSC = CDFW Species of Special Concern
- SFP = CDFW Fully Protected species

[b] USFWS (U.S. Fish and Wildlife Service). 2019. ECOS species profile for Canada Lynx (Lynx canadensis). Website. Available at: https://ecos.fws.gov/ecp0/profile/speciesProfile?sId=3652#crithab [Accessed March 2020].

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APPENDIX S. RECREATION SUPPORTING TECHNICAL INFORMATION

After circulation of the Draft EIR, the applicable biological opinion and the operational flow requirements for the Klamath River changed and changes to this appendix to address those changes are printed in this Final EIR Appendix S. None of the changes result in significant new information in the EIR under the meaning of CEQA Guidelines, section 15088.5, subdivision (a):

> New information added to an EIR is not 'significant' unless the EIR is changed in a way that deprives the public of a meaningful opportunity to comment upon a substantial adverse environmental effect of the project or a feasible way to mitigate or avoid such an effect (including a feasible project alternative) that the project's proponents have declined to implement.

However, the changes were numerous enough that reprinting the section rather than simply including a list of revisions was warranted to improve clarity and readability of the document.

As part of the 2012 KHSA EIS/EIR, potential changes in recreation opportunities were modeled by evaluating flow variations between the No Project ("dams in" scenario using the 2010 BiOp Flows) and the Proposed Project ("dams out" scenario using the KBRA Flows), since river flows influence when certain recreational activities could occur. The 2012 KHSA EIS/EIR modeling estimated the flows in multiple reaches of the Klamath River and the analysis compared those modeled flows with the acceptable range of flows for whitewater boating and fishing by reach to estimate the average number of days when those recreational activities could occur under each scenario. The analysis of potential changes in recreation opportunities from the 2012 KHSA EIS/EIR is reproduced in this appendix in Sections S.1 and S.2.

Flow requirements in the Klamath River have changed since the modeling for the 2012 KHSA EIS/EIR was performed. Separate and independent of the Proposed Project, the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) issued a Joint Biological Opinion for the Klamath Irrigation Project in 2013 specifying the hydrology requirements for the Klamath River (2013 BiOp Flows) and the standard to which the USBR Klamath Irrigation Project operated at that time (NMFS and USFWS 2013). Accordingly, the 2013 BiOp Flows served as the operational flow requirement for the Klamath River at the time of the Notice of Preparation for the Lower Klamath Project EIR (i.e., December 22, 2016), as detailed in Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*. For the Lower Klamath Project EIR, the 2013 BiOp Flows serve as an existing conditions CEQA baseline and they replace both the KBRA Flows ("dams out" scenario [i.e., Proposed Project])

and the 2010 BiOp Flows ("dams in" scenario [i.e., No Project Alternative]) in the previous 2012 KHSA EIS/EIR recreational flow analysis.

After the issuance of the Lower Klamath Project Draft EIR on December 27, 2018, the applicable biological opinion and the operational flow requirements for the Klamath River changed again in March 2019, when the new biological opinions were issued by NMFS (2019) and USFWS (2019). The 2019 BiOp Flows are now the current operational flow requirement for the Klamath River and as such they are analyzed in the Lower Klamath Project Final EIR as a second CEQA baseline, representing flows under newly defined existing conditions (see also Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*). The potential change in the average number of days of acceptable river flows for whitewater boating and fishing under "dams out" and "dams in" conditions are analyzed in the Lower Klamath Project Final EIR using both the 2013 BiOp Flows, which were the applicable flows when the Lower Klamath Project Notice of Preparation was issued, and the 2019 BiOp Flows, which became the applicable flows after March 2019. Section S.3 presents an analysis of the changes in the 2012 KHSA EIS/EIR flow-dependent recreational opportunities due to differences between the previously modeled flows and the 2013 BiOp and the 2019 BiOp Flows.

The Proposed Project, the data modeled as part of the 2012 KHSA EIS/EIR, and the recreational opportunities under the 2013 BiOp Flows and the 2019 BiOp Flows are further discussed in Section 3.20.5 *[Recreation] Potential Impacts, Impacts, and Mitigation*.

S.1 Potential Flow Changes That May Alter Flow-Dependent Recreation

Flow-dependent recreational activities on the Klamath River include whitewater boating and fishing. River flows may change based on the various future management scenarios (i.e., "dams in" versus "dams out") and could subsequently affect the availability and the quality of the recreation experience. Optimal and acceptable flows for various recreation opportunities along reaches of the Klamath River were developed as a part of technical studies completed during the relicensing process (FERC 2007). Optimal and acceptable flow levels can be compared with existing or proposed levels to assess the effect on various recreation activities. River flows under both No Project and Proposed Project alternatives have been modeled by U.S. Bureau of Reclamation (USBR); results of the models are used to project the effects on recreation activities within the various river reaches.

The following tables summarize flows acceptable for fishing and whitewater boating opportunities in the various reaches of the Klamath River. Table S-1 provides a summary for each of the major river reaches where whitewater boating and fishing currently take place. Table S-2 summarizes monthly

changes in flows for the Hells Corner Reach specifically for two sets of flow conditions (1,000 to 3,500 cfs and 1,300 to 3,500 cfs) that may be deemed acceptable for different types of whitewater boating. Tables S-3 through S-8 include the number of days per month with acceptable flows for each activity under the No Project Alternative ("dams in") and the Proposed Project ("dams out"). This data is also presented graphically in Section 3.20 *Recreation*. In Tables S-3 through S-8, it is assumed that flows less than 1,300 cfs are not acceptable for whitewater boating in order not to understate the potential impact of the Proposed Project on whitewater boating. However, the impact of dam removal on whitewater boating could be smaller if acceptable flows for some types of whitewater boating occur between 1,000 and 1,300 cfs.

Table S-1. Summary of Acceptable Flow Data for Whitewater Boating and Fishing. (Table reproduced from Table R-1 in 2012 KHSA EIS/EIR Volume II.)

River Reach	Activity	Acceptable Flows		Total Avg. Annual No Days with Acceptable Flows		Percent Difference
		Low Value (cfs)	High Value (cfs)	Dams In	Dams Out	
Keno Reach	Whitewater Boating	1,000	4,000	151.29	139.30	-7.93%
	Fishing	200	1,500	246.10	237.53	-3.48%
J.C. Boyle Bypass Reach	Whitewater Boating	1,300	1,800	4.63	41.35	793.56%
	Fishing	200	1,000	106.96	141.86	32.63%
Hells Corner Reach	Whitewater Boating/Kayaking	1,000	3,500	331.61	187.67	- 43%
	Whitewater Boating/Rafting	1,300	3,500	277.98	119.33	-57.07%
	Fishing	200	1,500	234.37	228.07	-2.69%
Copco No. 2 Bypass Reach	Whitewater Boating	600	1,500	10.22	223.09	2083.83%
	Fishing	50	600	13.75	2.84	-79.36%
Iron Gate to Scott River	Whitewater Boating/Fishing	800	4,000	278.04	280.86	1.01%
Scott River to Salmon River	Boating	800	7,000	242.96	246.26	1.36%
	Fishing	800	4,000	174.92	182.23	4.18%
Salmon River to Trinity River	Whitewater Boating/Fishing	800	10,000	207.00	210.67	1.78%
Trinity River to Ocean	Whitewater Boating/Fishing	1,800	18,000	238.86	238.33	-0.22%

Source: USBR 2012b,c; PacifiCorp 2004; FERC 2007; Greimann 2012.

Table S-2. Hells Corner – Whitewater Boating Recreation Days from two Different Criteria for "Acceptable Flows." (Table reproduced from Table R-2 in 2012 KHSA EIS/EIR Volume II.)

Month	1,000–3,500 cfs			1,300–3,500 cfs		
	Dams In	Dams Out Days	% Change Days	Dams In Days	Dams Out Days	% Change Days
January	26.27	16.00	39%	20.88	13.4	36%
February	21.94	11.65	47%	17.80	10.3	42%
March	22.59	18.23	19%	21.78	15.7	28%
April	21.80	18.81	14%	20.27	15.4	24%
May	26.88	22.37	17%	25.90	19.5	25%
June	29.96	25.14	16%	28.78	20.3	29%
July	30.41	15.40	49%	17.27	11.0	36%
August	31.00	13.09	58%	19.45	2.3	88%
September	30.00	19.47	35%	17.04	4.1	76%
October	31.00	10.48	66%	31.00	0	100%
November	30.00	6.79	77%	29.43	1	97%
December	29.76	10.24	66%	28.35	4.3	85%
Total	331.61	187.67	43%	277.95	117.3	58%

Source: Greimann 2012.

S.2 Recreational Flow Analysis

The recreation analysis evaluated and estimated the effect of potential future river flows on different recreation activities along various reaches of the Klamath River. High and low flow values for the recreation activities along the various reaches are provided in the following tables. Flow values that fall within these ranges are considered necessary for the various activities to occur. The Klamath Project Simulation Model (KPSIM) coupled to a daily operations model of the Klamath River below Link Dam for the No Project and the Proposed Project alternatives estimated the duration of recreational flows by reach. For additional information on the KPSIM model please refer to the USBR (2012a) report, "Hydrology, Hydraulics and Sediment Transport Studies for the Secretary's Determination on Klamath River Dam Removal and Basin Restoration, Technical Report No. SRH-2011-02."

The average, the maximum, and minimum number of days by month that the river is expected to be within the high and low value are listed on each row of Tables S-3 through S-8. The results are provided for wet, average, and dry start years under both the No Project ("dams in") and Proposed Project ("dams out") alternatives. The data provided for the Proposed Project are only for the years following dam removal (post-2019).

The Hells Corner Reach is a peaking reach and daily averages do not adequately capture conditions. Therefore, the following conditions must be met in order to be considered within range:

Whitewater Boating: Flows are within the desirable range between 10 a.m. and 2 p.m.

Fishing: Flows are within the desirable range for at least 4 hours either between 5 a.m. and 11 a.m., or between 3 p.m. and 9 p.m.

Table S-3. Analysis for Proposed Project, All Years, Average Number of Days.
(Table reproduced from Table R-3 in 2012 KHSA EIS/EIR Volume II.)

River Reach	Activity	Low Value (cfs)	High Value (cfs)	Average Number of Days within Flow Range												
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	WY Total
Keno Reach	Whitewater Boating—Standard	1,000	4,000	15.7	12.0	20.5	19.3	23.2	20.9	12.3	2.9	4.2	0.0	2.0	6.5	139.3
	Play Boating	1,100	1,800	6.4	1.9	4.5	5.4	5.7	5.6	6.4	1.4	2.8	0.0	0.8	3.3	44.1
	Fishing	200	1,500	14.9	13.2	6.9	6.3	10.0	14.0	24.4	31.0	30.0	31.0	28.6	27.1	237.5
J.C. Boyle Bypass Reach	Whitewater Boating—Standard	1,300	1,800	3.8	1.9	4.4	3.7	5.8	5.7	7.2	2.3	4.1	0.0	0.0	2.4	41.3
	Fishing	200	1,000	11.6	11.1	3.0	1.4	4.9	4.8	15.6	17.9	10.5	20.5	22.8	19.1	141.9
Hells Corner Reach	Whitewater Boating	1,200	3,500	13.8	10.3	16.1	16.0	21.5	21.6	13.8	3.7	5.5	0.1	1.0	5.2	130.9
	Fishing	200	1,500	14.2	13.1	6.1	5.6	8.6	12.5	22.1	30.2	30.0	31.0	28.6	26.0	228.1
Copco No. 2 Bypass Reach	Whitewater Boating	600	1,500	13.5	12.4	6.1	5.6	8.6	12.5	22.1	30.2	30.0	31.0	28.6	24.5	223.1
	Fishing	50	600	0.7	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	2.8

River Reach	Activity	Low Value (cfs)	High Value (cfs)	Average Number of Days within Flow Range												
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	WY Total
Iron Gate to Scott River	Whitewater Boating	800	4,000	21.1	16.6	12.7	13.8	19.2	24.3	29.6	31.0	30.0	29.7	26.9	25.8	280.9
	Fishing	800	2,500	12.7	9.9	5.1	5.5	6.4	14.3	24.8	31.0	30.0	29.7	24.7	20.7	215.1
Scott River to Salmon River	Boating	800	7,000	14.6	9.5	7.5	8.8	14.2	23.7	30.2	31.0	30.0	31.0	26.3	19.3	246.3
	Fishing	800	4,000	5.5	3.9	2.0	2.6	4.7	12.7	26.7	31.0	30.0	30.9	21.8	10.9	182.2
Salmon River to Trinity River	Whitewater Boating/ Fishing	800	10,000	8.7	5.0	3.4	4.7	9.6	20.4	30.5	31.0	30.0	30.9	23.8	13.0	210.7
Trinity River to Ocean	Whitewater Boating/ Fishing	1,800	18,000	11.8	6.9	5.6	10.1	16.0	25.0	30.5	30.3	30.0	30.8	25.3	16.2	238.3

Source: USBR 2012b,c; PacifiCorp 2004; FERC 2007; Greimann 2012.

Table S-4. Analysis for Proposed Project, All Years, Maximum Number of Days.
(Table reproduced from Table R-4 in 2012 KHSA EIS/EIR Volume II.)

River Reach	Activity	Low Value (cfs)	High Value (cfs)	Maximum Number of Days within Flow Range												
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	WY Total
Keno Reach	Whitewater Boating—Standard	1,000	4,000	31	29	31	30	31	30	31	31	30	0	30	31	271
	Play Boating	1,100	1,800	31	28	31	30	31	30	31	31	30	0	30	31	180
	Fishing	200	1,500	31	29	31	30	31	30	31	31	30	31	30	31	366
J.C. Boyle Bypass Reach	Whitewater Boating—Standard	1,300	1,800	31	28	31	30	31	30	31	31	30	0	1	24	117
	Fishing	200	1,000	31	29	31	30	31	30	31	31	30	31	30	31	365
Hells Corner Reach	Whitewater Boating	1,200	3,500	31	29	31	30	31	30	31	31	30	1	30	31	242
	Fishing	200	1,500	31	29	31	30	31	30	31	31	30	31	30	31	366
Copco No. 2 Bypass Reach	Whitewater Boating	600	1,500	31	29	31	30	31	30	31	31	30	31	30	31	366
	Fishing	50	600	29	29	0	0	0	0	0	0	0	0	0	31	89

River Reach	Activity	Low Value (cfs)	High Value (cfs)	Maximum Number of Days within Flow Range											
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	WY Total
Iron Gate to Scott River	Whitewater Boating	800	4,000	31	29	31	30	31	30	31	31	30	31	30	31	366
	Fishing	800	2,500	31	29	31	30	31	30	31	31	30	31	30	31	366
Scott River to Salmon River	Boating	800	7,000	31	29	31	30	31	30	31	31	30	31	30	31	366
	Fishing	800	4,000	31	29	31	30	31	30	31	31	30	31	30	31	366
Salmon River to Trinity River	Whitewater Boating/ Fishing	800	10,000	31	29	31	30	31	30	31	31	30	31	30	31	366
Trinity River to Ocean	Whitewater Boating/ Fishing	1,800	18,000	31	29	31	30	31	30	31	31	30	31	30	31	366

Source: USBR 2012b,c; PacifiCorp 2004; FERC 2007; Greimann 2012.

Table S-5. Analysis for Proposed Project, All Years, Minimum Number of Days.
(Table reproduced from Table R-5 in 2012 KHSA EIS/EIR Volume II.)

River Reach	Activity	Low Value (cfs)	High Value (cfs)	Minimum Number of Days within Flow Range												
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	WY Total
Keno Reach	Whitewater Boating—Standard	1,000	4,000	0	0	0	0	0	0	0	0	0	0	0	0	0
	Play Boating	1,100	1,800	0	0	0	0	0	0	0	0	0	0	0	0	0
	Fishing	200	1,500	0	0	0	0	0	0	0	30	30	31	0	0	92
J.C. Boyle Bypass Reach	Whitewater Boating—Standard	1,300	1,800	0	0	0	0	0	0	0	0	0	0	0	0	0
	Fishing	200	1,000	0	0	0	0	0	0	0	0	0	0	0	0	0
Hells Corner Reach	Whitewater Boating	1,200	3,500	0	0	0	0	0	0	0	0	0	0	0	0	0
	Fishing	200	1,500	0	0	0	0	0	0	0	0	30	31	0	0	91
Copco No. 2 Bypass Reach	Whitewater Boating	600	1,500	0	0	0	0	0	0	0	0	30	31	0	0	91
	Fishing	50	600	0	0	0	0	0	0	0	0	0	0	0	0	0

River Reach	Activity	Low Value (cfs)	High Value (cfs)	Minimum Number of Days within Flow Range												
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	WY Total
Iron Gate to Scott River	Whitewater Boating	800	4,000	0	0	0	0	0	0	1	30	30	3	2	0	152
	Fishing	800	2,500	0	0	0	0	0	0	0	30	30	3	0	0	99
Scott River to Salmon River	Boating	800	7,000	0	0	0	0	0	0	4	31	30	31	0	0	137
	Fishing	800	4,000	0	0	0	0	0	0	0	30	30	28	0	0	104
Salmon River to Trinity River	Whitewater Boating/ Fishing	800	10,000	0	0	0	0	0	0	16	30	30	29	0	0	124
Trinity River to Ocean	Whitewater Boating/ Fishing	1,800	18,000	0	0	0	0	0	0	17	1	30	24	0	0	136

Source: USBR 2012b,c; PacifiCorp 2004; FERC 2007; Greimann 2012.

Table S-6. Analysis for No Project, All Years, Average Number of Days.
(Table reproduced from Table R-6 in 2012 KHSA EIS/EIR Volume II.)

River Reach	Activity	Low Value (cfs)	High Value (cfs)	Average Number of Days within Flow Range												
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	WY Total
Keno Reach	Whitewater Boating—Standard	1,000	4,000	16.1	13.7	19.6	18.0	24.5	22.9	1.8	0.0	0.0	7.9	11.8	14.9	151.3
	Play Boating	1,100	1,800	2.7	0.0	3.6	3.6	7.3	11.2	0.0	0.0	0.0	0.6	5.3	2.5	36.8
	Fishing	200	1,500	16.4	12.2	7.9	13.5	11.6	21.0	30.9	31.0	30.0	31.0	22.9	17.7	246.1
J.C. Boyle Bypass Reach	Whitewater Boating—Standard	1,300	1,800	0.1	1.3	1.7	0.8	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.4	4.6
	Fishing	200	1,000	12.5	6.7	10.5	12.1	12.8	9.5	1.2	0.0	6.5	18.9	7.6	8.6	107.0
Hells Corner Reach	Whitewater Boating	1,200	3,500	23.4	18.7	22.6	21.6	26.3	29.9	24.4	26.7	27.1	31.0	30.0	29.2	310.9
	Fishing	200	1,500	15.0	12.2	7.3	13.4	9.7	15.2	30.8	31.0	30.0	31.0	21.2	17.5	234.4
Copco No. 2 Bypass Reach	Whitewater Boating	600	1,500	0.9	2.5	3.2	2.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.7	10.2
	Fishing	50	600	2.1	2.5	2.8	2.7	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.7
Iron Gate to	Whitewater Boating	800	4,000	20.3	13.8	12.2	15.0	17.3	24.4	30.9	31.0	30.0	31.0	29.1	23.0	278.0

River Reach	Activity	Low Value (cfs)	High Value (cfs)	Average Number of Days within Flow Range												
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	WY Total
Scott River																
	Fishing	800	2,500	10.8	7.0	5.4	7.4	6.4	17.5	30.1	31.0	30.0	30.5	23.5	14.3	214.0
Scott River to Salmon River	Boating	800	7,000	13.7	8.3	7.1	10.2	13.2	24.0	30.9	31.0	30.0	30.8	26.0	17.8	243.0
	Fishing	800	4,000	4.1	2.5	1.2	2.2	3.9	13.0	29.4	31.0	30.0	30.3	19.6	7.6	174.9
Salmon River to Trinity River	Whitewater Boating/ Fishing	800	10,000	8.7	4.1	2.8	4.5	9.0	21.0	30.7	31.0	30.0	30.5	23.2	11.6	207.0
Trinity River to Ocean	Whitewater Boating/ Fishing	1,800	18,000	11.7	6.2	6.1	10.1	16.2	25.5	30.7	30.4	30.0	30.7	25.3	15.9	238.9

Source: USBR 2012b,c; PacifiCorp 2004; FERC 2007; Greimann 2012.

Table S-7. Analysis for No Project, All Years, Maximum Number of Days.
(Table reproduced from Table R-7 in 2012 KHSA EIS/EIR Volume II.)

River Reach	Activity	Low Value (cfs)	High Value (cfs)	Maximum Number of Days within Flow Range												
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	WY Total
Keno Reach	Whitewater Boating—Standard	1,000	4,000	31	29	31	30	31	30	31	0	0	31	30	31	245
	Play Boating	1,100	1,800	31	0	31	30	31	30	0	0	0	31	30	31	142
	Fishing	200	1,500	31	29	31	30	31	30	31	31	30	31	30	31	366
J.C. Boyle Bypass Reach	Whitewater Boating—Standard	1,300	1,800	2	20	29	8	11	0	0	0	0	0	0	19	48
	Fishing	200	1,000	31	29	31	30	31	30	31	0	30	31	30	31	245
Hells Corner Reach	Whitewater Boating	1,200	3,500	31	29	31	30	31	30	31	31	30	31	30	31	366
	Fishing	200	1,500	31	29	31	30	31	30	31	31	30	31	30	31	366
Copco No. 2 Bypass Reach	Whitewater Boating	600	1,500	31	28	31	20	18	1	0	0	0	0	0	20	83
	Fishing	50	600	29	25	31	29	30	1	0	0	0	0	0	1	59

River Reach	Activity	Low Value (cfs)	High Value (cfs)	Maximum Number of Days within Flow Range												
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	WY Total
Iron Gate to Scott River	Whitewater Boating	800	4,000	31	29	31	30	31	30	31	31	30	31	30	31	366
	Fishing	800	2,500	31	29	31	30	31	30	31	31	30	31	30	31	366
Scott River to Salmon River	Boating	800	7,000	31	29	31	30	31	30	31	31	30	31	30	31	366
	Fishing	800	4,000	31	29	31	30	31	30	31	31	30	31	30	31	366
Salmon River to Trinity River	Whitewater Boating/ Fishing	800	10,000	31	29	31	30	31	30	31	31	30	31	30	31	366
Trinity River to Ocean	Whitewater Boating/ Fishing	1,800	18,000	31	29	31	30	31	30	31	31	30	31	30	31	366

Source: USBR 2012b,c; PacifiCorp 2004; FERC 2007; Greimann 2012.

Table S-8. Analysis for No Project, All Years, Minimum Number of Days.
(Table reproduced from Table R-8 in 2012 KHSA EIS/EIR Volume II.)

River Reach	Activity	Low Value (cfs)	High Value (cfs)	Minimum Number of Days within Flow Range												
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	WY Total
Keno Reach	Whitewater Boating—Standard	1,000	4,000	0	0	0	0	0	0	0	0	0	0	0	0	0
	Play Boating	1,100	1,800	0	0	0	0	0	0	0	0	0	0	0	0	0
	Fishing	200	1,500	0	0	0	0	0	0	30	31	30	31	0	0	122
J.C. Boyle Bypass Reach	Whitewater Boating—Standard	1,300	1,800	0	0	0	0	0	0	0	0	0	0	0	0	0
	Fishing	200	1,000	0	0	0	0	0	0	0	0	0	0	0	0	0
Hells Corner Reach	Whitewater Boating	1,200	3,500	0	0	0	0	0	29	0	0	0	31	30	0	183
	Fishing	200	1,500	0	0	0	0	0	0	30	31	30	30	0	0	122
Copco No. 2 Bypass Reach	Whitewater Boating	600	1,500	0	0	0	0	0	0	0	0	0	0	0	0	0
	Fishing	50	600	0	0	0	0	0	0	0	0	0	0	0	0	0

River Reach	Activity	Low Value (cfs)	High Value (cfs)	Minimum Number of Days within Flow Range												
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	WY Total
Iron Gate to Scott River	Whitewater Boating	800	4,000	0	0	0	0	0	0	29	31	30	31	20	0	144
	Fishing	800	2,500	0	0	0	0	0	0	15	31	30	3	0	0	121
Scott River to Salmon River	Boating	800	7,000	0	0	0	0	0	0	28	31	30	19	0	0	133
	Fishing	800	4,000	0	0	0	0	0	0	12	31	30	1	0	0	101
Salmon River to Trinity River	Whitewater Boating/ Fishing	800	10,000	0	0	0	0	0	0	22	30	30	9	0	0	128
Trinity River to Ocean	Whitewater Boating/ Fishing	1,800	18,000	0	0	0	0	0	0	22	1	30	18	0	0	138

Source: USBR 2012b,c; PacifiCorp 2004; FERC 2007; Greimann 2012.

S.3 Changes in 2012 KHSA EIS/EIR Model Results Due to Variations Between KBRA Flows and 2013 BiOp Flows or KBRA Flows and 2019 BiOp Flows

As previously introduced, the 2013 BiOp Flows were the hydrology requirement to which the USBR Klamath Irrigation Project operated at the time that the Lower Klamath Project EIR Notice of Preparation was issued (December 22, 2016). For the Lower Klamath Project EIR, the 2013 BiOp Flows serve as an existing conditions CEQA baseline, and they replace both the KBRA Flows ("dams out" scenario [i.e., Proposed Project]) and the 2010 BiOp Flows ("dams in" scenario [i.e., No Project Alternative]) originally modeled for the 2012 KHSA EIS/EIR since the KRRC's Proposed Project does not include a change in the flow requirements for the Klamath River as part of dam removal (i.e., the same flow requirements downstream of the location of Iron Gate Dam would occur regardless of dam removal). After the issuance of the Lower Klamath Project Draft EIR on December 27, 2018, the applicable biological opinion and the operational flow requirements for the Klamath River changed again in March 2019, when the new biological opinions were issued by NMFS (2019) and USFWS (2019). The 2019 BiOp Flows are now the current operational flow requirement for the Klamath River and as such they are analyzed in the Lower Klamath Project Final EIR as a second CEQA baseline, representing flows under newly defined existing conditions (see also Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project*).

The Lower Klamath Project EIR recreational flow analysis considers that, if the dams were to be removed, Keno Dam flow releases would be managed to maintain biological opinion required flows downstream of the location of Iron Gate Dam. While the specific Keno Dam flow releases under a dam removal scenario with the 2013 BiOp Flows or the 2019 BiOp Flows are unknown, if dam removal occurs, USBR, NMFS, and USFWS would coordinate to identify a methodology to back calculate the Keno Dam releases and flow requirements necessary to provide flows downstream of Iron Gate Dam consistent with the expectations under the applicable biological opinion (NMFS 2019). Overall, this means that Keno Dam flow releases for maintaining the 2013 BiOp Flows or the 2019 BiOp Flows at the location of Iron Gate Dam generally would be similar irrespective of dam removal, which would minimize flow differences between "dams in" and "dams out" scenarios for the Lower Klamath Project analysis as compared with the analysis conducted for the 2012 KHSA EIS/EIR. In the 2012 KHSA EIS/EIR analysis, (Tables S-1 to S-8) KBRA Flows ("dams out" scenario [i.e., Proposed Project]) and the 2010 BiOp Flows ("dams in" scenario [i.e., No Project Alternative]) were purposefully different because KBRA Flows were a connected action to dam removal. For the Lower Klamath Project analysis, having the same biological opinion flow requirements in the Klamath River regardless of dam removal also means that during certain months there would be less variation in the number of days with acceptable flows for flow-dependent recreational opportunities (i.e., whitewater boating and fishing) between the

"dams in" and "dams out" scenarios, as compared with the 2012 KHSA EIS/EIR analysis (Tables S-1 to S-8).

However, the primary difference between the "dams in" and "dams out" flow scenarios, namely the lack of hydropower peaking operations under a "dams out" scenario, would still affect recreational flows under the Proposed Project in a similar way as was modeled in the 2012 KHSA EIS/EIR. Although the 2013 BiOp Flows and the 2019 BiOp Flows underlying the recreational flow analysis in this EIR are different from the KBRA Flows and the 2010 BiOp Flows modeled in the 2012 KHSA EIS/EIR, the flows due to hydropower operations in the J.C. Boyle Bypass Reach, the J.C. Boyle Peaking Reach (including Hell's Corner Reach), and the Copco No. 2 Bypass Reach would still change in the following generally predictable ways should the dams be removed: flows within the J.C. Boyle Bypass Reach and the Copco No. 2 Bypass Reach would increase due to the absence of hydropower bypass operations; flows within the J.C. Boyle Peaking Reach would generally become more constant due to the elimination of hydropower peaking operations; and peak flows within the J.C. Boyle Peaking Reach would decrease due to the elimination of hydropower peaking operations.

As explained in Section 3.1.6 *Summary of Available Hydrology Information for the Proposed Project,* monthly flow exceedance curve plots are useful for comparing the flow differences by month under 2013 BiOp and KBRA Flows, since they show the entire potential range of flows that would occur during different water year types (i.e., wet, median, and dry year types). Variations between exceedance flow curves for the 2013 BiOp Flows and the KBRA Flows, as well as for the 2019 BiOp Flows and the KBRA Flows, were evaluated to qualitatively determine how monthly variations between the flow regimes would alter the estimated number of days within the acceptable flow range for flow-dependent recreational activities. The acceptable flow ranges for various reaches (Table S-1) are plotted along with the calculated monthly flow exceedance curves for the modeled 2013 BiOp Flows and the 2019 BiOp Flows for the period 1980−2011, as well as the modeled KBRA Flows for the same period, at Keno Dam (Figure S-1 to Figure S-) and at Iron Gate Dam (Figure). Figures S-1 to Figure S- also display p-values for paired heteroscedastic t-tests of the KBRA Flows and 2019 BiOp Flows for the period 1980−2011, where the p-values indicate whether there is a statistical difference between the flow distributions. Months with a white background have a p-value greater than 0.05, indicating that there is no statistical difference between the KBRA and the 2019 BiOp flow distributions, while months with a light yellow background (p-value less than 0.05) or a bright yellow background (p-values less than 0.01) indicate a corresponding statistical difference between the two flow distributions. Klamath River reaches between Keno Dam and Iron Gate Dam are assessed using the exceedance curves at Keno Dam and the applicable acceptable flow range for flow-dependent recreation activities (Table S-1), and the reaches downstream of Iron Gate Dam are assessed using the exceedance curves at Iron Gate Dam and the applicable acceptable flow range for flow-dependent recreation activities

(Table S-1) in these reaches. This evaluation focuses on exceedance flow curves during July, August, and September, because those are the highest demand months for recreational activities on the Klamath River, but it also considers the exceedance flow curves for the entire year.

Note that Klamath River flows from Keno Dam to Iron Gate Dam would be the sum of the Keno Dam flow releases and accretions from tributaries along this entire section of the Klamath River and groundwater springs in the J.C. Boyle Bypass Reach, so the Keno Dam flow exceedance curves under the 2013 BiOp Flows or 2019 BiOp Flows with "dams in" also are still expected to be generally representative of flow conditions within the Klamath River from Keno Dam to Iron Gate Dam under the Proposed Project ("dams out").

S.3.1 Changes in 2012 KHSA EIS/EIR Model Results Due to Variations Between KBRA Flows and 2013 BiOp Flows

In the Keno, J.C. Boyle Bypass, and Hell's Corner reaches of the Upper Klamath River, differences between the average number of days with acceptable flows for whitewater boating under the 2013 BiOp Flows and those under the KBRA Flows, as shown by the monthly flow exceedance curves at Keno Dam (Figure S-1 to Figure S-), would likely result in a net decrease in the number of days suitable for whitewater boating under the Proposed Project. Whitewater boating requires a minimum flow of 1,000 cfs to 1,300 cfs in the Keno, J.C. Boyle Bypass, and Hell's Corner reaches, and whitewater boating cannot occur when the maximum flows exceed 4,000 cfs in the Keno Reach, 1,800 cfs in the J.C. Boyle Bypass Reach, or 3,500 cfs in the Hell's Corner Reach of the Klamath River (Table S-1). Much of the variation between the 2013 BiOp Flows and the KBRA Flows during winter and spring occurs within the acceptable range of flows for whitewater boating and these variations would not alter the number of days that whitewater boating could occur during this time period. However, during summer and fall months, variations between the 2013 BiOp Flows and the KBRA Flows would alter the number of days available for whitewater boating under the Proposed Project, since they would change the frequency that flows would be within the acceptable range. In July through September, KBRA Flows would exceed 1,000 cfs during wet water years, with KBRA Flows exceeding 1,300 cfs during wet water years in July. Under the KBRA Flows, the projected average number of days of whitewater boating for all water year types between July and September would range from 2.3 days in August in the J.C. Boyle Bypass Reach to 13.8 days in July in the Hell's Corner Reach (Table S-3). However, the 2013 BiOp Flows would remain below 1,000 cfs in July and September except during very wet water year types (i.e., exceedance probability less than 5 percent) and 2013 BiOp Flows would remain below 1,000 cfs during all water year types in August. Additionally, the 2013 BiOp Flows would remain below 1,300 cfs during all water year types between July through September. As such, the number of days that whitewater boating could occur between July and September in the Keno, J.C. Boyle Bypass, and Hell's Corner reaches of the Klamath River would decrease under the 2013 BiOp Flows compared to the KBRA Flows since the

2013 BiOp Flows would be within the acceptable range for whitewater boating less frequently than the KBRA Flows.

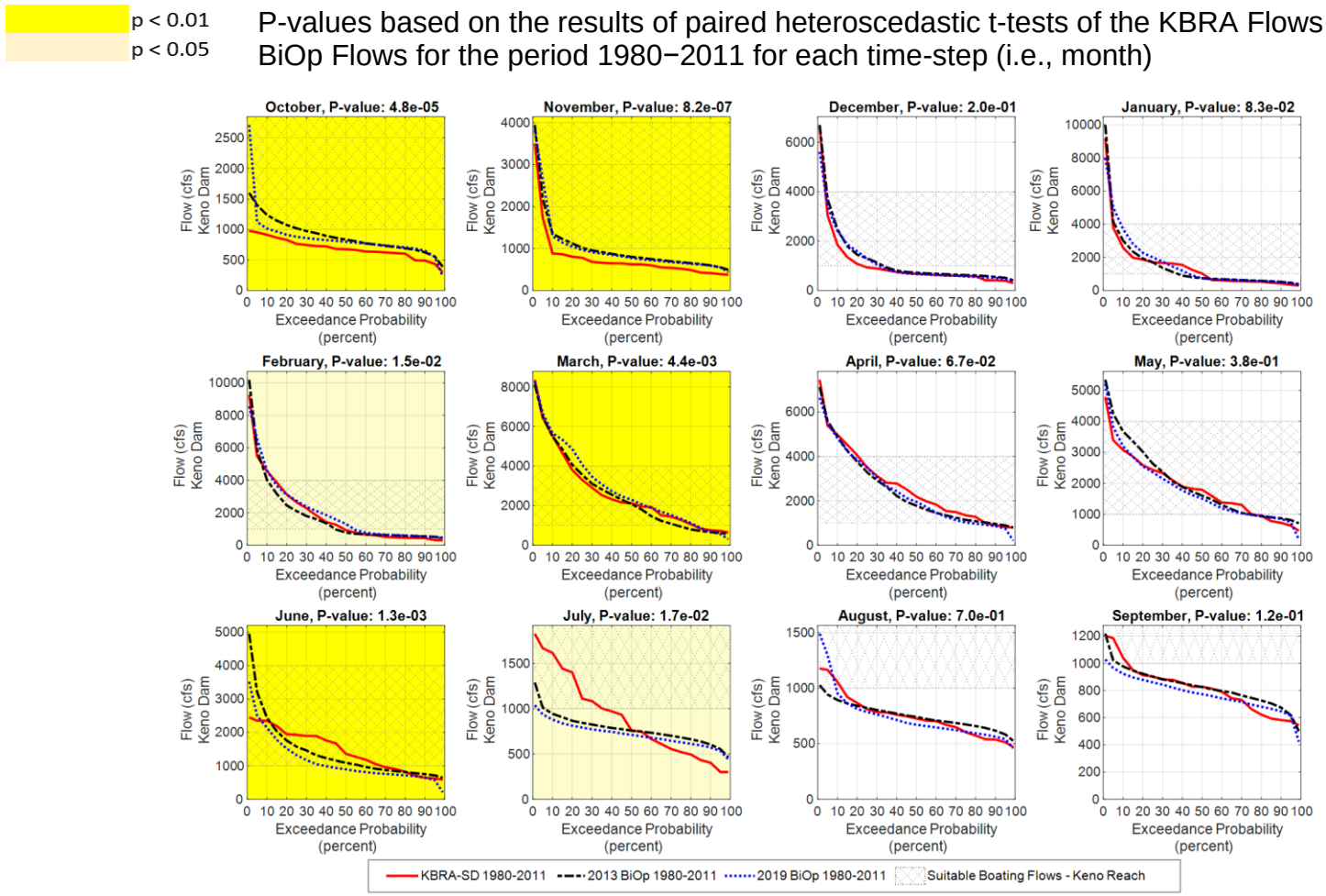

Figure S-1. Consideration of Whitewater Boating Flows in the Keno Reach: Monthly Flow Exceedance Curves at Keno Dam for the KBRA Flows (KBRA-SD 1980−2011), 2013 Joint Biological Opinion Flows (2013 BiOp 1980−2011), and 2019 Biological Opinion Flows (2019 BiOp 1980−2011) Along With The Range of Suitable Whitewater Boating Flows in the Keno Reach in Grey Cross-Hatching. Source: USBR 2019. Note: The Scale on the Y-Axis (Flow in cfs) Varies Significantly Between Months. Wet, Median, and Dry Water Years Correspond to the 10 Percent, 50 Percent, and 90 Percent Flow Exceedance Probabilities, Respectively.

p < 0.01
p < 0.05

P-values based on the results of paired heteroscedastic t-tests of the KBRA Flows and 2019 BiOp Flows for the period 1980–2011 for each time-step (i.e., month)

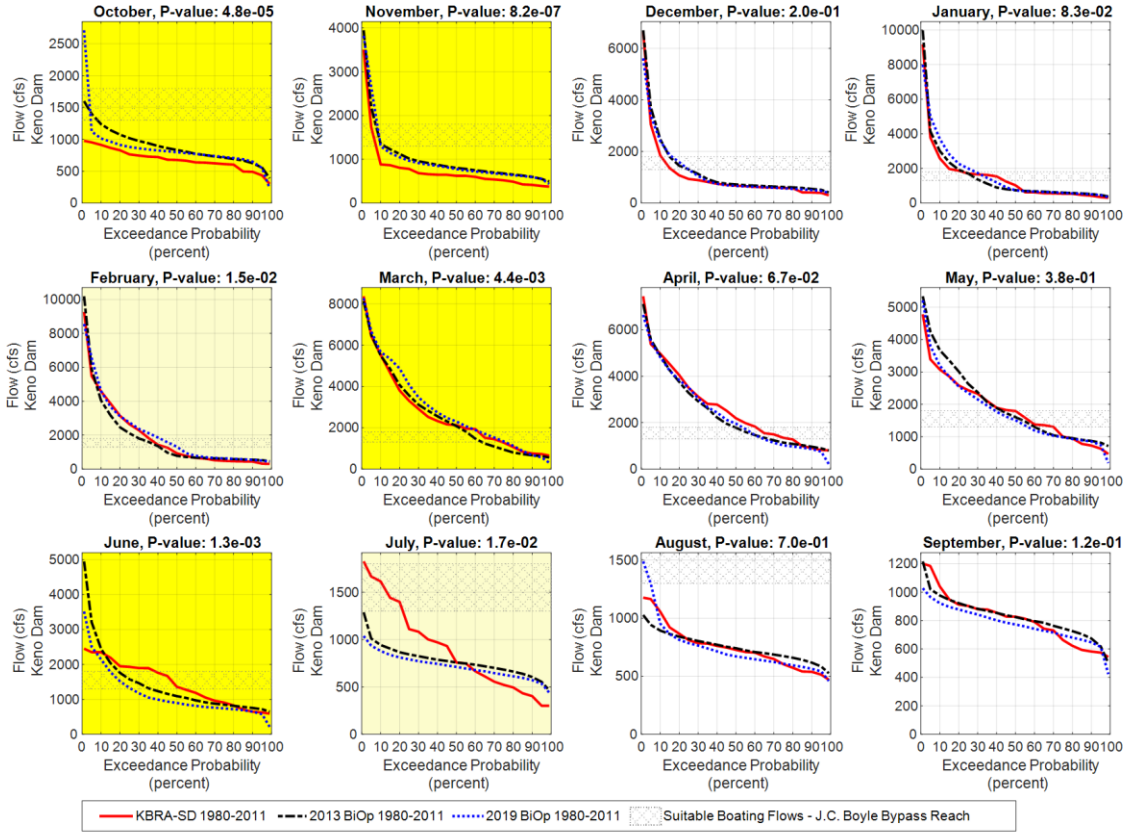

Figure S-2. Consideration of Whitewater Boating Flows in the J.C. Boyle Reach: Monthly Flow Exceedance Curves at Keno Dam for the KBRA Flows (KBRA-SD 1980−2011), 2013 Joint Biological Opinion Flows (2013 BiOp 1980−2011), and 2019 Biological Opinion Flows (2019 BiOp 1980−2011) Along With The Range of Suitable Whitewater Boating Flows in the J.C. Boyle Bypass Reach in Grey Cross-Hatching. Source: USBR 2019. Note: The Scale on the Y-Axis (Flow in cfs) Varies Significantly Between Months. Wet, Median, and Dry Water Years Correspond to the 10 Percent, 50 Percent, and 90 Percent Flow Exceedance Probabilities, Respectively.

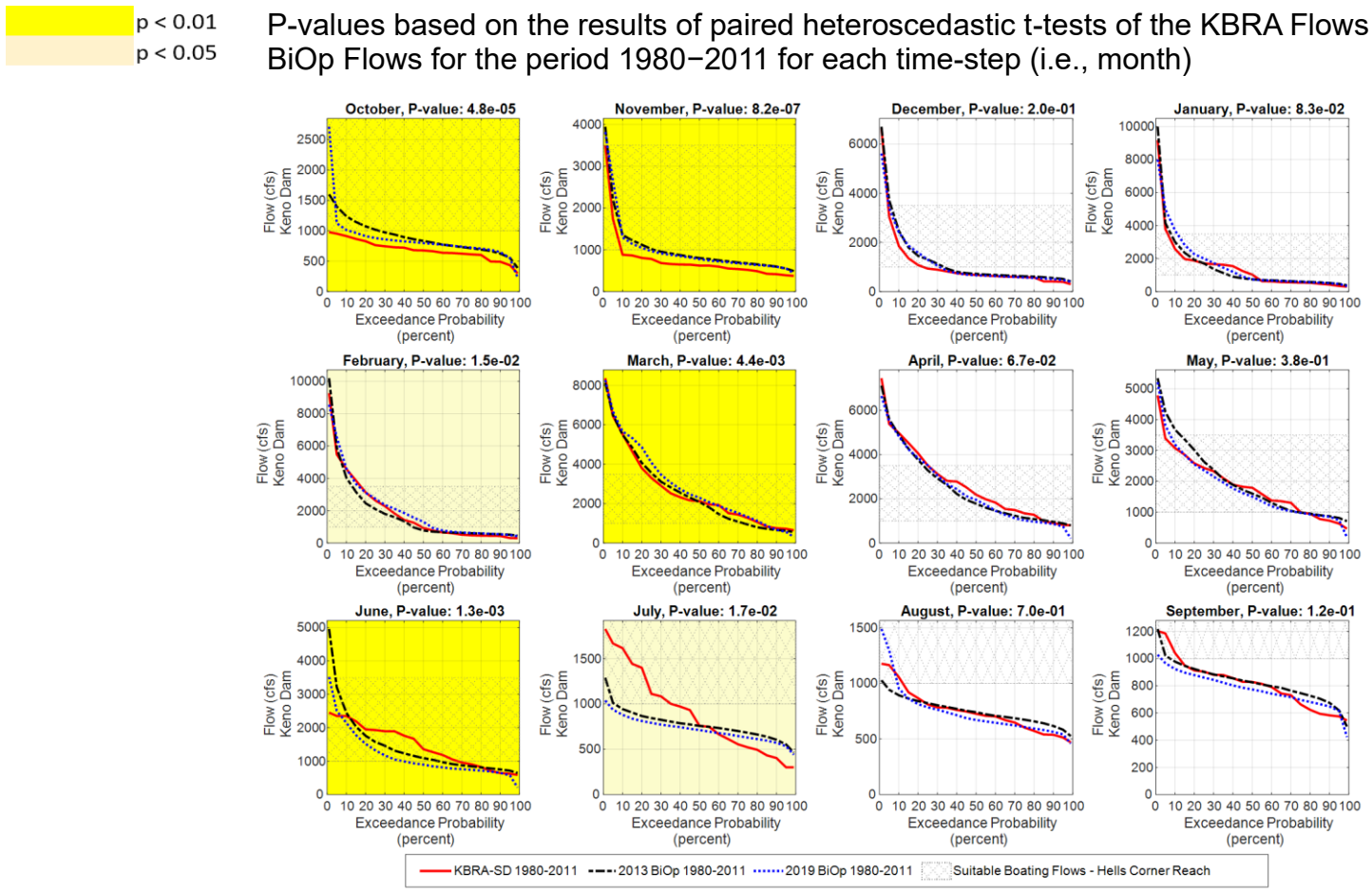

Figure S-3. Consideration of Whitewater Boating Flows (Kayaking) in the Hell's Corner Reach: Monthly Flow Exceedance Curves at Keno Dam for the KBRA Flows (KBRA-SD 1980−2011), 2013 Joint Biological Opinion Flows (2013 BiOp 1980−2011), and 2019 Biological Opinion Flows (2019 BiOp 1980−2011) Along With The Range of Suitable Whitewater Boating Flows (Kayaking) in the Hell's Corner Reach in Grey Cross-Hatching. Source: USBR 2019. Note: The Scale on the Y-Axis (Flow in cfs) Varies Significantly Between Months. Wet, Median, and Dry Water Years Correspond to the 10 Percent, 50 Percent, and 90 Percent Flow Exceedance Probabilities, Respectively.

p < 0.01
p < 0.05

P-values based on the results of paired heteroscedastic t-tests of the KBRA Flows and 2019 BiOp Flows for the period 1980−2011 for each time-step (i.e., month)

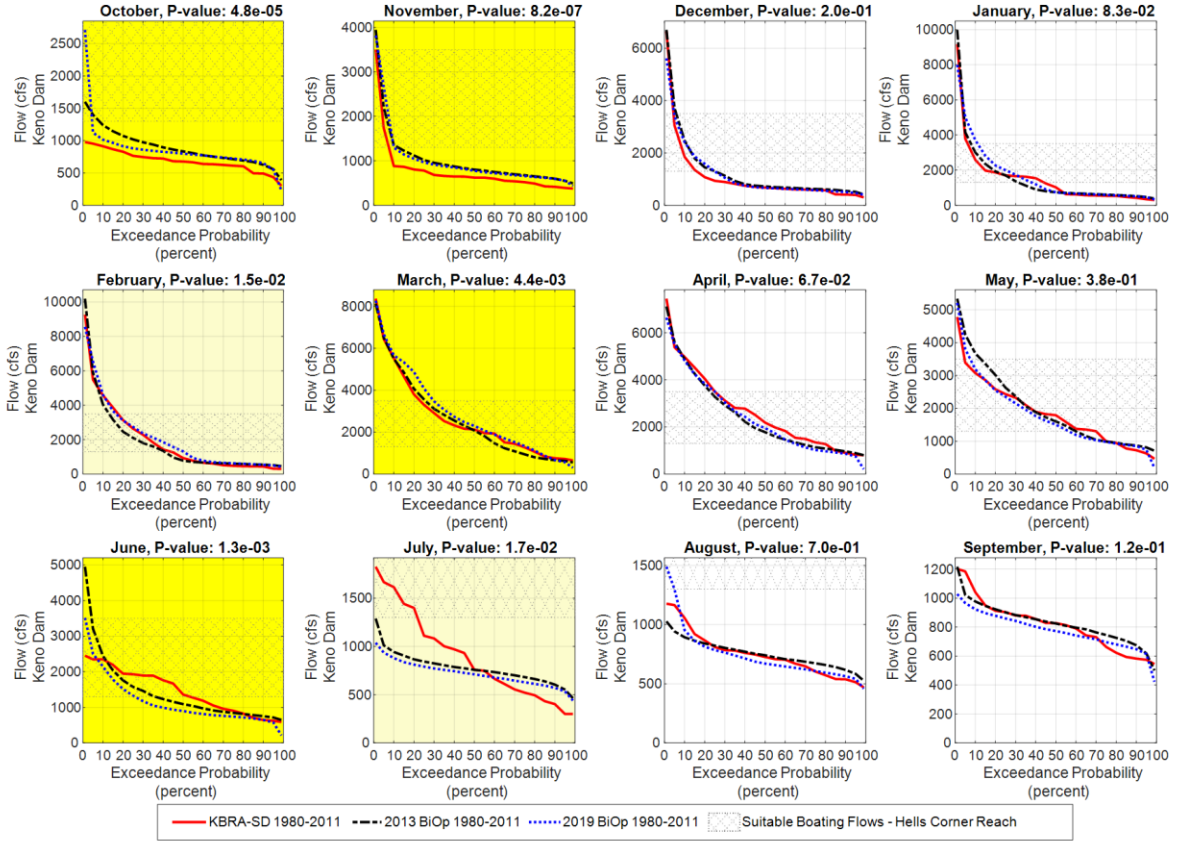

Figure S-4. Consideration of Whitewater Boating Flows (Rafting) in the Hell's Corner Reach: Monthly Flow Exceedance Curves at Keno Dam for the KBRA Flows (KBRA-SD 1980−2011), 2013 Joint Biological Opinion Flows (2013 BiOp 1980−2011), and 2019 Biological Opinion Flows (2019 BiOp 1980−2011) Along With The Range of Suitable Whitewater Boating Flows (Rafting) in the Hell's Corner Reach in Grey Cross-Hatching. Source: USBR 2019. Note: The Scale on the Y-Axis (Flow in cfs) Varies Significantly Between Months. Wet, Median, and Dry Water Years Correspond to the 10 Percent, 50 Percent, and 90 Percent Flow Exceedance Probabilities, Respectively.

p < 0.01
p < 0.05

P-values based on the results of paired heteroscedastic t-tests of the KBRA Flows and 2019 BiOp Flows for the period 1980−2011 for each time-step (i.e., month)

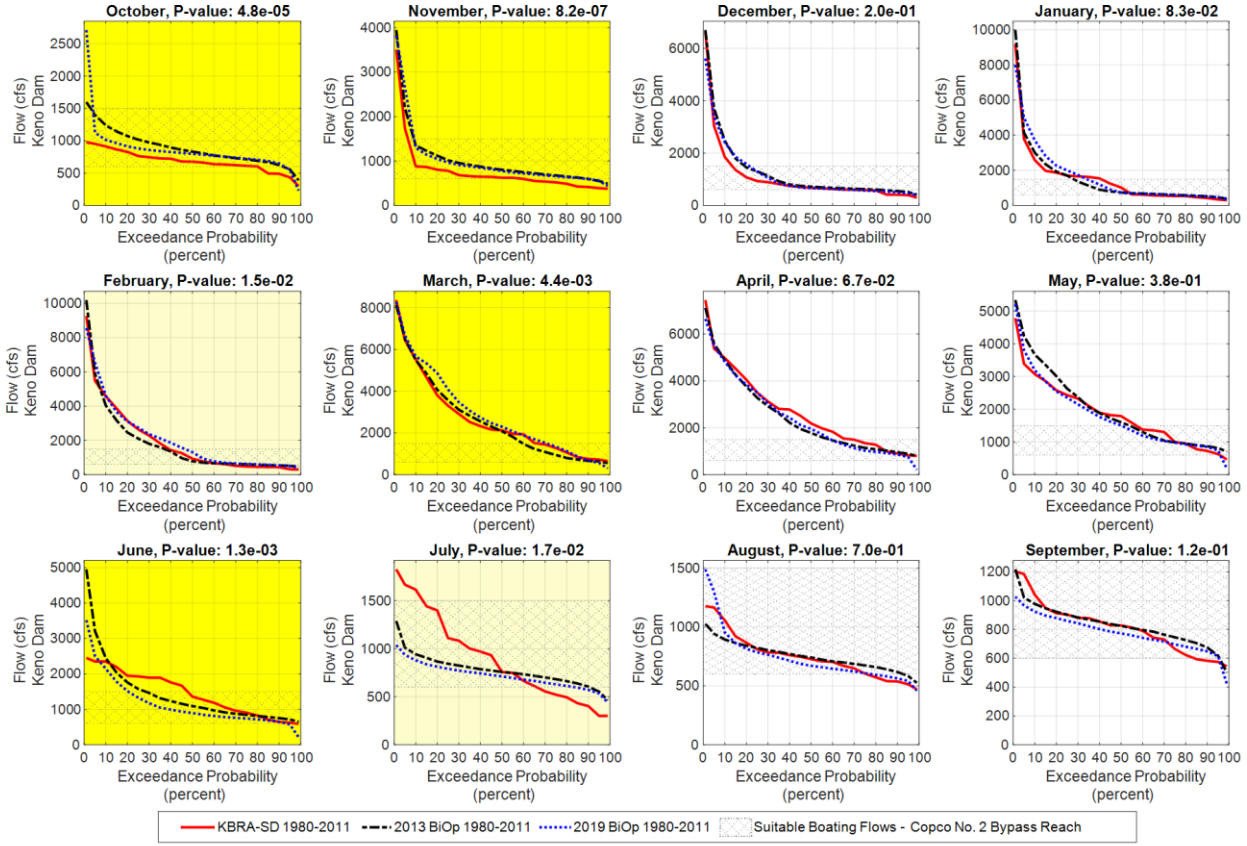

Figure S-5. Consideration of Whitewater Boating Flows in the Copco No. 2 Bypass Reach: Monthly Flow Exceedance Curves at Keno Dam for the KBRA Flows (KBRA-SD 1980−2011), 2013 Joint Biological Opinion Flows (2013 BiOp 1980−2011), and 2019 Biological Opinion Flows (2019 BiOp 1980−2011) Along With The Range of Suitable Whitewater Boating Flows in the Copco No. 2 Bypass Reach in Grey Cross-Hatching. Source: USBR 2019. Note: The Scale on the Y-Axis (Flow in cfs) Varies Significantly Between Months. Wet, Median, and Dry Water Years Correspond to the 10 Percent, 50 Percent, and 90 Percent Flow Exceedance Probabilities, Respectively.

p < 0.01
p < 0.05

P-values based on the results of paired heteroscedastic t-tests of the KBRA Flows and 2019 BiOp Flows for the period 1980−2011 for each time-step (i.e., month)

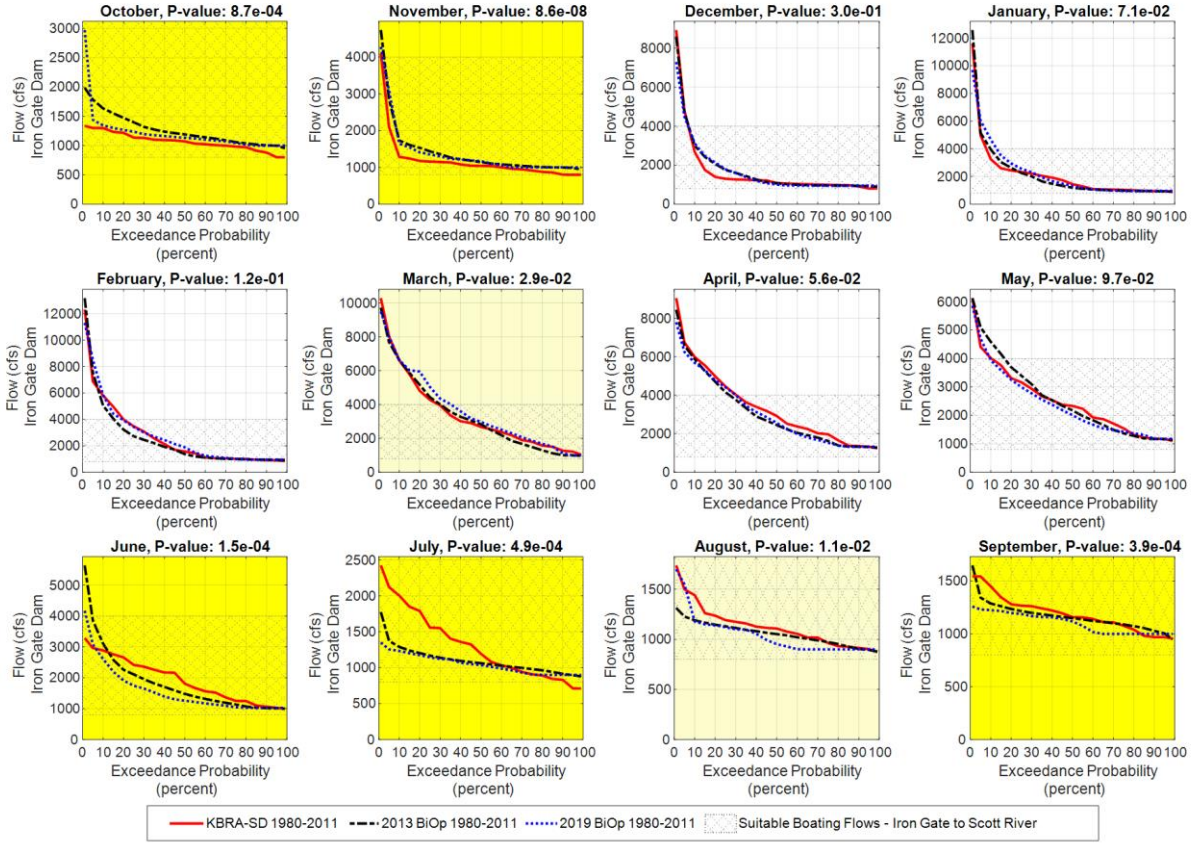

Figure S-6. Consideration of Whitewater Boating and Fishing Flows in the Iron Gate Dam to Salmon Creek Reach: Monthly Flow Exceedance Curves at Iron Gate Dam for the KBRA Flows (KBRA-SD 1980−2011), 2013 Joint Biological Opinion Flows (2013 BiOp 1980−2011), and 2019 Biological Opinion Flows (2019 BiOp 1980−2011) Along With The Range of Suitable Whitewater Boating and Fishing Flows in the Iron Gate Dam to Salmon Creek Reach in Grey Cross-Hatching. Source: USBR 2019. Note: The Scale on the Y-Axis (Flow in cfs) Varies Significantly Between Months. Wet, Median, and Dry Water Years Correspond to the 10 Percent, 50 Percent, and 90 Percent Flow Exceedance Probabilities, Respectively.

Conversely, in October the projected average number of days of whitewater boating would increase under the 2013 BiOp Flows relative to the KBRA Flows since the 2013 BiOp Flows exceed 1,000 cfs in 30 percent of years, but the KBRA Flows are always below 1,000 cfs. Upper Klamath River flows in the Keno, J.C. Boyle Bypass, and Hell's Corner reaches would be within the range of acceptable flows for whitewater boating under 2013 BiOp Flows in October under some water year types, especially wet water years, but acceptable whitewater boating flows would not occur under KBRA Flows. Thus, the projected average number of days of whitewater boating for all water year types in October between Keno Dam and Iron Gate Dam would be greater under 2013 BiOp Flows than under the KBRA Flows.

Overall, the projected annual average number of days that would support whitewater boating for all water year types in the Keno, J.C. Boyle Bypass, and Hell's Corner reaches of the Upper Klamath River would decrease under the 2013 BiOp Flows compared to those modeled in the 2012 KHSA EIS/EIR under the KBRA Flows, since the decreases in July through September are expected to be greater than the increase in October.

The average number of days that fishing could occur in the Keno, J.C. Boyle Bypass, and Hell's Corner reaches of the Upper Klamath River would increase under the 2013 BiOp compared to the KBRA Flows. In addition to detailing the percent of time that flows would be exceeded, the monthly flow exceedance curves also indicate the percent of years when the flows would occur. The percent of years within the acceptable flow range for fishing (i.e., 200 cfs to 1,500 cfs in the Keno, J.C. Boyle Bypass, and Hell's Corner reaches) can be estimated by subtracting the percent exceedance from one hundred percent, if the minimum flow is always greater than the minimum acceptable fishing flow (i.e., 200 cfs). Under the 2013 BiOp and KBRA Flows, the percent of years within the acceptable fishing flow range is generally similar and the average number of days available for fishing would also remain generally similar for most months except June and July. In those months, the 2013 BiOp Flows would be within the acceptable fishing flow range more frequently (approximately 70 percent of years in the Keno Reach during June;100 percent of years in the Keno Reach during July) than the KBRA Flows (approximately 50 percent of years in the Keno Reach during June; approximately 85 percent of years in the Keno Reach during July). The frequency of suitable fishing flows would vary between the reaches due to variations in the suitable maximum and minimum flows for fishing within each reach, but there would be an overall net increase in the projected average number of days with acceptable fishing flows under the 2013 BiOp Flows compared to under the KBRA Flows in the Keno, J.C. Boyle Bypass, and Hell's Corner reaches of the Upper Klamath River.

Downstream of Iron Gate Dam, a comparison of the monthly exceedance curves for the 2013 BiOp and KBRA Flows at Iron Gate Dam (Figure) indicates that the number of days flows are within the acceptable range for flow-dependent

recreational activities would be generally similar under 2013 BiOp and KBRA Flows. Most of the variations between the 2013 BiOp and KBRA Flows at Iron Gate Dam occur within the acceptable range of flows for whitewater boating, boating, or fishing and those variations would not alter the number of days flow-dependent recreational activities could occur. Differences between the 2013 BiOp and KBRA Flows outside of the acceptable range of flows downstream of Iron Gate Dam occur infrequently, are relatively small (i.e., less than 10 percent change in frequency of exceedance), and primarily occur for either dry (represented by a 90 percent exceedance) or wet (represented by a 10 percent exceedance) water year types. In May, KBRA Flows would exceed 4,000 cfs in approximately 10 percent of years, but 2013 BiOp Flows would exceed 4,000 cfs in approximately 18 percent of years. In June, KBRA Flows would always be within the range of acceptable flows for whitewater boating, but 2013 BiOp Flows would exceed 4,000 cfs in approximately 5 percent of years (i.e., very wet years). These variations between the KBRA and 2013 BiOp Flows would decrease the average number of days within the acceptable flow range for whitewater boating and fishing in the Klamath River from Iron Gate to its confluence with the Salmon River under the 2013 BiOp Flows. In July, KBRA Flows would not exceed 800 cfs in approximately 10 percent of years (i.e., dry water years), but 2013 BiOp Flows would always exceed 800 cfs. Similarly, the KBRA flows in October would not exceed 800 cfs in approximately 5 percent of years (i.e., very dry water years), but 2013 BiOp Flows would always exceed 800 cfs. The result of these variations would increase the average number of days within the acceptable flow range for whitewater boating and fishing in the Klamath River downstream of Iron Gate Dam under the 2013 BiOp Flows. The overall net change in the average number of days within the acceptable flow range for recreational activities between the 2013 BiOp and KBRA Flows would be minimal downstream of Iron Gate Dam, but the exact number of days under 2013 BiOp Flows would vary slightly from those modeled in the 2012 KHSA EIS/EIR analysis under the KBRA Flows. As such, the average number of days for flow-dependent recreational activities estimated in the 2012 KHSA EIS/EIR analysis downstream of Iron Gate Dam is generally representative of trends and conditions under the 2013 BiOp Flows.

S.3.2 Changes in 2012 KHSA EIS/EIR Model Results Due to Variations Between KBRA Flows and 2019 BiOp Flows

In the Keno, J.C. Boyle Bypass, and Hell's Corner reaches of the Upper Klamath River, differences between the average number of days with acceptable flows for whitewater boating under the 2019 BiOp Flows and the KBRA Flows, as shown by the monthly flow exceedance curves at Keno Dam (Figure S-1 to Figure S-), would likely result in a net decrease in the number of days that flows are within the acceptable range for whitewater boating under the Proposed Project. Whitewater boating requires a minimum flow of 1,000 cfs to 1,300 cfs in the Keno, J.C. Boyle Bypass, and Hell's Corner reaches, while whitewater boating cannot occur when the maximum flows exceed 4,000 cfs in the Keno Reach, 1,800 cfs in the J.C. Boyle Bypass Reach, or 3,500 cfs in the Hell's Corner

Reach of the Klamath River (Table S-1). Much of the variations between the 2019 BiOp Flows and KBRA Flows during winter and spring occur within the acceptable range of flows for whitewater boating and these variations would not alter the number of days that whitewater boating could occur during this time period. However, during summer and fall months, variations between the 2019 BiOp Flows and KBRA Flows would alter the number of days available for whitewater boating, since they would change the frequency that flows would be within the acceptable range. In May and June, the projected average number of days of whitewater boating under KBRA Flows for all water year types between July and September would range from 5.7 days in June in the J.C. Boyle Bypass Reach to 21.6 days in June in the Hell's Corner Reach. However, 2019 BiOp Flows in May and June would be slightly less frequently within the range of acceptable whitewater boating flows than KBRA Flows primarily due to slightly lower flows during drier water year types that do not meet the minimum flows for whitewater boating, slightly higher flows during wetter water year types that exceed the maximum flows for whitewater boating, or a combination of both. In July through September, KBRA Flows would exceed 1,000 cfs during wet water years, with KBRA Flows exceeding 1,300 cfs during wet water years in July, resulting in suitable flows for whitewater boating opportunities during wetter water year types (i.e., exceedance probability less than approximately 35 percent in July and less than approximately 12 percent in August and September). Under the KBRA Flows, the projected average number of days of whitewater boating for all water year types between July and September would range from 2.3 days in August in the J.C. Boyle Bypass Reach to 13.8 days in July in the Hell's Corner Reach (Table S-3). However, the 2019 BiOp Flows would remain below 1,000 cfs in July and September except during very wet water year types (i.e., exceedance probability less than approximately 5 percent) and 2019 BiOp Flows would exceed 1,000 cfs in August only during wet water year types (i.e., exceedance probability approximately 10 percent or less). Thus, the number of days whitewater boating could occur between July and September in the Keno, J.C. Boyle Bypass, and Hell's Corner reaches of the Klamath River would decrease under the 2019 BiOp Flows compared to the KBRA Flow model results. Conversely, the average number of days of whitewater boating in October in the Klamath River between Keno and Iron Gate dams would increase under the 2019 BiOp Flows relative to the KBRA Flows (i.e., less than one day) since the 2019 BiOp Flows exceed 1,000 cfs in very wet to wet water year types (i.e., exceedance probability less than approximately 5 to 10 percent), but the KBRA Flows are always below 1,000 cfs.

Overall, the annual average number of days supporting whitewater boating for all water year types in the Keno, J.C. Boyle Bypass, and Hell's Corner reaches of the Upper Klamath River would decrease under the 2019 BiOp Flows compared to under the KBRA Flows, since decreases in May through September are expected to be greater than the increase in October.

The average number of days that fishing could occur in the Keno, J.C. Boyle Bypass, and Hell's Corner reaches of the Upper Klamath River would increase under the 2019 BiOp Flows compared to the KBRA Flows. In addition to detailing the percent of time that flows would be exceeded, the monthly flow exceedance curves also indicate the percent of years when the flows would occur. The percent of years within the acceptable flow range for fishing (i.e., 200 cfs to 1,500 cfs in the Keno, J.C. Boyle Bypass, and Hell's Corner reaches) can be estimated by subtracting the percent exceedance from one hundred percent, if the minimum flow is always greater than the minimum acceptable fishing flow (i.e., 200 cfs). Under the 2019 BiOp Flows and the KBRA Flows, the percent of years within the acceptable fishing flow range is generally similar (i.e., less than 10 percent change in frequency of exceedance) and the average number of days available for fishing would also remain generally similar for most months except June and July. In those months, the 2019 BiOp Flows would be within the acceptable fishing flow range more frequently (approximately 80 percent of years in the Keno Reach during June; 100 percent of years in the Keno Reach during July) than the KBRA Flows (approximately 50 percent of years in the Keno Reach during June; approximately 85 percent of years in the Keno Reach during July). While the specific frequency that flows are within the acceptable range for fishing would vary between the reaches due to variations in the suitable maximum and minimum flows for fishing between reaches, there would be an overall net increase in the projected average number of days with acceptable fishing flows under the 2019 BiOp Flows compared to under the KBRA Flows in the Keno, J.C. Boyle Bypass, and Hell's Corner reaches of the Upper Klamath River.

Downstream of Iron Gate Dam, a comparison of the monthly exceedance curves for the 2019 BiOp and KBRA Flows at Iron Gate Dam (Figure) indicates that the number of days that flows are within the acceptable range for flow-dependent recreational activities would be generally similar under 2019 BiOp Flows and the KBRA Flows. Most of the variations between the 2019 BiOp Flows and the KBRA Flows at Iron Gate Dam occur within the acceptable range of flows for whitewater boating, boating, or fishing and those variations would not alter the number of days flow-dependent recreational activities could occur. Differences between the 2019 BiOp Flows and KBRA Flows outside of the acceptable range of flows downstream of Iron Gate Dam are consistently relatively small (i.e., less than 10 percent change in frequency of exceedance) and occur during winter months (i.e., January through March), so there would be a minimal change in the average number of days within the acceptable flow range for recreational activities between the 2019 BiOp and KBRA Flows downstream of Iron Gate Dam. As such, the average number of days for flow-dependent recreational activities estimated in the 2012 KHSA EIS/EIR analysis downstream of Iron Gate Dam is generally representative of trends and conditions under the 2019 BiOp Flows.

S.4 References

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Attachment 2

Revisions to Draft EIR Recirculated Portions

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REVISIONS TO THE DRAFT EIR AT2-1

3.9 Air Quality AT2-2

APPENDIX N. AIR EMISSIONS MODELING FOR THE LOWER KLAMATH PROJECT AT2-3

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REVISIONS TO THE DRAFT EIR

This attachment identifies revisions to the Draft EIR that required recirculation of *Air Quality* and *Greenhouse Gas Emissions and Energy* portions of the EIR prior to certification because these specific revisions constituted significant new information, as defined by CEQA Guidelines, section 15088.5, subdivision (b):

(1) A new significant environmental impact that would result from the project or from a new mitigation measure proposed to be implemented.

(2) A substantial increase in the severity of an environmental impact that would result unless mitigation measures are adopted that reduce the impact to a level of insignificance.

None of the revisions to the Draft EIR are due to either of the following, as defined by CEQA Guidelines, section 15088.5, subdivision (b):

(3) A feasible project alternative or mitigation measure considerably different from others previously analyzed that would clearly lessen the environmental impacts of the project, but the project's proponents decline to adopt it.

(4) The draft EIR was so fundamentally and basically inadequate and conclusory in nature that meaningful public review and comment were precluded.

For all other revisions to the Draft EIR, please refer to Volume III, Attachment 1.

3.9 Air Quality

3.9.2 Environmental Setting

Recirculated Draft EIR Section 3.9.2.3 Air Quality – Environmental Setting – Monitoring-Station Data and Attainment-Area Designation, paragraph 5 on page RE-3-8:

As such, this monitoring station is considered representative of ambient air quality in Siskiyou County.

APPENDIX N. AIR EMISSIONS MODELING FOR THE LOWER KLAMATH PROJECT

Attachment A. Emissions Calculations

Recirculated Draft EIR Appendix N Attachment A Table Construction Activity (grading and earthmoving) for the Proposed Project, Continued Operations with Fish Passage Alternative, Two Dam Removal Alternative, Three Dam Removal Alternative, and No Hatchery Alternative, table title on page RE-A-16:

Construction Activity (grading and earthmoving) for the Proposed Project, Continued Operations with Fish Passage Alternative, Two Dam Removal Alternative, Three Dam Removal Alternative, and No Hatchery Alternative[1]

Recirculated Draft EIR Appendix N Attachment A Table Construction Activity (grading and earthmoving) for the Proposed Project, Continued Operations with Fish Passage Alternative, Two Dam Removal Alternative, Three Dam Removal Alternative, and No Hatchery Alternative, new footnote on page RE-A-18:

[1] Equipment quantities and daily use estimates were available for the combined demolition activities that would occur at Copco No. 1 and Copco No. 2 dam complexes. Based on the relative anticipated duration of activities at each site, daily equipment use was apportioned by a factor of 0.7 for Copco No. 1 Dam and 0.3 for Copco No. 2 Dam. Maximum daily emissions were obtained by summing daily emissions for construction phases anticipated to occur at the same time and daily emissions were summed over the total daily duration for each phase to obtain total emissions.

Recirculated Draft EIR Appendix N Attachment A Table Off-Road Construction Activity (grading and earthmoving) for the Partial Removal Alternative, table title on page RE-A-35:

Off-Road Construction Activity (grading and earthmoving) for the Partial Removal Alternative[1]

Recirculated Draft EIR Appendix N Attachment A Table Off-Road Construction Activity (grading and earthmoving) for the Partial Removal Alternative, new footnote on page RE-A-46:

[1] Equipment quantities and daily use estimates were available for the combined demolition activities that would occur at Copco No. 1 and Copco No. 2 dam complexes. Based on the relative anticipated duration of activities at each site, daily equipment use was apportioned by a factor of 0.7 for Copco No. 1 Dam and 0.3 for Copco No. 2 Dam. Maximum daily emissions were obtained by summing daily emissions for construction phases anticipated to occur at the same time and

daily emissions were summed over the total daily duration for each phase to obtain total emissions.

Recirculated Draft EIR Appendix N Attachment A Table J.C. Boyle Equipment for the Proposed Project, Two Dam Removal Alternative, and Three Dam Removal Alternative, table title on page RE-A-75:

J.C. Boyle Equipment for the Proposed Project, Two Dam Removal Alternative, and Three Dam Removal Alternative[1]

Recirculated Draft EIR Appendix N Attachment A Table J.C. Boyle Equipment for the Proposed Project, Two Dam Removal Alternative, and Three Dam Removal Alternative, new footnote on page RE-A-76:

[1] Equipment quantities and daily use estimates were available for the combined demolition activities that would occur at Copco No. 1 and Copco No. 2 dam complexes. Based on the relative anticipated duration of activities at each site, daily equipment use was apportioned by a factor of 0.7 for Copco No. 1 Dam and 0.3 for Copco No. 2 Dam. Maximum daily emissions were obtained by summing daily emissions for construction phases anticipated to occur at the same time and daily emissions were summed over the total daily duration for each phase to obtain total emissions.

Recirculated Draft EIR Appendix N Attachment A Table Dam and Powerhouse Removal Equipment for the Partial Removal Alternative, table title on page RE-A-82:

Dam and Powerhouse Removal Equipment for the Partial Removal Alternative[1]

Recirculated Draft EIR Appendix N Attachment A Table Dam and Powerhouse Removal Equipment for the Partial Removal Alternative, new footnote on page RE-A-83:

[1] Equipment quantities and daily use estimates were available for the combined demolition activities that would occur at Copco No. 1 and Copco No. 2 dam complexes. Based on the relative anticipated duration of activities at each site, daily equipment use was apportioned by a factor of 0.7 for Copco No. 1 Dam and 0.3 for Copco No. 2 Dam. Maximum daily emissions were obtained by summing daily emissions for construction phases anticipated to occur at the same time and daily emissions were summed over the total daily duration for each phase to obtain total emissions.

Recirculated Draft EIR Appendix N Attachment A Table Restoration Equipment for the Proposed Project, Partial Removal Alternative, Two Dam Removal Alternative, Three Dam Alternative, table title on page RE-A-95:

Restoration Equipment for the Proposed Project, Partial Removal Alternative, Two Dam Removal Alternative, Three Dam Alternative[1]

Recirculated Draft EIR Appendix N Attachment A Table Restoration Equipment for the Proposed Project, Partial Removal Alternative, Two Dam Removal Alternative, Three Dam Alternative, new footnote on page RE-A-95:

[1] Equipment quantities and daily use estimates were available for the combined demolition activities that would occur at Copco No. 1 and Copco No. 2 dam complexes. Based on the relative anticipated duration of activities at each site, daily equipment use was apportioned by a factor of 0.7 for Copco No. 1 Dam and 0.3 for Copco No. 2 Dam. Maximum daily emissions were obtained by summing daily emissions for construction phases anticipated to occur at the same time and daily emissions were summed over the total daily duration for each phase to obtain total emissions.

Recirculated Draft EIR Appendix N Attachment A Table Emissions Factors: Dam and Powerhouse Removal for the Proposed Project, Partial Removal Alternative, Two Dam Removal Alternative, Three Dam Removal Alternative, table title on page RE-A-111:

Emissions Factors: Dam and Powerhouse Removal for the Proposed Project, Partial Removal Alternative, Two Dam Removal Alternative, Three Dam Removal Alternative[1]

Recirculated Draft EIR Appendix N Attachment A Table Emissions Factors: Dam and Powerhouse Removal for the Proposed Project, Partial Removal Alternative, Two Dam Removal Alternative, Three Dam Removal Alternative, new footnote on page RE-A-113:

[1] Equipment quantities and daily use estimates were available for the combined demolition activities that would occur at Copco No. 1 and Copco No. 2 dam complexes. Based on the relative anticipated duration of activities at each site, daily equipment use was apportioned by a factor of 0.7 for Copco No. 1 Dam and 0.3 for Copco No. 2 Dam. Maximum daily emissions were obtained by summing daily emissions for construction phases anticipated to occur at the same time and daily emissions were summed over the total daily duration for each phase to obtain total emissions.

Recirculated Draft EIR Appendix N Attachment A Table Emissions Factors: Restoration for the Proposed Project, Partial Removal Alternative, Two Dam Removal Alternative, Three Dam Removal Alternative, table title on page RE-A-115:

Emissions Factors: Restoration for the Proposed Project, Partial Removal Alternative, Two Dam Removal Alternative, Three Dam Removal Alternative[1]

Recirculated Draft EIR Appendix N Attachment A Table Emissions Factors: Restoration for the Proposed Project, Partial Removal Alternative, Two Dam Removal Alternative, Three Dam Removal Alternative, new footnote on page RE-A-116:

[1] Equipment quantities and daily use estimates were available for the combined demolition activities that would occur at Copco No. 1 and Copco No. 2 dam complexes. Based on the relative anticipated duration of activities at each site, daily equipment use was apportioned by a factor of 0.7 for Copco No. 1 Dam and 0.3 for Copco No. 2 Dam. Maximum daily emissions were obtained by summing daily emissions for construction phases anticipated to occur at the same time and daily emissions were summed over the total daily duration for each phase to obtain total emissions.

Recirculated Draft EIR Appendix N Attachment A Table Emissions Factors: Fugitive Dust for the Proposed Project and Alternatives, column heading on page RE-A-124:

Aggregate Storage Piles,[1] Travel on Unpaved[2/3]/Paved Road[4/5], and Bulldozing[6]

Recirculated Draft EIR Appendix N Attachment A Table SMAQMD Road Construction Emissions Model OFFOAD Equipment Emissions Factors on page RE-A-126:

[1] EPA 2006. AP-42, Chapter 13.2.4 Miscellaneous Sources, Aggregate Storage Piles, Equation 1
[2] EPA 2006. AP-42, Chapter 13.2.42 Miscellaneous Sources, Unpaved Roads, Equation 1a
[3] EPA 2006. AP-42, Chapter 13.2.42 Miscellaneous Sources, Unpaved Roads, Equation 2
[4] EPA 2011. AP-42, Chapter 13.2.41 Miscellaneous Sources, Paved Roads, Equation 1
[5] EPA 2011. AP-42, Chapter 13.2.41 Miscellaneous Sources, Paved Roads, Equation 2
[6] EPA 1998. AP-42 Chapter 11.9 Mineral Products Industry, Western Surface Coal Mining, Equation 11.9-1 Bulldozing

Recirculated Draft EIR Appendix N Attachment A Table Proposed Project Dam and Powerhouse Removal, table title on page RE-A-162:

Proposed Project Dam and Powerhouse Removal[1]

Recirculated Draft EIR Appendix N Attachment A Table Proposed Project Dam and Powerhouse Removal, new footnote on page RE-A-164:

[1] Equipment quantities and daily use estimates were available for the combined demolition activities that would occur at Copco No. 1 and Copco No. 2 dam complexes. Based on the relative anticipated duration of activities at each site, daily equipment use was apportioned by a factor of 0.7 for Copco No. 1 Dam and 0.3 for Copco No. 2 Dam. Maximum daily emissions were obtained by summing daily emissions for construction phases anticipated to occur at the same time and daily emissions were summed over the total daily duration for each phase to obtain total emissions.

Recirculated Draft EIR Appendix N Attachment A Table Proposed Project Restoration, table title on page RE-A-165:

Proposed Project Restoration[1]

Recirculated Draft EIR Appendix N Attachment A Table Proposed Project Restoration Proposed Project Restoration, column headings 16 to 18 on page RE-A-165:

Copco No 1 Diesel Fuel Usage
Copco No 2 Diesel Fuel Usage
Iron Gate Diesel Fuel Usage

Recirculated Draft EIR Appendix N Attachment A Table Proposed Project Restoration, new footnote on page RE-A-165:

[1] Equipment quantities and daily use estimates were available for the combined demolition activities that would occur at Copco No. 1 and Copco No. 2 dam complexes. Based on the relative anticipated duration of activities at each site, daily equipment use was apportioned by a factor of 0.7 for Copco No. 1 Dam and 0.3 for Copco No. 2 Dam. Maximum daily emissions were obtained by summing daily emissions for construction phases anticipated to occur at the same time and daily emissions were summed over the total daily duration for each phase to obtain total emissions.

Recirculated Draft EIR Appendix N Attachment A Table Partial Removal Dam and Powerhouse Removal, table title on page RE-A-173:

Partial Removal Dam and Powerhouse Removal[1]

Recirculated Draft EIR Appendix N Attachment A Table Partial Removal Dam and Powerhouse Removal, new footnote on page RE-A-176:

[1] Equipment quantities and daily use estimates were available for the combined demolition activities that would occur at Copco No. 1 and Copco No. 2 dam complexes. Based on the relative anticipated duration of activities at each site, daily equipment use was apportioned by a factor of 0.7 for Copco No. 1 Dam and

0.3 for Copco No. 2 Dam. Maximum daily emissions were obtained by summing daily emissions for construction phases anticipated to occur at the same time and daily emissions were summed over the total daily duration for each phase to obtain total emissions.

Recirculated Draft EIR Appendix N Attachment A Table Partial Removal Restoration, column headings 16 to 18 on page RE-A-177:

Copco No 1 Diesel Fuel Usage
Copco No 2 Diesel Fuel Usage
Iron Gate Diesel Fuel Usage

Recirculated Draft EIR Appendix N Attachment A Table Partial Removal Trips and VMT, table title on page RE-A-178:

Partial Removal Trips and VMT[1]

Recirculated Draft EIR Appendix N Attachment A Table Partial Removal Trips and VMT, new footnote on page RE-A-178:

[1] Equipment quantities and daily use estimates were available for the combined demolition activities that would occur at Copco No. 1 and Copco No. 2 dam complexes. Based on the relative anticipated duration of activities at each site, daily equipment use was apportioned by a factor of 0.7 for Copco No. 1 Dam and 0.3 for Copco No. 2 Dam. Maximum daily emissions were obtained by summing daily emissions for construction phases anticipated to occur at the same time and daily emissions were summed over the total daily duration for each phase to obtain total emissions.

Recirculated Draft EIR Appendix N Attachment A Table Two Dam Removal Dam and Powerhouse Removal, table title on page RE-A-186:

Two Dam Removal Dam and Powerhouse Removal[1]

Recirculated Draft EIR Appendix N Attachment A Table Two Dam Removal Dam and Powerhouse Removal, new footnote on page RE-A-187:

[1] Equipment quantities and daily use estimates were available for the combined demolition activities that would occur at Copco No. 1 and Copco No. 2 dam complexes. Based on the relative anticipated duration of activities at each site, daily equipment use was apportioned by a factor of 0.7 for Copco No. 1 Dam and 0.3 for Copco No. 2 Dam. Maximum daily emissions were obtained by summing daily emissions for construction phases anticipated to occur at the same time and daily emissions were summed over the total daily duration for each phase to obtain total emissions.

Recirculated Draft EIR Appendix N Attachment A Table Two Dam Removal Restoration, table title on page RE-A-189:

Two Dam Removal Restoration[1]

Recirculated Draft EIR Appendix N Attachment A Table Two Dam Removal Restoration, new footnote on page RE-A-189:

[1] Equipment quantities and daily use estimates were available for the combined demolition activities that would occur at Copco No. 1 and Copco No. 2 dam complexes. Based on the relative anticipated duration of activities at each site, daily equipment use was apportioned by a factor of 0.7 for Copco No. 1 Dam and 0.3 for Copco No. 2 Dam. Maximum daily emissions were obtained by summing daily emissions for construction phases anticipated to occur at the same time and daily emissions were summed over the total daily duration for each phase to obtain total emissions.

Recirculated Draft EIR Appendix N Attachment A Table Three Dam Removal Dam and Powerhouse Removal, table title on page RE-A-197:

Three Dam Removal Dam and Powerhouse Removal[1]

Recirculated Draft EIR Appendix N Attachment A Table Three Dam Removal Dam and Powerhouse Removal, new footnote on page RE-A-198:

[1] Equipment quantities and daily use estimates were available for the combined demolition activities that would occur at Copco No. 1 and Copco No. 2 dam complexes. Based on the relative anticipated duration of activities at each site, daily equipment use was apportioned by a factor of 0.7 for Copco No. 1 Dam and 0.3 for Copco No. 2 Dam. Maximum daily emissions were obtained by summing daily emissions for construction phases anticipated to occur at the same time and daily emissions were summed over the total daily duration for each phase to obtain total emissions.

Recirculated Draft EIR Appendix N Attachment A Table Three Dam Removal Restoration, table title on page RE-A-200:

Three Dam Removal Restoration[1]

Recirculated Draft EIR Appendix N Attachment A Table Three Dam Removal Restoration, column headings 13 to 18 on page RE-A-200:

Copco No 1 Diesel Fuel Usage
Copco No 2 Diesel Fuel Usage
Iron Gate Diesel Fuel Usage

Recirculated Draft EIR Appendix N Attachment A Table Three Dam Removal Restoration, new footnote on page RE-A-200:

[1] Equipment quantities and daily use estimates were available for the combined demolition activities that would occur at Copco No. 1 and Copco No. 2 dam complexes. Based on the relative anticipated duration of activities at each site, daily equipment use was apportioned by a factor of 0.7 for Copco No. 1 Dam and 0.3 for Copco No. 2 Dam. Maximum daily emissions were obtained by summing daily emissions for construction phases anticipated to occur at the same time and daily emissions were summed over the total daily duration for each phase to obtain total emissions.